

DESCRIPTION

CONTACT PIN UNIT AND ELECTRIC COMPONENT SOCKET USING SAME

TECHNICAL FIELD

[0001] The present invention relates to a contact pin unit for removably containing an electric component such as an IC package and electrically connecting the electric component to a circuit board by contact pins, and an electric component socket using the same.

BACKGROUND ART

[0002] Conventionally, for example an IC socket that removably contains an electric component such as an IC package and is mounted on a circuit board includes a contact pin unit. The contact pin unit forms a container for the IC package, and has contact pins arranged so that one end of each contact pin comes into contact with the IC package and the other end comes into contact with the circuit board, to electrically connect the IC package and the circuit board.

[0003] As such a contact pin unit, the following structure has been proposed: Washboard-like contact pin frames in each of which a plurality of grooves crossing a plate body are formed in parallel along the surface of the plate body are stacked in the plate thickness direction in the state where one end and the other end of each of the contact pins arranged in the grooves project outward from the plate body (for example, see Patent Document 1).

REFERENCE DOCUMENT LIST

PATENT DOCUMENT

[0004] Patent Document 1: Japanese Patent Application Laid-open Publication
No. 2012-89389

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] Consider the case where the dimension of the contact pin unit in the contact pin frame stack direction exceeds a design value. Even when the contact pin unit is compressed in the stack direction, it is difficult to adjust the dimension to the design value by such compression because no compression allowance in the stack direction is provided between the adjacent contact pin frames.

[0006] The dimensional adjustment may be performed by making fine correction to a die for molding the contact pin frames. However, if the dimension of the contact pin unit in the stack direction deviates from the design value when the contact pin frames molded using the corrected die are stacked, fine correction needs to be made to the die again. This is likely to complicate the dimensional adjustment of the contact pin unit.

[0007] In view of these problems, the present invention has an object of providing a contact pin unit that facilitates dimensional adjustment in the stack direction and an electric component socket using the same.

MEANS FOR SOLVING THE PROBLEMS

[0008] To solve the problems stated above, a contact pin unit according to the present invention is a contact pin unit for removably containing an electric component and electrically connecting the electric component and a circuit board, and includes:

contact pins each of which has one end that comes into contact with the electric component and an other end that comes into contact with the circuit board; and contact pin frames in each of which a plurality of grooves are formed in parallel along a surface of a plate body, the contact pin frames being stacked in a plate thickness direction in a state where the contact pins are arranged in the grooves with the one end and the other end of each of the contact pins projecting outward from the plate body, wherein a small projection that deforms when the stacked contact pin frames are compressed in a stack direction is formed on part of at least one of abutting surfaces of adjacent contact pin frames in a stack state which abut each other in the stack direction.

[0009] An electric component socket according to the present invention includes: a socket body provided with the contact pin unit described above; a socket cover rotatably supported with respect to the socket body; a heat dissipation member rotatably supported with respect to the socket cover, and pressing the electric component contained in the contact pin unit in a state where the socket cover is closed; and a latch member for holding the state where the socket cover is closed.

EFFECTS OF THE INVENTION

[0010] The contact pin unit and electric component socket according to the present invention facilitate the dimensional adjustment of the contact pin unit in the contact pin frame stack direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a plan view of an IC socket, where the upper half illustrates the state where a socket cover is open and the lower half illustrates the state where the

socket cover is closed.

FIG. 2 is a front view of the IC socket.

FIG. 3 is a side view of the IC socket.

FIG. 4 is a sectional view along line A-A in FIG. 1.

FIG. 5 is a sectional view along line B-B in FIG. 1.

FIG. 6 is a perspective view of a contact pin unit.

FIG. 7 is a plan view of the contact pin unit.

FIG. 8 is a sectional view along line C-C in FIG. 7.

FIG. 9 is a sectional view along line D-D in FIG. 7.

FIG. 10 is a plan view of the contact pin unit from which a first frame body has been removed.

FIG. 11 is a perspective view illustrating the state of stacking contact pin frames.

FIG. 12 is a plan view of a contact pin frame.

FIG. 13 is a sectional view along line E-E in FIG. 12.

FIG. 14 is a sectional view along line F-F in FIG. 12.

FIG. 15 is an enlarged view of part G in FIG. 13.

FIG. 16 is an enlarged view of part H in FIG. 14.

FIG. 17 is an enlarged view of part I in FIG. 14.

FIG. 18 is an explanatory view illustrating the stack state of a unit body in part H in FIG. 14.

FIG. 19 is an explanatory view for describing the compression effect of the unit body in the stack direction, where (a) illustrates the state before compression and (b) illustrates the state after compression.

FIG. 20 illustrates an example of an IC package, where (a) is a front view and (b) is a bottom view.

MODE FOR CARRYING OUT THE INVENTION

[0012] The following describes an embodiment for carrying out the present invention in detail, with reference to attached drawings.

FIGS. 1 to 5 illustrate an example of an electric component socket according to this embodiment.

[0013] The electric component socket is an integrated circuit (IC) socket 10 that contains an IC package 100 as an electric component and is placed on a circuit board 200 to electrically connect the IC package 100 and the circuit board 200, for example for the purpose of conducting performance tests such as burn-in tests.

[0014] The IC socket 10 includes: a socket body 12 in which the IC package 100 is contained; a socket cover 16 that is provided on the socket body 12 so as to be openable and closable, and presses the IC package 100 through a heat dissipation member 14; and a lock mechanism 18 for holding the state where the socket cover 16 is closed (hereafter referred to as “closed state”). The heat dissipation member 14 is abutted on the IC package 100 contained in the socket body 12, to enable heat dissipation from the IC package 100.

[0015] The following description assumes that the IC package 100 contained in the socket body 12 is a ball grid array (BGA) IC package having a plurality of hemispherical terminals 100b arranged in a matrix of m rows × n columns (m and n are natural numbers other than 0) on a bottom surface 100a of a package body which is substantially square in planar view, as illustrated in FIG. 20.

[0016] The socket body 12 is substantially rectangular in planar view, and has a first rotating shaft X1 at one side end 12a and a second rotating shaft X2 at the other side end 12b in parallel with the first rotating shaft X1.

[0017] The socket cover 16 is a substantially quadrilateral frame body, and one side of the frame body as a proximal end 16a of the socket cover 16 is rotatably supported by the first rotating shaft X1 of the socket body 12. The socket cover 16 is configured so that, when rotated from the state indicated by the dotted lines in FIG. 2, a distal end 16b of the socket cover 16 which is the side opposite to the side as the proximal end 16a engages with the below-mentioned latch member.

[0018] The socket cover 16 has the above-mentioned heat dissipation member 14 that presses the IC package 100 in the closed state, in the space surrounded by the frame body. The heat dissipation member 14 is rotatably supported with respect to the socket cover 16 by a third rotating shaft X3 provided in parallel with the first rotating shaft X1, and presses the upper surface of the IC package 100 with uniform pressure when the socket cover 16 is closed. This reduces non-uniformity in the distribution of pressure applied to the IC package 100, and allows heat generated from the IC package 100 to be efficiently transferred to the heat dissipation member 14. The heat dissipation member 14 mainly dissipates the transferred heat from heat dissipation fins 14a into the air.

[0019] The lock mechanism 18 includes: a latch member 20 that is biased away from the socket body 12 at the other side end 12b of the socket body 12, and engages with the distal end 16b of the socket cover 16; and a substantially U-shaped lever member 22 that, when rotated, moves the latch member 20 closer to the socket body 12 via a cam mechanism (not illustrated). The lock mechanism 18 is configured so that, when the lever member 22 is rotated from the state indicated by the dotted lines in FIG. 2 and tilted to be substantially in parallel with the socket body 12 to thereby move the latch member 20 closer to the socket body 12 in the state where the distal end 16b of the socket cover 16 engages with the latch member 20, the heat

dissipation member 14 presses the IC package 100 by the socket cover 16 whose distal end 16b engages with the latch member 20, and the lock mechanism 18 enters the lock state of restricting the operation of the lever member 22 in this pressing state.

[0020] The socket body 12 has a recess 12c from the top to the bottom in a center part in planar view. A contact pin unit 24 is located in the recess 12c. The contact pin unit 24 in the socket body 12 forms a container for removably containing the IC package 100, and also forms a connector for electrically connecting the IC package 100 and the circuit board 200.

[0021] FIGS. 6 to 13 illustrate the contact pin unit 24.

The contact pin unit 24 includes: a unit body 28 having a plurality of contact pins 26; and a floating plate 34 attached to the unit body 28 and holding the IC package 100 from the bottom surface 100a side.

[0022] As illustrated in FIG. 8, the floating plate 34 is biased away from the unit body 28 by an elastic member 24a inserted between the unit body 28 and the floating plate 34. The floating plate 34 has pin through holes 34a through each of which one end (the below-mentioned first contact portion) of a different one of the plurality of contact pins 26 arranged in the unit body 28 passes from the unit body 28 toward the bottom surface 100a of the IC package 100. Further, a guide member 34b for guiding each corner of the IC package 100 so that the hemispherical terminals 100b on the bottom surface 100a of the IC package 100 held on the floating plate 34 are appropriately positioned on the pin through holes 34a is attached to the floating plate 34.

[0023] The unit body 28 includes: the contact pins 26 each of which has one end that comes into contact with the hemispherical terminal 100b on the bottom surface 100a of the IC package 100 held on the floating plate 34 and the other end that comes

into contact with an electrode portion (not illustrated) of the circuit board 200 to electrically connect the IC package 100 and the circuit board 200; and contact pin frames 36 for arranging the contact pins 26.

[0024] The contact pins 26 each include: a first contact portion 26a that comes into contact with the hemispherical terminal 100b of the IC package 100; a second contact portion 26b that comes into contact with the electrode portion (not illustrated) of the circuit board 200; and a spring portion 26c curved into an S shape or the like between the two contact portions. The spring portion 26c is formed so as to, when the floating plate 34 is pressed to the unit body 28 against the biasing force in the state where the first contact portion 26a is in contact with the hemispherical terminal 100b and the second contact portion 26b is in contact with the electrode portion of the circuit board 200, elastically deform by the compression force applied between the first contact portion 26a and the second contact portion 26b to reduce the distance between the first contact portion 26a and the second contact portion 26b.

[0025] The contact pin frames 36 are each a washboard-like plate body in which a plurality of grooves 36b crossing the plate body are formed in parallel along the surface 36a of the plate body. For example, in the case where the contact pin frame 36 is a substantially rectangular flat plate, the grooves 36b extending from one side to the opposite side of the surface 36a of the flat plate are formed in parallel. With the contact pins 26 being arranged in the grooves 36b, the contact pin frames 36 are stacked in the plate thickness direction D_t in the state where the first contact portion 26a and second contact portion 26b of each contact pin 26 project outward from the plate body. This forms the unit body 28 (for example, substantially a rectangular parallelepiped).

[0026] The shape and size of the grooves 36b in the contact pin frames 36 are set

so that, when the contact pin frames 36 are stacked, the contact pins 26 will not interfere with the contact pin frames 36 and affect the dimension of the contact pin frames 36 in the stack direction. The positions of the grooves 36b in the direction in which the grooves 36b are arranged in parallel are set according to the pitch of the matrix-arranged hemispherical terminals 100b in one of the row direction and the column direction (for example, the row direction).

[0027] In each groove 36b in each of the contact pin frames 36, the center part of the groove 36b except the part on the circuit board 200 side and the part on the IC package 100 side is a through groove 36d from the front surface 36a to back surface 36c of the contact pin frame 36. When the contact pin 26 is placed in the groove 36b, the spring portion 26c is inserted in the through groove 36d. When the contact pin frames 36 are stacked to form the unit body 28, the through grooves 36d of the contact pin frames 36 connect to each other, and form unit through holes 28a through the unit body 28 in the stack direction. Each unit through hole 28a contains the spring portion 26c of each contact pin 26, and also avoids the interference with the corresponding contact pin frame 36 by the deformation of the spring portion 26c in the case where a compression force is applied between the first contact portion 26a and second contact portion 26b of the contact pin 26.

[0028] In each groove 36b in each of the contact pin frames 36, the part on the IC package 100 side other than the through groove 36d is a first bottomed groove 36e. The opening of the first bottomed groove 36e is blocked by the back surface 36c of the adjacent contact pin frame 36 in the stack state, to form a first insertion hole 36f into which the first contact portion 26a side of the contact pin 26 with respect to the spring portion 26c is inserted. The first contact portion 26a side of the contact pin 26 with respect to the spring portion 26c can reciprocate in the first insertion hole 36f in

the direction from the IC package 100 to the circuit board 200, by the deformation of the spring portion 26c of the contact pin 26.

[0029] In each groove 36b in each of the contact pin frames 36, the part on the circuit board 200 side other than the through groove 36d is a second bottomed groove 36g. The opening of the second bottomed groove 36g is blocked by the back surface 36c of the same contact pin frame 36 that blocks the opening of the first bottomed groove 36e, to form a second insertion hole 36h into which the second contact portion 26b side of the contact pin 26 with respect to the spring portion 26c is inserted. The second contact portion 26b side of the contact pin 26 with respect to the spring portion 26c can reciprocate in the second insertion hole 36h in the direction from the IC package 100 to the circuit board 200, by the deformation of the spring portion 26c of the contact pin 26.

[0030] In detail, the contact pin frames 36 are stacked as follows: A predetermined number of contact pin frames 36 corresponding to the number of matrix-arranged hemispherical terminals 100b in the other one of the row direction and the column direction (for example, the column direction) are stacked by, at both ends 36i in a first direction D_1 which is the direction in which the grooves 36b are arranged in parallel, inserting guide shafts 38 through guide holes 36j pierced in the plate thickness direction D_t , i.e. a second direction D_2 which is the direction in which the contact pin frames 36 are stacked.

[0031] The unit body 28 formed by stacking the predetermined number of contact pin frames 36 in this way is inserted into a quadrilateral cylinder formed by overlaying a substantially quadrilateral first frame body 30 and second frame body 32 with their respective openings 30a and 32a coinciding with each other, in the state where the first contact portions 26a and second contact portions 26b of the contact pins 26

project respectively from the openings 30a and 32a of the quadrilateral cylinder in the opening direction. The inserted unit body 28 is sandwiched and fixed by the first frame body 30 and the second frame body 32 at such a position that causes no interference with the first contact portions 26a and second contact portions 26b of the contact pins 26, for example, at both ends 36i of the contact pin frames 36 in the first direction D_1 .

[0032] Here, in one of the row direction and column direction (for example, the row direction) of the matrix-arranged hemispherical terminals 100b, the first contact portions 26a of the contact pins 26 arranged in the contact pin frames 36 can be accurately brought into contact with the hemispherical terminals 100b through the pin through holes 34a, by managing the molding accuracy relating to the positions in the direction in which the grooves 36b are arranged in parallel, i.e. the first direction D_1 .

[0033] In the other one of the row direction and column direction (for example, the column direction) of the matrix-arranged hemispherical terminals 100b, however, even when the molding accuracy of the contact pin frames 36 is strictly managed, there is a possibility that the actual dimension of the unit body 28 in the stack direction, i.e. the second direction D_2 , exceeds a design value due to a stacking error associated with stacking many contact pin frames 36. This may hinder accurate contact of the first contact portions 26a of the contact pins 26 arranged in the contact pin frames 36 with the hemispherical terminals 100b through the pin through holes 34a.

[0034] Even if the contact pin unit 24 is compressed in the stack direction, it is difficult to adjust the dimension to the design value by such compression because no compression allowance in the stack direction is provided between the adjacent contact pin frames 36.

[0035] Besides, even though the dimensional adjustment is performed by making

fine correction to a die for molding the contact pin frames 36 in units of 0.0001 mm as an example, if the dimension of the contact pin unit 24 in the stack direction deviates from the design value when the contact pin frames 36 molded using the corrected die are stacked, fine correction needs to be made to the die again. This is likely to complicate the dimensional adjustment of the contact pin unit 24.

[0036] In view of this, at least one small projection 36k that crushes when the stacked contact pin frames 36 are compressed in the stack direction is formed on part of the front surface 36a from among the front surface 36a and back surface 36c of the adjacent contact pin frames 36 in the stack state which abut (or come into contact with, the same applies hereafter) each other in the stack direction, as illustrated in FIGS. 14 to 18. Thus, the dimension in the stack direction when the contact pin frames 36 are simply stacked is intentionally set to exceed the design value of the unit body 28 in the stack direction, as illustrated in (a) in FIG. 19. After this, the contact pin frames 36 are compressed in the stack direction, so that the actual dimension of the unit body 28 in the stack direction can be adjusted to the design value, as illustrated in (b) in FIG. 19.

[0037] The crushing of the small projection 36k is plastic deformation in which the small projection 36k is crushed under pressure, which hardly evokes the plastic deformation of the contact pin frame 36 except the small projection 36k and its neighboring part. Therefore, crushing the small projection 36k has the effect of reducing the dimension of the unit body 28 having the predetermined number of stacked contact pin frames 36 in the stack direction by, between the adjacent contact pin frames 36 in the stack state, bringing the back surface 36c of one contact pin frame 36 closer to the front surface 36a of the other contact pin frame 36. In other words, the crushing of the small projection 36k involves not only the case where,

between the adjacent contact pin frames 36 in the stack state, the front surface 36a of one contact pin frame 36 and the back surface 36c of the other contact pin frame 36 abut each other in the stack direction as in the case where no small projection 36k is formed, but also the case where the front surface 36a of one contact pin frame 36 and the back surface 36c of the other contact pin frame 36 do not abut each other in the stack direction except at the small projection 36k.

[0038] The formation of the small projection 36k is not limited to the front surface 36a from among the front surface 36a and back surface 36c of the adjacent contact pin frames 36 in the stack state which abut each other in the stack direction as mentioned above. The small projection 36k may be formed on the back surface 36c, or on both of the front surface 36a and the back surface 36c. Thus, the small projection 36k is formed on part of any of the abutting surfaces of the adjacent contact pin frames 36 in the stack state which abut each other in the stack direction.

[0039] The shape, dimension, etc. of the small projection 36k are designed so that the dimension in the stack direction when the predetermined number of contact pin frames 36 are stacked exceeds the design value of the unit body 28 in the stack direction and the dimension is reduced at least to the design value when the stacked contact pin frames 36 are compressed in the stack direction.

[0040] The small projection 36k can be formed so that, when the unit body 28 is compressed in the stack direction, pressure is efficiently transmitted to the small projection 36k in each contact pin frame 36. For example, the small projection 36k may be formed substantially at the same position in each contact pin frame 36.

[0041] The small projection 36k can also be formed so that the distance between the stacked contact pin frames 36 (i.e. the distance between the front surface 36a and the back surface 36c) is relatively uniformly reduced by compression in all parts of

each contact pin frame 36. For example, as in this embodiment, the small projection 36k may be linearly formed in the direction in which the grooves 36b are arranged in parallel, on both separate sides of the contact pin frame 36 corresponding to the first contact portion 26a and second contact portion 26b of the contact pin 26 placed in each groove 36b.

[0042] The small projection 36k may have any position, shape, and dimension, as long as the dimension in the stack direction when the predetermined number of contact pin frames 36 are stacked exceeds the design value of the unit body 28 in the stack direction and the dimension is reduced at least to the design value when the stacked contact pin frames 36 are compressed in the stack direction. Accordingly, for example, the small projection 36k may be scattered on the abutting surface, or the small projection 36k may be formed on the abutting surface in the first direction D_1 continuously or intermittently to form one or more straight lines or curved lines. For the same reason, the small projection 36k may have any of various cross sectional shapes such as a rectangle, a triangle, a semicircle, a trapezoid, and an inverted trapezoid.

[0043] The following describes a method of manufacturing the contact pin unit 24 using the contact pin frames 36 having such small projections 36k.

First, in each groove 36b of each of the contact pin frames 36, the spring portion 26c of the contact pin 26 is inserted into the through groove 36d, the first contact portion 26a side from the spring portion 26c is located in the first bottomed groove 36e, and the second contact portion 26b side from the spring portion 26c is located in the second bottomed groove 36g. The contact pins 26 are thus arranged in each contact pin frame 36.

[0044] The predetermined number of contact pin frames 36 in each of which the

contact pins 26 are arranged are stacked in the plate thickness direction Dt, to form the unit body 28.

As mentioned above, the dimension of the stacked contact pin frames 36 in the stack direction is set to exceed the design value, by forming the small projections 36k beforehand. The stacked contact pin frames 36 are then compressed in the stack direction until the dimension becomes equal to the design value.

[0045] For example, the contact pin frames 36 stacked by inserting the guide shafts 38 through the guide holes 32i are placed on a reference plane so that the stack direction is substantially perpendicular to the reference plane. Jig blocks are placed on the reference plane on both sides of the stacked contact pin frames 36. The distance of the jig blocks from the reference plane in substantially the perpendicular direction in the case where the jig blocks are placed on the reference plane is equal to the design value of the unit body 28 in the stack direction. One or more pressing jigs having such a dimension that can be disposed between the jig blocks and also having a flat pressing surface are set on the stack end surface of the stacked contact pin frames 36 while avoiding the guide shafts 38, and pressed in parallel with the reference plane until they abut the jig blocks on both sides. The stacked contact pin frames 36 are thus compressed in the stack direction.

[0046] The compressed unit body 28 is inserted into the quadrilateral cylinder formed by overlaying the substantially quadrilateral first frame body 30 and second frame body 32 with their respective openings 30a and 32a coinciding with each other, in the state where the first contact portions 26a and second contact portions 26b of the contact pins 26 project respectively from the openings 30a and 32a of the quadrilateral cylinder in the opening direction. The inserted unit body 28 is sandwiched and fixed by the first frame body 30 and the second frame body 32 at

such a position that causes no interference with the first contact portions 26a and second contact portions 26b of the contact pins 26.

The unit body 28 sandwiched and fixed by the first frame body 30 and the second frame body 32 is connected to the floating plate 34 via the elastic member 24a attached to the first frame body 30, to produce the contact pin unit 24.

[0047] The following describes the operation of the IC socket 10 including such a contact pin unit 24.

First, in the state where the socket cover 16 of the IC socket 10 and the lever member 22 are open as illustrated in the upper half of FIG. 1 and the dotted lines in FIG. 2, the IC package 100 is guided by the guide member 34b and held on the floating plate 34 of the contact pin unit 24.

[0048] The socket cover 16 is then rotated to be substantially in parallel with the socket body 12 and closed, and the distal end 16b of the socket cover 16 is engaged with the latch member 20, as illustrated in FIG. 4. The lever member 22 is further rotated and tilted to be substantially in parallel with the socket body 12 to thereby move the latch member 20 closer to the socket body 12 by the cam mechanism (not illustrated), as illustrated in FIG. 2. This causes the heat dissipation member 14 to press the IC package 100, and brings about the lock state of restricting the operation of the lever member 22 in the pressing state.

[0049] Since the heat dissipation member 14 rotates with respect to the socket cover 16, the heat dissipation member 14 and the IC package 100 are mostly in a surface contact state from when the heat dissipation member 14 first comes into contact with the IC package 100 to when the lock state begins. This reduces non-uniformity in the distribution of pressure applied from the heat dissipation member 14 to the IC package 100, and allows heat generated from the IC package 100 to be

efficiently transferred to the heat dissipation member 14.

[0050] As a result of the heat dissipation member 14 pressing the IC package 100 toward the unit body 28, the floating plate 34 is pressed to be closer to the unit body 28 against the biasing force of the elastic member 24a. Meanwhile, the first contact portion 26a of each contact pin 26 comes into contact with the hemispherical terminal 100b of the IC package 100 through the pin through hole 34a of the floating plate 34, which produces a compression force between the first contact portion 26a and the second contact portion 26b. However, since the spring portion 26c of the contact pin 26 elastically deforms to absorb the compression force, the first contact portion 26a and second contact portion 26b of the contact pin 26 are respectively in contact with the hemispherical terminal 100b and the circuit board 200 with predetermined pressure.

[0051] In addition, the lower surface of the heat dissipation member 14 abuts the upper surface of the IC package 100, and dissipates heat from the heat dissipation fins 14a. In this state, voltages are applied to the IC package 100 to conduct performance tests such as burn-in tests.

[0052] In such a contact pin unit 24, the dimension of the stacked contact pin frames 36 in the stack direction is set to exceed the design value of the unit body 28 in the stack direction, by forming the small projections 36k beforehand.

Hence, the design value of the unit body 28 in the stack direction can be realized simply by compressing the stacked contact pin frames 36 in the stack direction. This facilitates the dimensional adjustment of the unit body 28 in the stack direction, as compared with the case of making fine correction to the die for molding the contact pin frames 36 to adjust the dimension of the contact pin frames 36 in the plate thickness direction. The time of manufacturing the contact pin unit 24 and the IC socket 10 can

be shortened in this way, which contributes to improved manufacturing efficiency.

[0053] Although the foregoing embodiment describes the case where the present invention is applied to the IC socket 10 containing the IC package 100 as an electric component socket, this is not a limitation. The present invention may be applied to other devices containing electric components.

[0054] Although the foregoing embodiment describes the case where the small projection 36k is part of the contact pin frame 36 and is formed integrally with the contact pin frame 36, the material of the small projection 36k may be different from the contact pin frame 36 to ease the crushing of the small projection 36k, by use of double molding that combines different materials (substances) to form an integral structure.

[0055] Although the foregoing embodiment describes the case where the small projection 36k is part of the contact pin frame 36 and is formed integrally with the contact pin frame 36, the small projection formed separately from the contact pin frame 36 may be integrated with the contact pin frame 36 by any known joining method such as bonding, deposition, welding, or mechanical joining. In this case, the separate small projection may be made of a different material from the contact pin frame 36, to ease crushing. Alternatively, the separate small projection may be provided without being integrated with the contact pin frame 36, for example by inserting an ultrathin sheet between the adjacent contact pin frames 36 in the stack state.

[0056] Although the foregoing embodiment describes the case where the dimensional adjustment is performed to realize the design value of the unit body 28 in the stack direction in such a manner that crushes the small projection 36k through plastic deformation when the stacked contact pin frames 36 are compressed, this is not a limitation. The dimensional adjustment may be performed to realize the design

value of the unit body 28 in the stack direction by the elastic deformation of the small projection 36k.

[0057] In the case of performing the dimensional adjustment to realize the design value of the unit body 28 in the stack direction by the elastic deformation of the small projection 36k, the unit body 28 is formed with stoppers being attached to guide pins on the stack end surface of the compressed contact pin frames 36, to prevent the stacked contact pin frames 36 from returning to the original state after the compression. To use a more elastic material than the contact pin frame 36 for the small projection 36k, the small projection 36k may be formed by double molding or formed as a separate small projection made of a more elastic material than the contact pin frame 36, as mentioned earlier.

[0058] The embodiment described above is merely selected to illustrate and describe the present invention, and it should be obvious to a person skilled in the art from this disclosure that various changes and modifications are possible without departing from the scope of the present invention as defined in the attached claims.

[0059] The above description of the embodiment according to the present invention is merely provided for the purpose of illustration, and is not to limit the present invention (the inventions claimed in the attached claims and their equivalent inventions).

REFERENCE SYMBOL LIST

[0060]

10 IC socket

12 socket body

12a one side end

12b	other side end
12c	recess
14	heat dissipation member
16	socket cover
16a	proximal end
16b	distal end
20	latch member
22	lever member
24	contact pin unit
26	contact pin
26a	first contact portion
26b	second contact portion
28	unit body
36	contact pin frame
36a	front surface
36b	groove
36c	back surface
36k	small projection
100	IC package
200	circuit board

CLAIMS

1. A contact pin unit for removably containing an electric component and electrically connecting the electric component and a circuit board, the contact pin unit comprising:

contact pins each of which has one end that comes into contact with the electric component and an other end that comes into contact with the circuit board;
and

contact pin frames in each of which a plurality of grooves are formed in parallel along a surface of a plate body, the contact pin frames being stacked in a plate thickness direction in a state where the contact pins are arranged in the grooves with the one end and the other end of each of the contact pins projecting outward from the plate body,

wherein a small projection that deforms when the stacked contact pin frames are compressed in a stack direction is provided on part of at least one of abutting surfaces of adjacent contact pin frames in a stack state which abut each other in the stack direction.

2. The contact pin unit according to claim 1, wherein the small projection crushes when the stacked contact pin frames are compressed in the stack direction.

3. The contact pin unit according to claim 1, wherein the small projection elastically deforms when the stacked contact pin frames are compressed in the stack direction.

4. The contact pin unit according to claim 1, wherein the small projection is formed in a direction in which the grooves are arranged in parallel.
5. The contact pin unit according to claim 1, wherein the small projection is formed on both separate sides of the contact pin frame corresponding to the one end and the other end of each of the contact pins arranged in the grooves.
6. The contact pin unit according to claim 1, wherein the small projection is linearly formed.
7. The contact pin unit according to claim 6, wherein the small projection has a rectangular cross section.
8. The contact pin unit according to claim 1, wherein the small projection is made of a same material as and formed integrally with the contact pin frame.
9. The contact pin unit according to claim 1, wherein the small projection is made of a different material from the contact pin frame, and integrated with the contact pin frame by double molding.
10. The contact pin unit according to claim 9, wherein the small projection is made of a material more deformable than the contact pin frame.
11. The contact pin unit according to claim 1, wherein the small projection is a

component separate from the contact pin frame, and is joined to the contact pin frame.

12. The contact pin unit according to claim 11, wherein the small projection is made of a material more deformable than the contact pin frame.

13. The contact pin unit according to claim 1, wherein the small projection is a sheet-like component separate from the contact pin frame, and is inserted between the adjacent contact pin frames in the stack state.

14. The contact pin unit according to claim 13, wherein the small projection is made of a material more deformable than the contact pin frame.

15. An electric component socket comprising:

a socket body provided with the contact pin unit according to any one of claims 1 to 14;

a socket cover rotatably supported with respect to the socket body;

a heat dissipation member rotatably supported with respect to the socket cover, and pressing the electric component contained in the contact pin unit in a state where the socket cover is closed; and

a latch member for holding the state where the socket cover is closed.