



G00002



166166

-1-

CHIP ELEMENT HOLDER AND METHOD OF HANDLING CHIP ELEMENTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a chip element holder and a method of handling chip elements. In particular, this invention relates to a chip element holder which can be favorably used in a process of forming electrodes on the outer surfaces of chip electronic element main bodies that are referred to as chip elements here. The present invention also relates to a method of handling such
10 chip elements.

2. Description of the Related Art

 An electronic element such as a laminated type ceramic capacitor is comprised of a chip electronic main body, and a plurality of electrodes serving as terminals on both end portions of the electronic element main body. In order to
15 form these electrodes, a paste application process is required to apply an electrically conductive paste on to each end portion of the electronic element main body. Further, in order to effectively carry out a paste application process for applying the electrically conductive paste, a great number of electronic element main bodies are needed to be aligned properly by using a holder, so that the
20 electrically conductive paste may be simultaneously applied to a great number of electronic element main bodies.

 The above mentioned holder may have various shapes or configurations. For example, Japanese Patent Gazette No. 2682250 has disclosed a holder which can be used to properly hold a plurality of electronic element main bodies, even if
25 each of the electronic element main bodies is small, having a length of only 1.0 mm or shorter on one side of a surface on which the electrodes are to be formed.

-2-

In the following, with reference to Figs. 7A-7E, an explanation will be given to a holder made according to a prior art, and also to a method of applying the electrically conductive paste with the use of the holder.

At first, Fig. 7A is used to indicate that a chip element holder 1 is holding
5 a plurality of chip electronic element main bodies 2 referred to as chip elements.

Here, the holder 1 as a whole is a plate member. On one of its main surfaces there are adhesively attached a plurality of electronic element main bodies 2 and thus an adhesive surface is formed in advance for holding the electronic element main bodies 2. In more detail, the holder 1 comprises a plate substrate 4
10 made of a rigid material such as a metal, and a holding member 5 formed by an elastomer such as a rubber which is bonded on the substrate 4. An adhesive surface 3 is formed on the surface of the holding member 5. However, the adhesive surface 3 may be replaced by the holding member 5 itself having an adhesive property, or by coating the surface of the holding member 5 with an
15 adhesive agent.

Each of the electronic element main bodies 2 has a first end portion 6 and a second end portion 7 which form part of its outer surface and which are opposite to each other so that electrodes may be later formed on these end portions. Further, each of the electronic element main bodies 2 is held by the holder 1 under
20 a condition in which its first end portion 6 has been bonded on the adhesive surface 3 of the holder 1.

Further, as shown in Fig. 7A, an electrically conductive paste 8 has been applied to a fixed base 9 so that a film having a predetermined thickness is formed on the fixed base 9.

25 Starting from a condition shown in Fig. 7A, the holder 1 is caused to move towards the fixed base 9, making the second end portion 7 of each electronic element main body 2 to be dipped into the electrically conductive paste 8.

-3-

Subsequently, the electronic element main bodies 2 are drawn up and thus the holder 1 is moved away from the electrically conductive paste 8. In this way, as shown in Fig. 7B, the electrically conductive paste 8 may be applied to the second end portion 7 of each electronic element main body 2. Afterwards, a
5 drying treatment is carried out so as to dry the electrically conductive paste 8 coated on each element main body.

Next, a step shown in Fig. 7C is carried out. In fact, Fig. 7C shows a second holder 10 having a structure which is substantially the same as that of the above first holder 1. Although the second holder 10 has an adhesive surface 11
10 formed on one of its main surfaces using the same manner as used in the above first holder 1, the adhesive surface 11 is set to offer a stronger adhesion strength than an adhesion force provided by the adhesive surface 3 of the first holder 1.

As shown in Fig. 7C, when the first holder 1 and the second holder 10 are brought close to each other, the second end portion 7 of each electronic element
15 main body 2, coated with the electrically conductive paste 8, may be bonded to the adhesive surface 11 of the second holder 10.

Then, as shown in Fig. 7D, the first holder 1 and the second holder 10 are separated from each other. At this moment, as related in the above, since an adhesion force provided by the adhesive surface 11 of the second holder 10 is set
20 to be stronger than that provided by the adhesive surface 3 of the first holder 1, the electronic element main bodies 2 will be held on the second holder 10.

Afterwards, held by the second holder 10, the electronic element main bodies 2 are treated still further in a manner such that the first end portion 6 of each element main body is coated with the electrically conductive paste 8, using
25 the steps which are substantially the same as those shown in Fig. 7A and Fig. 7B. In this way, as shown in Fig. 7E, it is sure that each electronic element main body 2 may be coated at its first and second end portions 6 and 7 by the electrically

-4-

conductive paste 8 and that such paste coated element main bodies may be held by the second holder 10.

Next, as shown in Fig. 7E, the paste coated electronic element main bodies 2 are separated from the second holder 10. In the separation process, a knife-like tool 12 is used. Therefore, the paste coated electronic element main bodies 2 may be removed from the adhesive surface 11 by moving the knife-like tool 12 along the adhesive surface 11.

However, the holding of the electronic element main bodies 2 by either the first holder 1 or the second holder 10, has been proved to have the following problems because a holding action is effective only by means of an adhesion force provided by either the adhesive surface 3 or the adhesive surface 11.

Firstly, an adhesion force provided by either the adhesive surface 3 or the adhesive surface 11 will become deteriorated partially or entirely with the passing of time or due to a sort of pollution. For this reason, the electronic element main bodies 2 which have already been held by either the first holder 1 or the second holder 10 are likely to fall off or become inclined or get deviated from their correction positions.

Further, as fast as an adhesion force provided by the adhesive surface 3 or the adhesive surface 11 becomes deteriorated, or once the adhesion force becomes different from one position to another, it is likely that a certain kind of transferring mistake might happen during a process in which the electronic element main bodies 2 are transferred from the first holder 1 to the second holder 10 in a manner as shown in Fig. 7C and 7D.

Moreover, transfer can only be effected in a direction from the first holder 1 to the second holder 10, i.e., rendering the electronic element main bodies to be transferred from the adhesive surface 3 having a relatively weak adhesion force to the adhesive surface 11 having a relatively strong adhesion force.

-5-

In addition, as shown in Fig. 7E, when the electronic element main bodies 2 are removed from the adhesive surface 11 using the knife-like tool 12, if the electronic element main bodies 2 are relatively firmly stuck on the adhesive surface 11, the electronic element main bodies 2 are likely to be damaged, causing cracks and notches in these element main bodies. Moreover, the use of the knife-like tool 12 can also bring about some damage to the adhesive surface 11 and pollute the same.

Further, the problems described above occur not only when handling the electronic element main bodies, but also when handling other chip elements.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved chip element holder capable of solving the above described problems, and also to provide a method of handling chip elements with the use of the improved chip element holder.

The present invention, at first, is a plate member if viewed as a whole, which is directed to a chip element holder, wherein one of its main surfaces is provided with an adhesive surface capable of bonding predetermined surfaces of a plurality of chip elements so as to hold the chip elements. In order to solve the above mentioned technical problems, the holder is so formed that it is characterized in that the holder is also provided with several through holes each having an open end which can be at least partially closed by part of the predetermined surface of one of the chip elements, so that an external force may be exerted on the predetermined outer surface of each chip element bonded on the adhesive surface, by way of the through holes, the external force is produced by a pressing force to the predetermined outer surfaces of the chip elements by way of the through holes.

The above external force may be a positive pressure or a negative pressure acting on the predetermined outer surfaces of the chip elements by way of the through holes. Alternatively, such an external force may be produced using a

WHAT IS CLAIMED IS:

1. A chip element holder, comprising:

a plate member having one of its main surfaces provided with an adhesive surface capable of bonding predetermined surfaces of a plurality of chip elements so as to hold the chip elements; and

several through holes provided in said plate member, each through hole having an open end which can at least be partially closed by part of the predetermined surface of one of the chip elements,

wherein an external force is exerted on the predetermined outer surfaces of the chip elements bonded on the adhesive surface by way of the through holes, the external force is produced by a pressing force to the predetermined outer surfaces of the chip elements by way of the through holes.

2. The chip element holder according to claim 1, wherein the external force is one of a positive pressure and a negative pressure acting on the predetermined outer surfaces of the chip elements by way of the through holes.

3. The chip element holder according to claim 1, wherein the external force is produced by a pusher member which can apply a pressing force to the predetermined outer surfaces of the chip elements by way of the through holes.

4. A method of handling chip elements, wherein said method is associated with the use of a chip element holder, said holder as a whole is a plate member, one of its main surfaces is provided with an adhesive surface capable of bonding predetermined

surfaces of a plurality of chip elements so as to hold the chip elements, said method comprising the steps of:

providing said chip element holder with several through holes, each through hole having an open end which can at least be partially closed by part of the predetermined surface of one of the chip elements, so that an external force may be exerted on the predetermined outer surfaces of the chip elements bonded on the adhesive surfaces;

preparing the chip element holder and a plurality of chip elements;

bonding the predetermined outer surfaces of the chip elements on the adhesive surface of the chip element holder under a condition in which each chip element is set on a position aligned with on through hole; and

holding the chip elements on the chip element holder,

wherein the external force is produced by a pressing force to the predetermined outer surfaces of the chip elements by way of the through holes,

thereby enabling the chip elements to be separated from the chip element holder.

5. The method of handling chip elements according to claim 4, wherein the step of separating the chip elements from the chip element holder uses, as an external force, a pressing force produced by a pusher member, said pressing force being applied to the predetermined outer surfaces of the chip elements by way of the through holes.

6. The method of handling chip elements according to claim 4, wherein the step of separating the chip elements from the chip element holder uses as the external force a positive pressure, said positive pressure being applied to the predetermined outer surfaces of the chip elements by way of the through holes.

7. The method of handling chip elements according to claim 4, wherein the step of holding the chip elements on the chip element holder uses as the external force a negative pressure, said negative pressure being applied to the predetermined outer surfaces of the chip elements by way of the through holes.

8. The method of handling chip elements according to claim 4, wherein the chip elements are chip electronic element main bodies, the outer surfaces of which are going to have electrodes to be formed thereon, said method further comprises a step of applying an electrically conductive paste for forming an electrode on to an outer surface which is opposite to a predetermined outer surface of each electronic element main body, with said step being carried out under a condition in which the electronic elements have been held on the chip element holder.

9. The method of handling chip elements according to claim 4, further comprising the steps of:

preparing, at a time when said chip element holder is used as a first chip element holder, a second chip element holder which is a different one from the first chip element holder, said second chip element holder as a whole is a plate member, one of its main surfaces is provided with an adhesive surface capable of bonding the predetermined surfaces of a plurality of chip elements so as to hold the chip elements;

rendering the adhesive surface of the second chip element holder to bond the chip elements being held by the first chip element holder;

exerting an external force for separating the chip elements from the first chip element holder on the predetermined outer surfaces of the chip elements by way of the through holes, thereby enabling the chip elements to be transferred from the first chip element holder to the second chip element holder; and

rendering the adhesive surface of the second chip element holder to bond the chip elements, so as to hold the chip elements on the second chip element holder.

-21-

10. The method of handling chip elements according to claim 4, further comprising the steps of:

preparing, at a time when said chip element holder is used as a first chip element holder, a second chip element holder which is a different one from the first chip element holder, said second chip element holder as a whole is a plate member, one of its main surfaces is provided with an adhesive surface capable of bonding the predetermined surfaces of a plurality of chip elements so as to hold the chip elements, said holder is also provided with several through holes each having an open end which can be at least partially closed by part of the predetermined surface of one of the chip elements, so that an external force may be exerted on the predetermined outer surfaces of the chip elements bonded on the adhesive surface;

rendering the adhesive surface of the second chip element holder to bond the chip elements being held by the first chip element holder;

applying a negative pressure through the through holes formed in the second chip element holder to keep the chip elements by virtue of a suction force, meanwhile rendering the chip elements to be transferred from the first chip element holder to the second chip element holder; and

rendering the adhesive surface of the second chip element holder to bond the chip elements, so as to hold the chip-like elements on the second chip element holder.

11. The method of handling chip elements according to claim 4, further comprising the steps of:

-22-

preparing, at a time when said chip element holder is used as a first chip element holder, a second chip element holder which is a different one from the first chip element holder, said second chip element holder as a whole is a plate member, one of its main surfaces is provided with an adhesive surface capable of bonding the predetermined surfaces of a plurality of chip elements so as to hold the chip elements, said holder is also provided with several through holes each having an open end which can be at least partially closed by part of the predetermined surface of one of the chip elements, so that an external force may be exerted on the predetermined outer surfaces of the chip elements bonded on the adhesive surface;

rendering the adhesive surface of the second element holder to bond the chip elements being held by the first chip element holder;

exerting an external force for separating the chip elements from the first chip element holder on the predetermined outer surfaces of the chip elements by way of the through holes formed in the first chip element holder, at the same time applying a negative pressure through the through holes formed in the second chip element holder to keep the chip elements by virtue of a suction force, meanwhile rendering the chip elements to be transferred from the first chip element holder to the second chip element holder; and

rendering the adhesive surface of the second chip element holder to bond the chip elements, so as to hold the chip elements on the second chip element holder.

12. The method of handling chip elements according to any one of claims 9 to 11, wherein the second chip element holder has a structure which is substantially the same as that of the first chip element holder.

13. The method of handling chip elements according to any one of claims 10 to 12, wherein the chip elements are chip electronic element main bodies

-23-

each having an outer surface including mutually opposed a first end portion and a second end portion on which electrodes are formed, said method further comprising the steps of:

holding the electronic element main bodies on the first chip element holder, bonding the first end portion of each electronic element main body on the adhesive surface of the first chip element holder;

applying an electrically conductive paste forming an electrode to the second end portion of each electronic element main body, said paste application being carried out under a condition in which the electronic element main bodies are held on the first chip element holder;

bonding, in a process of holding the electronic element main bodies on the second chip element holder, the second end portion of each electronic element main body on the adhesive surface of the second chip element holder, said second end portion having already been coated with the electrically conductive paste; and

applying an electrically conductive paste forming an electrode to the first end portion of each electronic element main body, said paste application being carried out under a condition in which the electronic element main bodies are held on the second chip element holder.

14. A chip element holder, comprising:

a plate member having one of its main surfaces provided with an adhesive surface capable of bonding predetermined surfaces of a plurality of chip elements so as to hold the chip elements; and

several through holes provided in said plate member, each through hole having an open end which can at least be partially closed by part of the predetermined surface of one of the chip elements,

wherein an external force is exerted on the predetermined outer surfaces of the chip elements bonded on the adhesive surface by way of the through holes,

wherein an external force is produced by a pusher member which can apply a pressing force to the predetermined outer surfaces of the chip elements by way of the through holes.

15. The chip element holder according to claim 14, wherein the external force is one of a positive pressure and a negative pressure acting on the predetermined outer surfaces of the chip elements by way of the through holes.