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Socket device for testing ICS

Abstract

Proposed is a socket device for testing integrated circuits (ICs) used to test ICs. The socket device includes a contact module (**100**) for seating an IC and having a plurality of contacts (**110**) for electrical connection of a lead of the IC and a terminal of a printed circuit board (PCB), and a pusher module (**200**) having a latch (**211**) to be fit-assembled from a top of the contact module (**100**) and for pressurizing the IC, wherein the pusher module (**200**) includes a lead frame (**210**) with the latch rotatably provided thereto, a pressurizing part (**220**) (**230**) assembled to the lead frame (**210**) with two floating hinge axes (C**1**) (C**2**) parallel to each other and elastically supported against the lead frame, first and second cam shafts (**240**) (**250**) provided in the respective floating hinge axes (C**1**) (C**2**), a handle (**260**), a lever (**270**), and a link (**280**).

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATION
(1) The present application claims priority to Korean Patent Application No. 10-2022-0167711, filed Dec. 5, 2022, the entire contents of which is incorporated herein for all purposes by this reference.
BACKGROUND OF THE INVENTION
Field of the Invention
(2) The present disclosure relates to a socket device for testing integrated circuits (ICs) used to test ICs.
Description of the Related Art
(3) In general, integrated circuit (IC) sockets are provided on test boards or burn-in boards and used in a system for a series of IC tests as burn-in chambers or peripheral devices thereof that allow input and output of power and electrical signals required to drive an IC and separate test devices to measure the characteristics of the IC are connected through input/output (I/O) terminals located on the boards (test boards, burn-in boards).
(4) Among widely used ICs, a ball grid array (BGA)-type IC innovatively reduces the size and thickness of an IC by arranging IC leads, that is, balls, on the entire underside of the IC.
(5) On the other hand, a land grid array (LGA)-type IC is a BGA-type IC with no ball attached to a pad (or land).
(6) Recently, a variety of LGA-type or BGA and LGA combination-type ICs are produced, and a socket for testing an LGA-type or combination-type IC is equipped with a plurality of contacts with a predetermined elastic force in the up and down directions, and lower terminals of a contact are connected to a printed circuit board (PCB) by contact or soldering.
(7) In this case, upper terminals of the contact are provided to contact leads of an IC loaded into the socket, and the socket needs to be equipped with a pressurizing device that presses the IC downward to ensure electrically stable contact.
(8) For reference, the physical force applied per contact may be calculated by dividing the physical force applied to the upper surface of an IC by a pressurizing device by the number of contacts.
(9) To be specific, the physical force applied to contacts is approximately 10 gf per contact. For example, when an IC has 500 leads, a strong physical force of about 5.0 Kgf needs to be applied.
(10) Therefore, a socket for testing ICs requires a pressurizing means that can effectively apply the strong physical force as described above to an IC.
(11) As the number of IC leads increases, lead pitch becomes narrower, and ICs become thinner, there is a need for a socket that is equipped with a pressurizing means that can apply strong pressure while keeping the entire surface of an IC even in response to the upward contact force applied to leads of the IC especially when conducting a burn-in test at high temperature for a long time.
(12) As an example of conventional socket, Korean Patent Application Publication No. 10-2022-

0020718 discloses a test device provided with a rotary-type handle mechanism for performing rotational manipulation at the top of the test device. However, it is difficult to add a heating package such as a heat sink or a heat dissipation fan to such a rotary-type test device.

Documents of Related Art

(13) (Patent Document 0001) Korean Patent Application Publication No. 10-2022-0020718 (published Feb. 21, 2022)

SUMMARY OF THE INVENTION

(14) Accordingly, the present disclosure has been made keeping in mind the above problems occurring in the related art, and the present disclosure is intended to provide a socket device for testing integrated circuits (ICs) used to test ICs and, more particularly, to a socket device that prevents damage to an IC by applying uniform pressing force to the entire upper surface of the IC during the IC loading process.

(15) An objective of the present disclosure is to provide a socket device that facilitates the installation of a heating package such as a heat sink and a heat dissipation fan along with a pressurization mechanism that applies pressure to an IC during the IC loading process.

(16) In order to achieve the above objective, according to an embodiment of the present disclosure, there is provided a socket device for testing integrated circuits (ICs), including: a contact module for seating an IC and having a plurality of contacts for electrical connection of a lead of the IC and a terminal of a printed circuit board (PCB); and a pusher module having a latch to be fit-assembled from a top of the contact module and for pressurizing the IC, wherein the pusher module may include: a lead frame with the latch rotatably provided thereto; a pressurizing part assembled to the lead frame with two floating hinge axes parallel to each other and elastically supported against the lead frame to be movable up and down to elastically pressurize the IC; first and second cam shafts provided in the respective floating hinge axes to adjust a vertical height of the pressurizing part depending on a rotation angle thereof; a handle rotatably fixed with the first cam shaft; a lever rotatably fixed with the second cam shaft; and a link having opposite ends rotatably connected to the handle and the lever.

(17) Preferably, the pressurizing part may include: a heat sink frame having a first elastic body disposed and assembled with the lead frame by means of the first and second cam shafts; and a pusher block provided with a second elastic body to be elastically supported against the heat sink frame and having a pressurizing surface that elastically pressurizes the IC.

(18) More preferably, each of the first and second cam shafts may include: a first section having a circular cross-section and rotatably assembled with the lead frame; and a second section extending from the first section and having a cam surface that forms a plane in an axial direction on a portion of an outer peripheral surface of each of the first and second cam shafts to be assembled with the heat sink frame.

(19) More preferably, the heat sink frame may include a floating hinge part formed with a floating hinge hole through which each of the first and second cam shafts is inserted, wherein the floating hinge hole may have a flat surface that makes surface contact with the cam surface.

(20) Preferably, the heat sink frame and the pusher block may be respectively provided with a first opening and a second opening formed through approximately a center thereof, and a heat sink may be further included, the heat sink being equipped with a plurality of heat dissipation fins, provided on top of the heat sink frame, inserted into the first and second openings, and having a pressurizing surface that pressurizes an IC. More preferably, the heat sink may be provided with a third elastic body and may be elastically assembled with the heat sink frame.

(21) According to an embodiment of the present disclosure, there is provided a pusher device for being assembled with a contact module of a socket device to electrically connect a lead of an IC and a terminal of a printed circuit board (PCB) to pressurize the IC. The pusher device includes: a lead frame with a latch rotatably provided thereto to be fit-assembled from a top of the contact module; a pressurizing part assembled to the lead frame with two floating hinge axes parallel to

each other and elastically supported against the lead frame to be movable up and down to elastically pressurize the IC; first and second cam shafts provided in the respective floating hinge axes to adjust a vertical height of the pressurizing part depending on a rotation angle thereof; a handle rotatably fixed with the first cam shaft; a lever rotatably fixed with the second cam shaft; and a link having opposite ends rotatably connected to the handle and the lever.
(22) A socket device for testing integrated circuits (ICs) according to the present disclosure includes a contact module and a pusher module that is fit-assembled from the top of the contact module and pressurizes an IC, wherein the pusher module includes: a lead frame; a pressurizing part assembled to the lead frame with two floating hinge axes C**21** and C**22** and elastically supported against the lead frame to be movable up and down to elastically pressurize the IC; first and second cam shafts provided in the respective floating hinge axes C**21** and C**22** to adjust the vertical height of the pressurizing part depending on a rotation angle thereof; a handle rotatably fixed with the first cam shaft; a lever rotatably fixed with the second cam shaft; and a link having opposite ends rotatably connected to the handle and the lever, so that the IC is pressed with uniform pressing force, thereby preventing damage to the IC.
(23) Furthermore, according to a socket device for testing integrated circuits (ICs) of the present disclosure, it is easy to install heating means such as a heat sink or a cooling fan on the upper portion of a pressurizing part.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The above and other objectives, features, and other advantages of the present disclosure will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:
(2) FIG. **1** is a perspective view of a socket device for testing integrated circuits (ICs) according to an embodiment of the present disclosure;
(3) FIGS. **2**A and **2**B are a plan view and a side view respectively of the socket device for testing integrated circuits (ICs) according to the embodiment of present disclosure;
(4) FIG. **3** is an exploded perspective view of the socket device for testing integrated circuits (ICs) according to the embodiment of the present disclosure;
(5) FIG. **4** is a cross-sectional view along line B-B of FIG. **3**;
(6) FIG. **5** is an exploded perspective view of a contact module of the socket device for testing integrated circuits (ICs) according to the embodiment of the present disclosure;
(7) FIGS. **6**A and **6**B are cross-sectional views showing the operation before and after pressurizing on the cross-section along line B-B of FIG. **2**A;
(8) FIG. **7** is a perspective view of a socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure;
(9) FIG. **8** is a plan view of the socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure;
(10) FIG. **9** is an exploded perspective view of the socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure;
(11) FIG. **10** is a cross-sectional view along line C-C of FIG. **8**;
(12) FIG. **11** is a cross-sectional view along line D-D of FIG. **8**;
(13) FIG. **12** is a cross-sectional view along line E-E of FIG. **8**; and
(14) FIG. **13** is a perspective view of a socket device for testing integrated circuits (ICs) according to still another embodiment of the present disclosure.
DETAILED DESCRIPTION OF THE INVENTION
(15) Terms and words used in this specification and claims should not be construed as limited to

their ordinary or dictionary meanings, and should be interpreted as meaning and concept consistent with the technical idea of the present disclosure on the basis of the principle that an inventor can appropriately define terminological concepts to best describe his or her invention.

(16) Accordingly, an embodiment described in this specification and the configuration shown in the drawings are only one of the most preferred embodiments of the present disclosure, and do not represent the entire technical idea of the present disclosure. Therefore, it should be understood that at the time of filing this application, there may be various equivalents and modifications that can replace the embodiment and the configuration.

(17) Hereinafter, preferred embodiments of the present disclosure will be described in detail with the accompanying drawings. Meanwhile, in the drawings below, the size of certain components may be relatively exaggerated to aid understanding of the invention, and when there is no need to distinguish between multiple identical components, the identical components may be expressed as one representative.

(18) FIG. **1** is a perspective view of a socket device for testing integrated circuits (ICs) according to an embodiment of the present disclosure; FIGS. **2**A and **2**B are a plan view and a side view respectively of the socket device for testing integrated circuits (ICs) according to the embodiment of present disclosure; FIG. **3** is an exploded perspective view of the socket device for testing integrated circuits (ICs) according to the embodiment of the present disclosure; FIG. **4** is a cross-sectional view along line B-B of FIG. **3**; and FIG. **5** is an exploded perspective view of a contact module of the socket device for testing integrated circuits (ICs) according to the embodiment of the present disclosure.

(19) Referring to FIGS. **1** to **5**, the socket device includes a contact module **100** provided with a plurality of contacts **110**, and a pusher module **200** equipped with a latch **211** and fitted to and assembled from the top of the contact module **100** to press an integrated circuit.

(20) In particular, referring to FIG. **5**, the contact module **100** is for seating an integrated circuit (hereinafter abbreviated as “IC”) to electrically connect a lead of the IC and a terminal of a printed circuit board (PCB), and includes a lower body **120** and an upper body **130**. The contact module **100** may further include a floating plate **140** and a base frame **150**.

(21) The lower body **120** and the upper body **130** have a roughly square structure. Holes **121** and **131** into which contacts **110** are inserted are formed in the lower body **120** and the upper body **130**, so that each contact **110** is accommodated and fixed between the lower body **120** and the upper body **130** to electrically connect the lead of the IC and the terminal of the PCB.

(22) In the present embodiment, the contact **110** consists of an upper contact pin **111**, a lower contact pin **112**, and a spring **113**. The upper contact pin **111** and the lower contact pin **112** are assembled so as to slide up and down, and the spring **113** is elastically supported between the upper contact pin **111** and the lower contact pin **112**. The upper contact pin **111** may include an upper head **111***a* having an upper tip. Due to the elastic force of the spring **113**, the upper head **111***a* is pressed in the direction of the lead of the IC, and the lower contact pin **112** is pressed in the direction of the terminal of the PCB, so that the contact **110** electrically connects each lead of the IC and each terminal the PCB. Meanwhile, the present disclosure is not limited to this contact, and various well-known socket contacts may be used as long as the lead of the IC and the terminal of the PCB can be electrically connected.

(23) Preferably, a spring **142** is disposed on the upper body **130** to elastically provide the floating plate **140**, and an IC for testing is seated on the floating plate **140**.

(24) The IC seating surface of the floating plate **140** may be formed with a plurality of ball lead receiving holes **141** to accommodate (ball) leads of the IC, and the upper head **111***a* of the contact **110** is positioned through the ball lead receiving hole **141**. The ball lead receiving hole may be omitted depending on the lead type of the IC (land grid array; LGA). Meanwhile, in FIG. **5**, although only one spring **142**, which provides elastic support between the upper body **130** and the floating plate **140**, is shown, a plurality of springs may be disposed between the upper body **130**

and the floating plate **140** within a range that can elastically support the floating plate **140** horizontally.

(25) The base frame **150** has an opening **151** through which the IC may penetrate, and includes a latch fixing protrusion **152** through which the latch of the pusher module is fixed. The lower body **120** and the upper body **130** are sequentially fixed to the base frame **150** by fastening members such as bolts, and the floating plate **140** disposed on the upper body **130** is assembled with the base frame **150** to be able to move up and down. The base frame **150** may include mounting holes or mounting pins for assembly on the PCB.

(26) Referring back to FIGS. **1** to **4**, the pusher module **200** includes a lead frame **210**, pressurizing parts **220** and **230**, first and second cam shafts **240** and **250**, a handle **260**, a lever **270**, and a link **280**.

(27) The lead frame **210** has an opening **212** through which the pressurizing parts **220** and **230** are positioned, and includes a latch **211** that may be fixed to the contact module **100**. In the present embodiment, the latch **211** is provided on two opposing sides among the four sides of the lead frame **210**, is hinge-assembled to the lead frame **210**, and is fixed to the latch fixing protrusion **152** of the contact module **100**. Preferably, the latch **211** is provided with an elastic body (spring) to provide operating force for pressurizing in the direction of fixation with the latch fixing protrusion **152** of the contact module **100**, and is elastically fixed to the latch fixing protrusion **152**.

(28) The lead frame **210** is provided with hinge blocks **213** and **214** for assembling the pressurizing parts **220** and **230** on the remaining two opposing sides of the four sides, excluding the sides where the latches **211** are placed. The hinge blocks **213** and **214** are composed of a first hinge block **213** and a second hinge block **214**, and a circular axial hole **214***a* is formed through each hinge block **213** and **214**. Reference numerals C**11** and C**12** represent the hinge axes of the axial holes of the first hinge block **213** and the second hinge block **214**, respectively. Handle fixing members **215** and **215***a* may be formed to extend integrally from the upper portion of the second hinge block **214**. In the present embodiment, the handle fixing members **215** and **215***a* are composed of a handle fixing block **215** and a handle fixing protrusion **215***a* that protrudes from the outer wall of the handle fixing block **215**.

(29) The pressurizing parts **220** and **230** are assembled to the lead frame **210** with two floating hinge axes C**21** and C**22** in parallel with each other and elastically supported against the lead frame **210** to be movable up and down, thereby elastically pressurizing an IC.

(30) Preferably, the pressurizing parts **220** and **230** are composed of: a heat sink frame **220** having a first elastic body S**1** and assembled with the lead frame **210** by means of the first and second cam shafts **240** and **250**; and a pusher block **230** provided under the heat sink frame **220** to elastically pressurize an IC by a second elastic body S**2**. The first elastic body S**1** and the second elastic body S**2** may be provided as known compression springs, but are not limited thereto. The first elastic body S**1** provides a reaction force to return the heat sink frame **220** to the initial position thereof when the pressing force on the IC is released, and the second elastic body S**2** provides the pressing force on the IC.

(31) The first elastic body S**1** is interposed between the lead frame **210** and the heat sink frame **220** and elastically supports the heat sink frame **220** upward. The second elastic body S**2** is interposed between the heat sink frame **220** and the pusher block **230** and elastically supports the pusher block **230** downward, providing a pressing force for the pusher block **230** to press the IC.

(32) The heat sink frame **220** has two floating hinge axes C**21**, C**22** and is assembled with the lead frame **210**, and due to the floating hinge axes C**21** and C**22**, the heat sink frame **220** may move up and down within a predetermined height range in the vertical direction with respect to the lead frame **210**. In the following description, since the two floating hinge axes C**21** and C**22** have the same configuration and operation, only the reference numerals for one floating hinge axis will be used without distinction in the description of the related embodiments, and if distinction is necessary, two floating hinge axes will be described as the first flow hinge axis C**21** and the second

flow hinge axis C**22**.

(33) To be specific, the heat sink frame **220** includes floating hinge parts **221** and **222** respectively corresponding to hinge blocks **213** and **214** of the lead frame **210** and assembled by means of the first and second cam shafts **240** and **250**, and each of the floating hinge parts **221** and **222** is formed with a floating hinge hole **221***a* through which the cam shaft **240** or the cam shaft **250** is assembled. Meanwhile, the cam shaft **240** includes a first section L**1** with a circular cross-section and a second section L**2** extending from the first section L**1** and having a cam surface **241** that forms a plane in the axial direction on a portion of the outer peripheral surface of the cam shaft **240**. The first section L**1** is a section inserted into the circular axial hole **214***a* of the lead frame **210**, and the second section L**2** is a section inserted into the hinge hole **221***a* of the heat sink frame **220**. Thus, the second section L**2** in which the cam surface **241** is formed on the cam shaft **240** is approximately determined by the position of the floating hinge part **221** of the heat sink frame **220**.

(34) The upper portion of the hinge hole **221***a* of the floating hinge part **221** has an arcuate surface having approximately the same curvature as the cam shaft **240**, while the lower portion of the hinge hole **221***a* has a flat surface that makes surface contact with the cam surface. Accordingly, depending on the rotation angle of the cam shafts **240** and **250** provided in the floating hinge axes C**21** and C**22**, the heat sink frame **220** may move up and down within a predetermined height range.

(35) The pusher block **230** is provided beneath the heat sink frame **220**, and the second elastic body S**2** is interposed to elastically press the IC. Preferably, the pusher block **230** includes a flat pressurizing surface **233** at the lower portion thereof, and the pressurizing surface **233** is in direct surface contact with the upper surface of the IC. The pusher block **230** has one or more stopper grooves **231** formed approximately along the lower edge thereof. As the stopper groove **231** is caught by a bolt head **232***a* of a stopper bolt **232** fastened to the heat sink frame **220**, the downward movement range of the pusher block **230** is limited.

(36) Preferably, the heat sink frame **220** and the pusher block **230** may be made of a metal material with excellent heat conduction. In addition, an additional heat generating unit or heating unit may be installed on the top of the heat sink frame **220**, so that the test may be conducted by heating or cooling an IC under test to an appropriate temperature.

(37) The handle **260**, the lever **270**, and the link **280** are provided in pairs symmetrically on the left and right sides of the socket device to form a handle unit, and by operating the handle unit, a pressing force that pressurizes an IC is generated.

(38) The handle **260** and the lever **270** are rotatably fixed to the rotation axes of the first cam shaft **240** and the second cam shaft **250**, respectively, and the link **280** is connected between the handle **260** and the lever **270**. Thus, the operating force generated by manipulating the handle **260** is transmitted to the lever **270** through the link **280**, and the first cam shaft **240** and the second cam shaft **250** are linked and rotated by the same angle according to the operation angle of the handle **260**. The handle **260** is provided with a fixing hole **261** that is inserted into the handle fixing protrusion **215***a*, which is a handle fixing member, so that the closed state of the handle **260** is fixed.

(39) FIGS. **6**A and **6**B are cross-sectional views showing the operation before and after pressurization of the socket device for testing integrated circuits (ICs) according to the embodiment of the present disclosure. FIG. **6**A shows a state in which the handle is in a closed state and a pressing force is generated on an IC, and FIG. **6**B shows a state in which the handle is in an open state and the pressing force on the IC is removed. As previously described, due to the manipulation of the handle, the first cam shaft and the second cam shaft are synchronized and rotated by the same angle. Thus, the following description will focus on the first cam shaft.

(40) The open/close manipulation position (vertical/horizontal) of the handle **260** is performed in a range of approximately 90°, and the cam surface **241** of the first cam shaft **240** linked thereto also rotates in a range of approximately 90°.

(41) Before assembling the contact module **100** and the pusher module **200**, an IC is loaded into the contact module **100**. Afterwards, the pusher module **200** is placed on the contact module **100**, and the latch **211** of the pusher module **200** is engaged with the latch fixing protrusion **152** of the contact module **100**, so that the contact module **100** and the pusher module **200** are fixed to each other. Thereafter, a pressing force on the IC is generated by rotating the handle **260** by 90° as shown in FIG. **6**A.
(42) FIG. **6**A shows a state in which a pressing force is generated on the IC when the handle **260** is closed, and the cam surface **241** of the first cam shaft **240** is oriented to the left, and the pusher block **230** pressurizes the top of the IC due to the first cam shaft **240** that hinges both ends of the lead frame **210** and the heat sink frame **220**. Meanwhile, when IC pressing force occurs, the hinge axes C**11** and C**12** of the lead frame **210** and the hinge axes C**21** and C**22** of the heat sink frame **220** are located on the same axis C (C**11**=C**21**) (C**12**=C**22**). Reference numeral D represents the diameter in the circular cross-section section of the first cam shaft **240**, and reference numeral d represents the step difference in the cam surface **241** section. In the closed state of the handle **260**, both the first elastic body S**1** interposed between the lead frame **210** and the heat sink frame **220** and the second elastic body S**2** interposed between the heat sink frame **220** and the pusher block **230** (see FIG. **3**) are compressed to the maximum displacement.
(43) FIG. **6**B shows a state in which the pressing force on the IC is released when the handle **260** is open. Due to the rotational operation of the handle **260**, the first cam shaft **240** rotates counterclockwise so that the cam surface **241** and the lower flat surface of the first floating hinge hole **221***a* come into surface contact, and due to the reaction force of the first elastic body S**1**, the heat sink frame **220** moves upward by a predetermined height h, and the second elastic body S**2** interposed between the heat sink frame **220** and the pusher block **230** (see FIG. **3**) is relaxed and the pressing force is removed. In the handle open state, the hinge axis C**21** of the heat sink frame **220** is offset by the step difference d created by the cam surface **241** with respect to the hinge axis C**11** of the lead frame **210**, and the size of this offset is approximately equal to the upward movement height h of the heat sink frame **220** (d≈h).
(44) In the socket device of the present disclosure configured as described above, when the handle **260** is rotated, the pressurizing parts **220** and **230** are assembled with both ends of the lead frame **210** by the floating hinge axes to move up and down, and the vertical movement occurs while the entire pressurizing parts **220** and **230** remain horizontal, thereby generating a uniform pressing force over the entire upper surface of the IC.
(45) FIG. **7** is a perspective view of a socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure; FIG. **8** is a plan view of the socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure; FIG. **9** is an exploded perspective view of the socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure; FIG. **10** is a cross-sectional view along line C-C of FIG. **8**; FIG. **11** is a cross-sectional view along line D-D of FIG. **8**; and FIG. **12** is a cross-sectional view along line E-E of FIG. **8**. FIGS. **7** to **12** show a handle in a closed state, and an IC is not shown. In the following description, the same numerals as the previous embodiment will be used for the same configuration, redundant explanation will be omitted, and the description will focus on the differences.
(46) Referring to FIGS. **7** to **12**, the socket device for testing integrated circuits (ICs) according to another embodiment of the present disclosure includes a contact module **100** and a pusher module **200**, and the contact module **100** is the same as in the previous embodiment
(47) The pusher module **200** includes a lead frame **210**, pressurizing parts **320**, **330**, and **340**, first and second cam shafts, a handle **260**, a lever **270**, and a link **280**. The pressurizing parts **320**, **330**, and **340** may include a heat sink frame **320**, a pusher block **330**, and a heat sink **340**.
(48) The lead frame **210** includes a latch **211** fixed to the contact module **100**. The heat sink frame **320** is assembled to the lead frame **210** with two floating hinge axes C**21** and C**22** by means of a

pair of cam shafts **240** and **250**, and is elastically supported on the upper part of the lead frame **210** by a first elastic body S**1** to be movable up and down, which is the same as in the previous embodiment. In addition, the handle **260** and the lever **270** being fixed to the floating hinge axes C**21** and C**22**, respectively, and the heat sink frame **320** moving up and down due to the manipulation of the handle **360**, which includes the link **280** connecting the handle **260** and the lever **270**, are also the same as in the previous embodiment.
(49) Preferably, in this embodiment, the heat sink frame **320** and the pusher block **330** are respectively provided with a first opening **320***a* and a second opening **330***a* formed through approximately the center thereof. The heat sink **340** is provided on top of the heat sink frame **320**, is inserted into the first opening **320***a* and the second opening **330***a*, and has a pressurizing surface **341** that directly pressurizes the upper portion of the IC. The heat sink **340** includes a plurality of heat dissipation fins **342** to increase the cooling effect, and is provided with a screw assembly hole **343** so as to be assembled with the upper portion of the heat sink frame **320** by a screw **344**. Preferably, the screw **344** is inserted into a third elastic body S**3** to keep the heat sink **340** and the heat sink frame **320** in close contact with each other, thereby stably maintaining the pressing force on the IC during the IC test process. Meanwhile, in the embodiment of the present disclosure, the first, second, and third elastic bodies S**1**, S**2**, and S**3** are described by taking a compression coil spring as an example, but are not limited thereto. In addition, each of the elastic bodies S**1**, S**2**, and S**3** are provided in plurality, and the elastic bodies S**1**, S**2**, and S**3** are arranged left-right and/or top-down symmetrical to apply a uniform pressing force to the IC.
(50) The socket device according to another embodiment of the present disclosure is the same as the previous embodiment in that, in conjunction with the open/close rotation operation of the handle **260**, the heat sink frame **320**, the pusher block **330**, and the heat sink **340**, which are pressurized parts, move up and down at the top of the lead frame **210** to provide pressing force to the IC. In particular, this embodiment is effective for IC packages that have a step difference between the central and peripheral portions of the upper surface.
(51) To be specific, referring to FIGS. **10** to **12**, in the state of the handle being closed, the first elastic bodies S**1** inserted between the lead frame **210** and the heat sink frame **320** have an upward reaction force and are compressed to the maximum displacement. In addition, as described in the previous embodiment, in the state of the handle being closed, the heat sink frame **320** moves downward and the pressurizing surface **341** of the heat sink **340** pressurizes the upper portion of the IC by the compressive elastic force of the second elastic bodies S**2** and the third elastic bodies S**3** to provide a pressing force to the IC.
(52) In particular, referring to FIGS. **11** and **12**, in the state of the handle being closed, the pressurizing surface **341** of the heat sink **340** pressurizes the central portion of the upper surface of the IC, and at this time, the heat sink **340** is lifted upward and separated from the heat sink frame **320**. Due to a height g**1** of this separation, the third elastic body S**3** into which the screw **344** is inserted is compressed, and the third elastic body S**3** exerts a pressing force on the central portion of the upper surface of the IC.
(53) Meanwhile, the pusher block **330** pressurizes the peripheral portion having a step difference from the center of the IC upper surface. At this time, the pusher block **330** is lifted upward and separated from the bolt head **232***a* of the stopper bolt **232** fastened to the heat sink frame **320**, and due to a height g**2** of this separation, the second elastic body S**2** is compressed, the second elastic body S**2** exerts a pressing force on the periphery of the upper surface of the IC. For reference, as described in the previous example (see FIG. **6**), in the state of the handle being closed, the heat sink frame **320** is positioned downward by a predetermined height h relative to the lead frame **210**, and the second elastic body S**2** is compressed by the downward displacement amount h of the heat sink frame **320** and the upward displacement amount g**2** of the pusher block **330** to pressurize the peripheral portion of the upper surface of the IC.
(54) FIG. **13** is a perspective view of a socket device for testing integrated circuits (ICs) according

to still another embodiment of the present disclosure, and a cooling fan **400** may be added to the top of the heat sink **340**.

(55) As above, although the present disclosure has been described with limited embodiments and drawings, the scope of the present disclosure is not limited thereto, and various modifications and variations may be made by those skilled in the art in the technical field to which the present disclosure belongs within the scope of equivalency of the technical idea of the present disclosure and the claims set forth below.

Claims

1. A socket device for testing integrated circuits (ICs), comprising: a contact module for seating an IC and having a plurality of contacts for electrical connection of a lead of the IC and a terminal of a printed circuit board (PCB); and a pusher module having a latch to be fit-assembled from a top of the contact module and for pressurizing the IC, wherein the pusher module comprises: a lead frame with the latch rotatably provided thereto; a pressurizing part assembled to the lead frame with two floating hinge axes parallel to each other and elastically supported against the lead frame to be movable up and down to elastically pressurize the IC; first and second cam shafts provided in the respective floating hinge axes to adjust a vertical height of the pressurizing part depending on a rotation angle thereof; a handle rotatably fixed with the first cam shaft; a lever rotatably fixed with the second cam shaft; and a link having opposite ends rotatably connected to the handle and the lever.
2. The socket device of claim 1, wherein the pressurizing part comprises: a heat sink frame having a first elastic body disposed and assembled with the lead frame by means of the first and second cam shafts; and a pusher block provided with a second elastic body to be elastically supported against the heat sink frame and having a pressurizing surface that elastically pressurizes the IC.
3. The socket device of claim 2, wherein each of the first and second cam shafts comprises: a first section having a circular cross-section and rotatably assembled with the lead frame; and a second section extending from the first section and having a cam surface that forms a plane in an axial direction on a portion of an outer peripheral surface of each of the first and second cam shafts to be assembled with the heat sink frame.
4. The socket device of claim 3, wherein the heat sink frame includes a floating hinge part formed with a floating hinge hole through which each of the first and second cam shafts is inserted, wherein the floating hinge hole has a flat surface that makes surface contact with the cam surface.
5. The socket device of claim 2, wherein the heat sink frame and the pusher block are respectively provided with a first opening and a second opening formed through approximately a center thereof, and a heat sink is further comprised, the heat sink being equipped with a plurality of heat dissipation fins, provided on top of the heat sink frame, inserted into the first and second openings, and having a pressurizing surface that pressurizes an IC.
6. The socket device of claim 5, wherein the heat sink is provided with a third elastic body and is elastically assembled with the heat sink frame.
7. The socket device of claim 5, wherein the heat sink is further provided with a cooling fan for cooling.
8. A pusher device for being assembled with a contact module of a socket device to electrically connect a lead of an IC and a terminal of a printed circuit board (PCB) to pressurize the IC, the pusher device comprising: a lead frame with a latch rotatably provided thereto to be fit-assembled from a top of the contact module; a pressurizing part assembled to the lead frame with two floating hinge axes parallel to each other and elastically supported against the lead frame to be movable up and down to elastically pressurize the IC; first and second cam shafts provided in the respective floating hinge axes to adjust a vertical height of the pressurizing part depending on a rotation angle

thereof; a handle rotatably fixed with the first cam shaft; a lever rotatably fixed with the second cam shaft; and a link having opposite ends rotatably connected to the handle and the lever.