

SOCKET CLEANING DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a cleaning device, in particular to a socket cleaning device.

BACKGROUND OF THE INVENTION

[0002] Chips are indispensable elements in electronic products. In order to test whether the manufactured chip functions normally, sockets are currently used for this purpose. The socket has a plurality of contact portions provided for pins of a chip to be tested, and determines whether the chip functions normally by detecting whether each pin can be energized normally.

[0003] During the chip testing process, the contact portions of the socket are prone to oxidation, dirt or tin staining, which affects the conductivity of the probe, thus leading to an unstable test yield. Therefore, the contact portions of the socket need to be cleaned regularly.

SUMMARY OF THE INVENTION

[0004] The present invention provides a socket cleaning device, which has a good cleaning effect and is not easily damaged and easy to manufacture.

[0005] In order to achieve the above advantages, an embodiment of the present invention provides a socket cleaning device suitable for cleaning a socket. The socket cleaning device includes: a substrate and an abrasive block. The abrasive block covers one side of the substrate. The abrasive block has a central portion overlapping the substrate and a

plurality of feet extending from edges of the central portion and not overlapping the substrate. Each of the feet is formed with a pressing region at a side facing the substrate and an abrasive region at a side away from the substrate.

[0006] In an embodiment, the central portion has a first recess and a plurality of connecting protrusions, the first recess is located at a center of the central portion and surrounded by the connecting protrusions, and each of the connecting protrusions is connected with one of the feet.

[0007] In an embodiment, the first recess is suitable to be sleeved on the socket.

[0008] In an embodiment, a depth of the first recess corresponds to a preset depth of the socket, preventing the socket from stopping operation.

[0009] In an embodiment, the foot is connected to an end of the connecting protrusion away from the substrate.

[0010] In an embodiment, the abrasive region is aligned with a surface of the connecting protrusion at a side away from the substrate.

[0011] In an embodiment, the central portion further has a plurality of second recesses, the second recesses are located in the first recess, and each of the second recesses is adjacent to one of the connecting protrusions.

[0012] In an embodiment, the second recesses are suitable to be sleeved on the socket.

[0013] In an embodiment, the feet include two first feet opposite in a first direction and two second feet opposite in a second direction perpendicular to the first direction, the first feet and the second feet form a plurality of limit slots located at corners of the socket cleaning device, and each of the limit slots is formed by one of the first feet and one of the

second feet adjacent thereto.

[0014] Based on the above, according to the socket cleaning device of the present invention, since the substrate covers the abrasive block and the parts of the abrasive block exposed from the substrate serve as the feet for cleaning the socket, there is a large contact area between the substrate and the abrasive block, so that the abrasive block cannot be easily separated from the substrate as the socket cleaning device is subjected to external force repeatedly during use. Besides, the abrasive block is easier to process than the substrate, so the abrasive block is easy to manufacture, and the manufactured feet can have good dimensional tolerance.

[0015] Other objectives, features and advantages of the invention will be further understood from the further technological features disclosed by the embodiments of the invention wherein there are shown and described preferred embodiments of this invention, simply by way of illustration of modes best suited to carry out the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a schematic three-dimensional view of a socket cleaning device according to an embodiment of the present invention;

[0017] FIG. 2 is a schematic side view of the socket cleaning device according to the embodiment in FIG. 1;

[0018] FIG. 3 is a schematic top view of the socket cleaning device according to the embodiment in FIG. 1;

[0019] FIG. 4 is a schematic view taken along line A-A in FIG. 3; and

[0020] FIG. 5 is a schematic view of the socket cleaning device in FIG. 1 when in use.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] Terms used in the description of the embodiments of the present invention, for example, orientation or position relation such as “above” and “below” are described according to the orientation or position relation shown in the drawings. The above terms are used for facilitating description of the present invention rather than limiting the present invention, i.e., indicating or implying that the mentioned elements have to have specific orientations and to be configured in the specific orientations. In addition, terms such as “first” and “second” involved in the description or claims are merely used for naming the elements or distinguishing different embodiments or ranges rather than limiting the upper limit or lower limit of the quantity of the elements.

[0022] FIG. 1 is a schematic three-dimensional view of a socket cleaning device according to an embodiment of the present invention. FIG. 2 is a schematic side view of the socket cleaning device according to the embodiment in FIG. 1. FIG. 3 is a schematic top view of the socket cleaning device according to the embodiment in FIG. 1. FIG. 4 is a schematic view taken along line A-A in FIG. 3. FIG. 5 is a schematic view of the socket cleaning device in FIG. 1 when in use. In FIG. 4, for the convenience of understanding the structure of the socket cleaning device 100, one of feet 22, which should be visible from this direction, is omitted.

[0023] As shown in FIG. 1 to FIG. 4, the socket cleaning device 100 of this embodiment is suitable for cleaning a socket 3. The socket cleaning device 100 includes a substrate 1 and an abrasive block 2. The abrasive block 2 covers one side of the substrate 1. The abrasive block 2 has a central portion 21 overlapping the substrate 1 and a plurality of feet 22 extending from edges of the central portion 21 and not overlapping the

substrate 1. Each of the feet 22 is formed with a pressing region 221 at a side facing the substrate 1 and an abrasive region 222 at a side away from the substrate 1.

[0024] Specifically, as shown in FIG. 5, the socket 3 is, for example, a seat having a first component 31 serving as a member for sucking and pressing the socket cleaning device 100 and a second component 32 serving as a central chassis, and the second component 32 is provided with test contacts 322a corresponding to pins of a chip to be tested. The socket 3 is suitable for clamping the chip to be tested (not shown) jointly by the first component 31 and the second component 32, so that the pins of the chip to be tested can be in contact and electrically connected with the test contacts 322a. In addition, in this embodiment, before entering the socket 3, the socket cleaning device 100 may, for example, pass through an exchange device (not shown) having a chip thickness sensor. The exchange device may detect a thickness of an object to be tested, such as the chip to be tested or the socket cleaning device 100, through the chip thickness sensor, and determine whether the thickness of the chip to be tested (or the socket cleaning device 100) is acceptable. If not, the exchange device stops operation and gives an alarm, and thereby, the chip to be tested (or the socket cleaning device 100) cannot be sent to the subsequent socket 3.

[0025] As shown in FIG. 1, in this embodiment, the substrate 1 is, for example, a rectangular plate, whose surface on one side in a thickness direction (third direction D3) is a connection surface 11. The connection surface 11 is, for example, the entire surface of the substrate 1 on this side. In order to clean the socket 3 under the existing operating procedure, a shape of the substrate 1, for example, corresponds to a shape of the chip to

be tested corresponding to the socket 3, and a thickness of the substrate 1 is, for example, less than a thickness of the aforementioned chip to be tested, for example, 1.1 mm, which is not limited thereto. The substrate 1 is, for example, a bakelite plate, a plate made of a mixture of fiberglass and epoxy resin, or a plastic plate, but is not limited thereto.

[0026] As shown in FIG. 1 to FIG. 4, in this embodiment, the abrasive block 2 is, for example, a plate which is directly connected to the surface (the connection surface 11) of the substrate 1 at one side and subjected to shape processing. The abrasive block 2 is attached to the substrate 1 in the third direction D3 of the socket cleaning device 100, for example, by attachment curing. The abrasive block 2 is, for example, made of a known abrasive material by attachment curing or adhesion, which is not limited thereto.

[0027] As shown in FIG. 1 to FIG. 4, the foot 22 is, for example, a rectangular sheet, which is formed by cutting and has a thickness less than that of the substrate 1 in the third direction D3. The thickness of the foot 22 is, for example, 0.3 mm, but is not limited thereto. The feet 22 may include two first feet 22a opposite in a length direction of the socket cleaning device 100 (a first direction D1) and two second feet 22b opposite in a second direction D2 (a thickness direction of the socket cleaning device 100) perpendicular to the first direction D1, which is not limited thereto.

[0028] As shown in FIG. 5, a position of each pressing region 221 of the abrasive block 2 corresponds, for example, to a position of a pressing member 311a of the first component 31, and the position of the pressing member 311a corresponds, for example, a position of the pin of the chip to be tested. The pressing member 311a can support and push the pin of the

chip to be tested or the foot 22 against the test contact 322a during testing. The abrasive region 222 corresponds, for example, to the position of the test contact 322a, and can contact the test contact 322a when the foot 22 is pushed by the pressing member 311a. It should be understood that the specific design of the feet 22 may correspond to the shape design of the pins of the chip to be tested, so the detailed design of the feet 22 is not limited to the above example.

[0029] As shown in FIG. 1 and FIG. 3, in this embodiment, the socket cleaning device 100 has, for example, limit slots 23 at four corners, and the limit slots 23 are suitable for corresponding to the shape of alignment posts (not shown) on the socket 3. Specifically, in this embodiment, the substrate 1 has, for example, notches 12 at 4 corners. Each notch 12 forms one limit slot 23 with one first foot 22a and one second foot 22b adjacent to the notch, and each limit slot 23 runs through two sides of the socket cleaning device 100 in the third direction D3 of the socket cleaning device 100.

[0030] It should be understood that in an embodiment not shown, depending on the shape of the alignment posts, the substrate 1 of the socket cleaning device 100 may not have the notches 12, and the limit slots 23 may be formed only by the first feet 22a and the second feet 22b. In addition, in other embodiments, the socket cleaning device 100 may only have the first feet 22a or the second feet 22b, so in a different embodiment, limit structures of the socket cleaning device 100 that have similar functions to the limit slots 23 may be formed by wall surfaces of the first feet 22a or the second feet 22b facing the first direction D1 or the second direction D2 in combination with side wall surfaces of the substrate 1, which is not limited thereto.

[0031] In this embodiment, shapes of other details of the abrasive block 2 may correspond to the shape design of the socket 3, so for the convenience of understanding the design of the abrasive block 2 described later, the specific shape of the socket 3 will be described first below.

[0032] As shown in FIG. 5, in this embodiment, the first component 31 of the socket 3 is, for example, a column. An end of the first component 31 close to the second component 32 is, for example, provided with an accommodating recess 311 capable of sucking the socket cleaning device 100 by vacuum. The accommodating recess 311 is recessed in a direction away from the second component 32, and a shape of the accommodating recess 311 is, for example, slightly greater than a dimension of the substrate 1 such that the accommodating recess can accommodate the substrate 1 when the first component 31 moves toward the second component 32, thereby ensuring the dimension of the substrate 1 to be in an allowable range. Top ends of wall surfaces surrounding the accommodating recess 311 form, for example, the pressing members 311a which contact the pressing regions 221 when the first component 31 moves close to the second component 32. A depth of the accommodating recess 311 is, for example, such that a bottom surface of the accommodating recess 311 can contact the substrate 1 when the pressing members 311a contact the pressing regions 221, but is not limited thereto.

[0033] As shown in FIG. 5, in this embodiment, alignment portions of the second component 32 of the socket 3 include, for example, a lifting seat 321 and a fixed seat 322 surrounding the lifting seat 321. The lifting seat 321 is, for example, movable relative to the fixed seat 322 in the direction facing or facing away from the first component 31 (i.e., the third direction D3), and when not subjected to an external force, the lifting seat

321 is for example, driven by a spring (not shown) mounted in the second component 32, so that an end of the lifting seat 321 close to the first component 31 protrudes from a surface of the fixed seat 322.

[0034] As shown in FIG. 4 and FIG. 5, the lifting seat 321 is suitable for carrying the central portion 21 of the socket cleaning device 100 and driving the socket cleaning device 100 to move. Dimensions of the lifting seat 321 are, for example, designed such that the lifting seat can carry the central portion 21 and the feet 22 protrude from the lifting seat 321. In this embodiment, the lifting seat 321 is, for example, convexly provided with an alignment frame 321a at the edge in the direction facing the first component 31 (i.e., in the third direction D3), and the alignment frame 321a is suitable to be aligned with the central portion 21 of the socket cleaning device 100 when the lifting seat 321 is combined with the socket cleaning device 100.

[0035] As shown in FIG. 5, the fixed seat 322 includes, for example, the test contacts 322a. The type of the test contacts 322a is not particularly limited. The test contacts may be pogo pins, but are not limited thereto. The test contacts 322a are, for example, located at parts of the fixed seat 322 adjacent to the lifting seat 321, and the test contacts 322a may protrude, for example, from the surface of the fixed seat 322 so as to come into contact with the feet 22 first when not subjected to an external force, and may be aligned with the surface of the fixed seat 322 when pushed by the feet 22, which is not limited thereto. The aforementioned alignment posts are, for example, located beside the test contacts 322a and surround the lifting seat 321.

[0036] Through the above structure, as shown in FIG. 5, during cleaning, the socket cleaning device 100 may be sucked to the

accommodating recess 311 of the first component 31 first, and then the pressing members 311a of the first component 31 may be allowed to push the socket cleaning device 100 and the lifting seat 321 to move downward along the D3 direction (the direction in FIG. 5) on the premise of contacting the pressing regions 221 of the feet 22, so that the abrasive regions 222 of the feet 22 can press, abrade and clean the test contacts 322a on the fixed seat 322. It should be understood that the above description of the socket 3 is only an example and is not limited thereto.

[0037] Returning to the socket cleaning device 100, as shown in FIG. 1 to FIG. 4, in this embodiment, the abrasive block 2 has, for example, a first recess 211 and a plurality of connecting protrusions 212 at the central portion 21. The first recess 211 is located at a center of the central portion 21 and surrounded by the connecting protrusions 212. As shown in FIG. 5, dimensions of the first recess 211 in the first direction D1 and the second direction D2 correspond, for example, the dimensions of the lifting seat 321 such that the first recess is suitable to be sleeved on the lifting seat 321, and a depth of the first recess 211 corresponds, for example, to a preset depth of the socket 3, for example, 0.3 mm, which can prevent the socket 3 or other test tools such as the exchange device described above from stopping operation as it is determined that the socket cleaning device 100 is a member having abnormal dimensions. From a manufacturing point of view, the part of the socket cleaning device 100 other than the feet 22 can be manufactured to have a desired thickness by changing the dimensions of the abrasive block 2 at the first recess 211 on the premise that the thickness of the substrate 1 is fixed.

[0038] As shown in FIG. 1 to FIG. 5, each of the connecting protrusions 212 surrounding the first recess 211 is, for example, connected

to one foot 22, and in this embodiment, the foot 22 may be connected to an end of the connecting protrusion 212 away from the substrate 1 such that the surface of the abrasive region 222 of the foot 22 is aligned with the surface of the connecting protrusion 212. The connecting protrusions 212 of the central portion 21 and the feet 22 are made of the same material, and thus, can be integrally formed without additional adhesion, which prevents the abrasive block 2 from damage from the joints.

[0039] As shown in FIG. 1 to FIG. 4, in this embodiment, corresponding to the shape of the alignment frame 321a on the lifting seat 321, the central portion 21 further has, for example, a plurality of second recesses 213 and a central protrusion 214 in the first recess 211. The central protrusion 214 is located at the center of the central portion 21. The second recesses 213 surround the central protrusion 214, and an edge of each second recess located at a bottom surface of the first recess 211 is adjacent to one connecting protrusion 212. The second recess 213 extends, for example, along a direction parallel to the connecting protrusion 212, and different second recesses 213 may respectively run through the abrasive block 2 in the first direction D1 or the second direction D2, which is not limited thereto. A depth of the second recesses 213 is, for example, 0.3 mm from the surface of the first recess 211, and the second recesses are suitable to be sleeved on the alignment frame 321a on the socket 3. During sleeving, wall surfaces of the second recesses 213 may contact side wall surfaces of the lifting seat 321, which prevents the socket cleaning device 100 from shaking.

[0040] As can be seen from the above, since the abrasive block 2 of the socket cleaning device 100 is utilized to simulate the shape of the chip to be tested corresponding to the socket 3 and the dimensions of each part

of the chip to be tested in each direction in this embodiment, the shape of the substrate 1 is relatively simple, and materials that are relatively rigid and difficult to process relative to the abrasive block 2 may be used to protect the abrasive block 2. Moreover, since the shape of the socket cleaning device 100 simulates the shape of the chip to be tested, during cleaning, the socket cleaning device 100 can be regarded as a chip to be tested having the function of cleaning the socket 3 and directly put into a tester, and can automatically clean the socket in combination with cleaning software of the tester, which can replace and save a lot of manual labor and can also eliminate the instability caused by personal factors during manual cleaning.

[0041] Based on the above, according to the socket cleaning device of the present invention, since the substrate covers the abrasive block and the parts of the abrasive block exposed from the substrate serve as the feet for cleaning the socket, there is a large contact area between the substrate and the abrasive block, so that the abrasive block cannot be easily separated from the substrate as the socket cleaning device is subjected to external force repeatedly during use. Besides, the abrasive block is easier to process than the substrate, so the abrasive block is easy to manufacture, and the manufactured feet can have good dimensional tolerance.

[0042] While the invention has been described in terms of what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention needs not be limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements included within the scope of the appended claims which are to be accorded with the broadest interpretation so as to encompass all such modifications and similar structures.

WHAT IS CLAIMED IS:

1. A socket cleaning device (100) suitable for cleaning a socket (3), the socket cleaning device (100) comprising:

a substrate (1); and

an abrasive block (2), covering one side of the substrate (1), the abrasive block (2) having a central portion (21) overlapping the substrate (1) and a plurality of feet (22) extending from edges of the central portion (21) and not overlapping the substrate (1), and each of the feet (22) being formed with a pressing region (221) at a side facing the substrate (1) and an abrasive region (222) at a side away from the substrate (1).

2. The socket cleaning device (100) according to claim 1, wherein the central portion (21) has a first recess (211) and a plurality of connecting protrusions (212), the first recess (211) is located at a center of the central portion (21) and surrounded by the connecting protrusions (212), and each of the connecting protrusions (212) is connected with one of the feet (22).

3. The socket cleaning device (100) according to claim 2, wherein the first recess (211) is suitable to be sleeved on the socket (3).

4. The socket cleaning device (100) according to claim 2, wherein a depth of the first recess (211) corresponds to a preset depth of the socket (3) thereby preventing the socket (3) from stopping operation.

5. The socket cleaning device (100) according to claim 2, wherein the foot (22) is connected to an end of the connecting protrusion (212) away from the substrate (1).

6. The socket cleaning device (100) according to claim 5, wherein the abrasive region (222) is aligned with a surface of the connecting protrusion (212) at a side away from the substrate (1).

7. The socket cleaning device (100) according to claim 2, wherein the central portion (21) further has a plurality of second recesses (213), the second recesses (213) are located in the first recess (211), and each of the second recesses (213) is adjacent to one of the connecting protrusions (212).

8. The socket cleaning device (100) according to claim 7, wherein the second recesses (213) are suitable to be sleeved on the socket (3).

9. The socket cleaning device (100) according to claim 1, wherein the feet (22) comprise two first feet (22a) opposite in a first direction (D1) and two second feet (22b) opposite in a second direction (D2) perpendicular to the first direction (D1), the first feet (22a) and the second feet (22b) form a plurality of limit slots (23) located at corners of the socket cleaning device (100), and each of the limit slots (23) is formed by one of the first feet (22a) and one of the second feet (22b) adjacent thereto.