

Description

The present invention relates to a method of manufacturing plural electronic components such as chip capacitors or chip resistors and to a method of manufacturing an electronic component array such as a capacitor array.

Japanese Patent Laying-Open No. 60-109204 (1985) describes a conventional method of forming external electrodes on chip components, which is of interest to the present invention. According to this known method, external electrodes are formed on chip components in the following procedure:

(1) First prepared are first and second holding plates, each of which is formed by an elastic body provided with a plurality of receiving holes passing therethrough across its front and rear surfaces.

(2) Second ends of chip components are pushed into the receiving holes of the first holding plate from the front side thereof, so that first ends of the chip components are exposed on the front surface of the first holding plate.

(3) Metal paste is applied to the first ends of the chip components which are exposed on the front surface of the first holding plate, and then the as-formed metal paste films are dried.

(4) The front surface of the first holding plate is opposed to that of the second holding plate, and the first ends, being provided with the metal paste films, of the chip components which are held by the first holding plate are pushed into the receiving holes of the second holding plate so that the second ends of the chip components, being provided with no metal paste films, are exposed on the front surface of the second holding plate, thereby transferring the chip components from the first holding plate to the second holding plate.

(5) Metal paste is applied to the second ends of the chip components which are exposed on the front surface of the second holding plate, and then the as-formed metal films are dried.

(6) The chip components are taken out from the second holding plate.

(7) The chip components treated in the aforementioned manner are heat treated in a heat treat furnace so that the metal paste films are fired, thereby forming external electrodes.

In the aforementioned conventional method, however, it is necessary to handle separate chip components for forming external electrodes thereon, and hence equipment is required for orienting the chip components along a constant direction. Such equipment includes the aforementioned first and second holding plates, and a device for pushing the chip components into the receiving holes of the first holding plate along a constant direction, for example. Further, a relatively large number of steps must be carried out

in order to form the external electrodes through the equipment.

In addition, thicknesses of the as-formed metal paste films tend to disperse in the aforementioned conventional method.

The invention aims to provide a method of manufacturing chip electronic components, which can reduce the number of steps for forming external electrodes with simplified equipment, while reducing dispersion in thickness of the external electrodes.

According to one aspect of the invention there is provided a method of manufacturing plural electronic components in order to provide an external electrode on at least one end surface of each component, the method comprising the steps of: preparing a block comprising said plural electronic components; cutting one or more grooves in said block in order to separate said plural components from each other and to form on each component said at least one end surface to be provided with external electrodes; applying metal paste into said one or more grooves; and cutting said metal paste filling up each said groove so as to divide the same in two and thereby form on said at least one end surface of each said component an external electrode comprising a metal paste film of desired thickness.

The practice of this one aspect of the invention is directed to a method of manufacturing chip electronic components, each of which is provided with external electrodes on both end surfaces thereof.

The metal paste for forming external electrodes can be applied into the cutting grooves provided in the block, which is still maintained in its original shape. Further, the metal paste filling up each of the cutting grooves is divided in two, to define external electrodes for an adjacent pair of chip electronic components.

The block is easier to handle as compared with the chip components being separately handled in the conventional method. Thus, the metal paste can be easily applied to prescribed positions.

Further, it is not necessary to orient separate chip components along a constant direction dissimilarly to the conventional method, whereby at least a step for such an operation can be omitted.

In addition, the thicknesses of the external electrodes are determined by spaces provided by the cutting grooves and the thickness of a blade which is employed for cutting the metal paste filling up each of the cutting grooves and dividing the same in two. Thus, it is possible to reduce dispersion in thickness of the external electrodes, while the thicknesses of the external electrodes can be easily controlled.

The present invention can advantageously be applied to manufacturing of chip-type ceramic electronic components such as multilayer ceramic capacitors, for example. In this case, the block may be prepared in a state containing a green ceramic material, i.e., in

an unfired state, so that a step of cofiring the metal paste with the green ceramic material is carried out after the step of cutting the metal paste. Such a specific method is usefully applied to manufacturing of chip-type ceramic electronic components such as multilayer ceramic capacitors which are provided therein with internal electrodes of a base metal such as nickel, in particular. In this case, it is hard to attain mutual dissolution of the nickel, forming the internal electrodes, with silver, forming external electrodes. Therefore, nickel paste is first applied onto the block as a first layer for forming external electrodes and cofired with the ceramic material contained in the block, so that paste containing silver is then applied as a second layer onto the as-obtained nickel film, and baked. In this case, a step can be advantageously applied to formation of the first layer for forming external electrodes.

The present invention can also be effectively applied to manufacturing of an electronic component array comprising a plurality of electronic component elements, each of which is provided with external electrodes on both ends surfaces thereof, and a carrier part holding the electronic component elements in common with spaces defined therebetween.

Therefore in another aspect the invention provides a method of manufacturing an electronic component array comprising a plurality of electronic component elements each being provided with external electrodes on two ends thereof, and a carrier part holding said electronic component elements in common with spaces defined therebetween, said method comprising the steps of: preparing a block comprising said electronic component elements and said carrier part; cutting grooves in said block between said electronic component elements so as not to extend into the carrier part in order to form surfaces on said electronic component elements which surfaces are to be provided with external electrodes; applying metal paste into said grooves; and cutting said metal paste filling up each said groove so as to divide the same in two and thereby form on said surfaces of said electronic component elements an external electrode comprising a metal paste film of desired thickness.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1(1) to 1(4) are sectional views showing steps included in an embodiment of the present invention.

Fig. 2 is a perspective view showing a block 1a employed in another embodiment of the present invention; and

Fig. 3 is a perspective view showing a capacitor array 11 obtained by still another embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1(1) to 1(4) illustrate steps included in an embodiment of the present invention, which is directed to manufacturing of multilayer ceramic capacitors.

As shown in Fig. 1(1), a block 1 is prepared from a layered product of green ceramic sheets. This block 1 is provided therein with layers of a plurality of internal electrodes 2 for forming electrostatic capacitance. The block 1 provides a plurality of chip-type multilayer ceramic capacitors when the same is cut along surfaces 3 and 4 to be provided with external electrodes.

Then, cutting grooves 5 are formed in the block 1 along the surfaces 3 and 4 to be provided with external electrodes, as shown in Fig. 1(1). Due to formation of the cutting grooves 5, the block 1 is divided into a plurality of chips 6 for defining individual multilayer ceramic capacitors respectively. The cutting grooves 5 are formed with a dicing saw, for example.

Then, metal paste 7 for forming external electrodes is applied into the cutting grooves 5 by casting, for example, as shown in Fig. 1(2).

Then, the metal paste 7 is dried as shown in Fig. 1(3).

Then, the metal paste 7 filling up each of the cutting grooves 5 is cut with a blade 8, for example, to be divided in two, as shown in Fig. 1(4). Thus, metal paste films 7 are defined on the surfaces 3 and 4 of the chips 6 in desired thicknesses.

The blade 8 is smaller in thickness than that employed for forming the cutting grooves 5 in the step shown in Fig. 1(1). It is possible to freely control the thicknesses of the metal paste films 7 which are defined on the surfaces 3 and 4 of the chips 6 to be provided with external electrodes, by appropriately selecting thicknesses of the blade for forming the cutting grooves 5 and the blade 8 shown in Fig. 1(4) respectively.

The chips 6 thus provided with the metal paste films 7 on the surfaces 3 and 4 respectively are then fired. At this time, the green ceramic materials contained in the chips 6 are cofired with the metal paste films 7. Thus, desired multilayer ceramic capacitors are obtained.

Fig. 2 shows another embodiment of the present invention. Referring to Fig. 2, elements corresponding to those shown in Figs. 1(1) to 1(4) are denoted by similar reference numerals, to omit redundant description.

In the embodiment shown in Fig. 2, a larger block 1a is prepared so that individual chips 6 are obtained when the same is cut along plural cutting lines 9 and

10 which are perpendicular to each other. Such a block 1a is first provided with cutting grooves 5, so that metal paste 7 is cast into the same and then dried. Thereafter the block 1a is cut along the cutting lines 9 and 10 with a dicing saw, for example. The block 1a may be successively cut along the cutting lines 9 and 10 in this order, or vice versa.

According to the embodiment shown in Fig. 2, formation of the cutting grooves 5 and application of the metal paste 7 can be simultaneously performed in relation to a number of chips 6, whereby mass productivity is improved, in particular.

Experimental Example carried out according to the present invention is now described.

First, ceramic slurry was formed by a doctor blade coater, to obtain sheets of 20 μm in thickness, 150 mm in width and 10 m in length. Then, conductive films for defining internal electrodes were formed on these sheets in desired patterns, and the sheets were stacked with each other and pressed to obtain the block 1a shown in Fig. 2.

Then, a dicing saw having a blade of 100 μm in thickness was applied to the block 1a, to form the cutting grooves 5.

Then, nickel paste which was adjusted to 4 to 5 poises in viscosity was cast into the cutting grooves 5 with a spatula. Then the block 1a was dried in an oven at 70°C for 30 minutes, and cut along the cutting lines 9 and 10 shown in Fig. 2 with a dicing saw. A blade employed in this step was smaller in thickness than that for forming the cutting grooves 5.

Then, the as-obtained chips 6 were debindered and fired. Thus, multilayer ceramic capacitors were obtained with nickel films provided as first layers for external electrodes. Then, silver films were formed by baking as second layers for external electrodes, and plated with Ni/Sn for improving solderability. Thus, the multilayer ceramic capacitors were completed.

In the aforementioned Experimental Example, the time required for forming the first layers for external electrodes was only 0.3 minutes as to 1000 multilayer ceramic capacitors, although the conventional method required 1 minute for such an operation. Further, it was possible to suppress deviation in thickness of the first layers, which was 120 % in the conventional method, to 15 % in the aforementioned Experimental Example.

While each embodiment has been described in relation to a method of manufacturing multilayer ceramic capacitors, the present invention is also applicable to chip-type ceramic electronic components other than multilayer ceramic capacitors, as well as to chip electronic components containing no ceramic material.

When the present invention is applied to chip-type ceramic electronic components, for example, the block to be provided with cutting grooves may not

necessarily be unfired as hereinabove described, but a block formed by a sintered body may be provided with cutting grooves, to be subjected to subsequent steps.

The present invention is also applicable to manufacturing of a capacitor array 11 shown in Fig. 3. Referring to Fig. 3, a capacitor array 11 comprises a plurality of capacitor elements 14, each of which is provided with external electrodes 12 and 13 on both end surfaces thereof. These capacitor elements 14 are held by a carrier part 15 in common, with spaces 16 defined therebetween. Each of the capacitor element 14 forms a multilayer capacitor comprising a plurality of internal electrodes 17, as shown expediently in the leftmost one appearing in Fig. 3. Actually, the internal electrodes 17 are not visible from the outside.

In order to obtain the aforementioned capacitor array 11, a block 18 is prepared for providing the capacitor elements 14 and the carrier part 15. In this stage, the block 18 is not yet provided with grooves corresponding to the spaces 16. This block 18 is formed by a layered product of a plurality of ceramic green sheets, which are provided with the internal electrodes 17 on desired positions.

Then, grooves for defining the spaces 16 are formed in the block 18, not to reach the carrier part 15.

Then, metal paste for forming the external electrodes 12 and 13 is applied into the aforementioned grooves. The metal paste filling up each groove is dried and then cut to be divided in two.

Thereafter the block 18 is fired, whereby the capacitor array 11 is obtained.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the scope of the present invention being limited only by the terms of the appended claims.

Claims

1. A method of manufacturing plural electronic components in order to provide an external electrode on at least one end surface of each component, the method comprising the steps of:
 - preparing a block (1, 1a) comprising said plural electronic components;
 - cutting one or more grooves (5) in said block (1, 1a) in order to separate said plural components from each other and to form on each component said at least one end surface (3, 4) to be provided with external electrodes;
 - applying metal paste (7) into said one or more grooves (5); and
 - cutting said metal paste (7) filling up each said groove (5) so as to divide the same in two and thereby form on said at least one end surface

10 which are perpendicular to each other. Such a block 1a is first provided with cutting grooves 5, so that metal paste 7 is cast into the same and then dried. Thereafter the block 1a is cut along the cutting lines 9 and 10 with a dicing saw, for example. The block 1a may be successively cut along the cutting lines 9 and 10 in this order, or vice versa.

According to the embodiment shown in Fig. 2, formation of the cutting grooves 5 and application of the metal paste 7 can be simultaneously performed in relation to a number of chips 6, whereby mass productivity is improved, in particular.

Experimental Example carried out according to the present invention is now described.

First, ceramic slurry was formed by a doctor blade coater, to obtain sheets of 20 μm in thickness, 150 mm in width and 10 m in length. Then, conductive films for defining internal electrodes were formed on these sheets in desired patterns, and the sheets were stacked with each other and pressed to obtain the block 1a shown in Fig. 2.

Then, a dicing saw having a blade of 100 μm in thickness was applied to the block 1a, to form the cutting grooves 5.

Then, nickel paste which was adjusted to 4 to 5 poises in viscosity was cast into the cutting grooves 5 with a spatula. Then the block 1a was dried in an oven at 70°C for 30 minutes, and cut along the cutting lines 9 and 10 shown in Fig. 2 with a dicing saw. A blade employed in this step was smaller in thickness than that for forming the cutting grooves 5.

Then, the as-obtained chips 6 were debindered and fired. Thus, multilayer ceramic capacitors were obtained with nickel films provided as first layers for external electrodes. Then, silver films were formed by baking as second layers for external electrodes, and plated with Ni/Sn for improving solderability. Thus, the multilayer ceramic capacitors were completed.

In the aforementioned Experimental Example, the time required for forming the first layers for external electrodes was only 0.3 minutes as to 1000 multilayer ceramic capacitors, although the conventional method required 1 minute for such an operation. Further, it was possible to suppress deviation in thickness of the first layers, which was 120 % in the conventional method, to 15 % in the aforementioned Experimental Example.

While each embodiment has been described in relation to a method of manufacturing multilayer ceramic capacitors, the present invention is also applicable to chip-type ceramic electronic components other than multilayer ceramic capacitors, as well as to chip electronic components containing no ceramic material.

When the present invention is applied to chip-type ceramic electronic components, for example, the block to be provided with cutting grooves may not

necessarily be unfired as hereinabove described, but a block formed by a sintered body may be provided with cutting grooves, to be subjected to subsequent steps.

The present invention is also applicable to manufacturing of a capacitor array 11 shown in Fig. 3. Referring to Fig. 3, a capacitor array 11 comprises a plurality of capacitor elements 14, each of which is provided with external electrodes 12 and 13 on both end surfaces thereof. These capacitor elements 14 are held by a carrier part 15 in common, with spaces 16 defined therebetween. Each of the capacitor element 14 forms a multilayer capacitor comprising a plurality of internal electrodes 17, as shown expediently in the leftmost one appearing in Fig. 3. Actually, the internal electrodes 17 are not visible from the outside.

In order to obtain the aforementioned capacitor array 11, a block 18 is prepared for providing the capacitor elements 14 and the carrier part 15. In this stage, the block 18 is not yet provided with grooves corresponding to the spaces 16. This block 18 is formed by a layered product of a plurality of ceramic green sheets, which are provided with the internal electrodes 17 on desired positions.

Then, grooves for defining the spaces 16 are formed in the block 18, not to reach the carrier part 15.

Then, metal paste for forming the external electrodes 12 and 13 is applied into the aforementioned grooves. The metal paste filling up each groove is dried and then cut to be divided in two.

Thereafter the block 18 is fired, whereby the capacitor array 11 is obtained.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the scope of the present invention being limited only by the terms of the appended claims.

Claims

1. A method of manufacturing plural electronic components in order to provide an external electrode on at least one end surface of each component, the method comprising the steps of:

preparing a block (1, 1a) comprising said plural electronic components;

cutting one or more grooves (5) in said block (1, 1a) in order to separate said plural components from each other and to form on each component said at least one end surface (3, 4) to be provided with external electrodes;

applying metal paste (7) into said one or more grooves (5); and

cutting said metal paste (7) filling up each said groove (5) so as to divide the same in two and thereby form on said at least one end surface



(3, 4) of each said component an external electrode comprising a metal paste film of desired thickness.

2. A method of manufacturing plural electronic components in accordance with claim 1, wherein said electronic components are chip-type ceramic electronic components and said block (1, 1a) comprises a green ceramic material, said method further comprising a step of cofiring said metal paste (7) with said green ceramic material after said step of cutting said metal paste (7). 5
3. A method of manufacturing chip electronic components in accordance with claim 1, wherein said chip electronic components are chip-type ceramic electronic components and said block (1, 1a) comprises a green ceramic material, said method further comprising a step of firing said green ceramic material before said step of cutting said grooves (5) in said block. 10 15 20
4. A method of manufacturing chip electronic components in accordance with any preceding claim, wherein said step of cutting said grooves (5) in said block (1, 1a) is carried out with a dicing saw. 25
5. A method of manufacturing chip electronic components in accordance with claim 1, further comprising a step of drying said metal paste (7) between said step of applying metal paste (7) and said step of cutting said metal paste (7). 30
6. A method of manufacturing chip electronic components in accordance with claim 1, further comprising a step of preparing a first blade for cutting said grooves (5) in said block (1, 1a) and a second blade (8) for cutting said metal paste (7) respectively, and a step of selecting a difference in thickness between said first and second blades in order to determine the thickness of the external electrodes to be formed. 35 40
7. A method of manufacturing electronic components in accordance with claim 1, wherein said block (1a) is cut along plural cutting lines (9, 10) being perpendicular to each other for providing a plurality of chip electronic components and said grooves (5) are cut along said first cutting lines (9), said method further comprising a step of cutting said block (1a) along said second cutting lines (10). 45 50
8. A method of manufacturing an electronic component array (11) comprising a plurality of electronic component elements (14) each being provided with external electrodes (12, 13) on two ends thereof, and a carrier part (15) holding said elec-

tronic component elements (14) in common with spaces (16) defined therebetween, said method comprising the steps of:

preparing a block (18) comprising said electronic component elements (14) and said carrier part (15);

cutting grooves in said block (18) between said electronic component elements so as not to extend into the carrier part (15) in order to form surfaces on said electronic component elements which surfaces are to be provided with external electrodes (12, 13);

applying metal paste into said grooves; and

cutting said metal paste filling up each said groove so as to divide the same in two and thereby form on said surfaces of said electronic component elements an external electrode comprising a metal paste film of desired thickness.

9. A method of manufacturing an electronic component array in accordance with claim 8, wherein each of said electronic component elements forms a capacitor.
10. A method of manufacturing an electronic component array in accordance with claim 8, wherein said block (18) contains a green ceramic material, said method further comprising a step of cofiring said metal paste with said green ceramic material after said step of cutting said metal paste.
11. A method of manufacturing an electronic component array in accordance with claim 8, wherein said block (18) contains a green ceramic material, said method further comprising a step of firing said green ceramic material before said step of forming grooves.

Patentansprüche

1. Verfahren zum Herstellen mehrerer elektronischer Bauteile zum Aufbringen einer Außenelektrode an mindestens einer Endseite jedes Bauteils, mit den folgenden Schritten:
 - Herstellen eines Blocks (1, 1a), der die mehreren elektronischen Bauteile enthält;
 - Einschneiden einer Nut (5) oder mehrerer in den Block (1, 1a), um die mehreren Bauteile voneinander zu trennen und um an jedem Bauteil die genannte mindestens eine Endseite (3, 4) zu erzeugen, die mit Außenelektroden zu versehen ist;
 - Einbringen von Metallpaste (7) in die Nut (5) oder die mehreren und
 - Zerschneiden der jede Nut (5) auffüllenden Metallpaste (7), um dieselbe zweizuteilen



und dadurch an der mindestens einen genannten Endseite (3, 4) jeder der Bauteile eine Außenelektrode auszubilden, die aus einem Metallpastefilm gewünschter Dicke besteht.

2. Verfahren zum Herstellen mehrerer elektronischer Bauteile gemäß Anspruch 1, bei dem die elektronischen Bauteile chipförmige, keramische Elektronikbauteile sind und der Block (1, 1a) aus ungebranntem Keramikmaterial besteht, wobei das Verfahren ferner einen Schritt des gemeinsamen Brennens der Metallpaste (7) und des ungebrannten Keramikmaterials nach dem Schritt des Zertrennens der Metallpaste (7) aufweist.
3. Verfahren zum Herstellen elektronischer Chipbauteile gemäß Anspruch 1, bei dem die elektronischen Chipbauteile chipförmige, keramische Elektronikbauteile sind und der Block (1, 1a) aus ungebranntem Keramikmaterial besteht, wobei das Verfahren ferner einen Schritt des Brennens des ungebrannten Keramikmaterials vor dem Schritt des Einschneidens der Nuten (5) in den Block enthält.
4. Verfahren zum Herstellen chipförmiger Elektronikbauteile nach einem der vorstehenden Ansprüche, bei dem der Schritt des Einschneidens der Nuten (5) in den Block (1, 1a) mit einer Trennsäge ausgeführt wird.
5. Verfahren zum Herstellen elektronischer Chipbauteile nach Anspruch 1, ferner mit einem Schritt des Trocknens der Metallpaste (7) zwischen dem Schritt des Auftragens der Metallpaste (7) und dem Schritt des Durchschneidens der Metallpaste (7).
6. Verfahren zum Herstellen elektronischer Chipbauteile nach Anspruch 1, ferner mit einem Schritt des Bereitstellens einer ersten Schneide zum Einschneiden der Nuten (5) in den Block (1, 1a) und einer zweiten Schneide (8) zum Durchschneiden der Metallpaste (7), und mit einem Schritt des Auswählens der Dickendifferenz zwischen der ersten und der zweiten Schneide, um die Dicken der herzustellenden Außenelektroden festzulegen.
7. Verfahren zum Herstellen elektronischer Bauteile nach Anspruch 1, bei dem der Block (1a) entlang mehrerer zueinander rechtwinkliger Schnitlinien (9, 10) zerteilt wird, um mehrere elektronische Chipbauteile zu erzeugen, und bei dem die Nuten (5) entlang der ersten Schnitlinien (9) eingeschnitten werden, wobei das Verfahren ferner einen Schritt des Zertrennens des Blocks (1a)

entlang der zweiten Schnitlinien (10) enthält.

8. Verfahren zum Herstellen eines Arrays aus elektronischen Bauteilen (11) mit mehreren elektronischen Bauteilen (14), die jeweils an zwei Enden mit Außenelektroden (12, 13) versehen sind, und mit einem Trägerteil (15), das diese elektronischen Komponenten (14) gemeinsam hält, wobei Zwischenräume (16) zwischen diesen liegen, mit den folgenden Schritten:
 - Herstellen eines Blocks (18), der die elektronischen Bauteile (14) und den Trägerteil (15) enthält;
 - Einschneiden von Nuten in den Block (18) zwischen den elektronischen Bauteilen in solcher Weise, daß sie sich nicht in den Trägerteil (15) erstrecken, um an den elektronischen Bauteilen Seiten auszubilden, die mit Außenelektroden (12, 13) zu versehen sind;
 - Einbringen von Metallpaste in die Nuten und
 - Zerschneiden der jede Nut auffüllenden Metallpaste, um dieselbe zweizuteilen und dadurch an den Seiten der elektronischen Bauteile eine Außenelektrode auszubilden, die aus einem Metallpastefilm gewünschter Dicke besteht.
9. Verfahren zum Herstellen eines Arrays aus elektronischen Bauteilen nach Anspruch 8, bei dem jedes der elektronischen Bauteile einen Kondensator bildet.
10. Verfahren zum Herstellen eines Arrays elektronischer Bauteile nach Anspruch 8, bei dem der Block (18) aus einem ungebrannten Keramikmaterial besteht und das Verfahren ferner einen Schritt des gemeinsamen Trennens der Metallpaste und des ungebrannten Keramikmaterials nach dem Schritt des Durchschneidens der Metallpaste umfaßt.
11. Verfahren zum Herstellen eines Arrays aus elektronischen Bauteilen nach Anspruch 8, bei dem der Block (18) aus einem ungebrannten Keramikmaterial besteht und das Verfahren ferner einen Schritt des Brennens des ungebrannten Keramikmaterials vor dem Schritt des Herstellens der Nuten umfaßt.

Revendications

1. Procédé de fabrication de plusieurs composants électroniques qui permet de former une électrode externe sur au moins une des faces de chaque composant, le procédé comprenant les étapes



de:

préparation d'un bloc (1, 1a) comportant lesdits composants multiples;

traçage d'une ou plusieurs rainure(s) (5) dans ledit bloc (1, 1a) afin de séparer lesdits composants multiples les uns des autres et de former sur au moins une desdites faces (3, 4) de chaque composant des électrodes externes;

application d'une pâte métallique (7) dans lesdites rainures (5); et

découpage en deux de ladite pâte métallique (7) remplissant chacune desdites rainures (5) pour former ainsi sur au moins une desdites faces (3, 4) de chacun desdits composants une électrode externe comportant un film de pâte métallique de l'épaisseur souhaitée.

2. Procédé de fabrication de plusieurs composants électroniques selon la revendication 1, dans lequel lesdits composants électroniques sont des composants électroniques en céramique de type puce et ledit bloc (1, 1a) est constitué d'un matériau céramique vert, ledit procédé comportant en outre une étape de cuisson simultanée de ladite pâte métallique (7) et dudit matériau céramique vert après ladite étape de découpage de ladite pâte métallique (7).

3. Procédé de fabrication de composants électroniques puces selon la revendication 1, dans lequel lesdits composants électroniques puces sont des composants électroniques en céramique de type puce et ledit bloc (1, 1a) est constitué d'un matériau céramique vert, ledit procédé comportant en outre une étape de cuisson dudit matériau céramique vert avant ladite étape de traçage desdites rainures (5) dans ledit bloc.

4. Procédé de fabrication de composants électroniques puces selon l'une quelconque des revendications précédentes, dans lequel ladite étape de traçage desdites rainures (5) dans ledit bloc (1, 1a) est réalisée à l'aide d'une scie à découper.

5. Procédé de fabrication de composants électroniques puces selon la revendication 1, comportant en outre une étape de séchage de ladite pâte métallique (7) entre ladite étape d'application de ladite pâte métallique (7) et ladite étape de découpage de ladite pâte métallique (7).

6. Procédé de fabrication de composants électroniques puces selon la revendication 1, comportant en outre une étape de préparation d'une première lame pour tracer lesdites rainures (5) dans ledit bloc (1, 1a) et une seconde lame (8) pour découper ladite pâte métallique (7), respectivement, et une étape

de sélection de différence d'épaisseur entre lesdites première et seconde lames afin de déterminer l'épaisseur des électrodes externes à former.

5 7. Procédé de fabrication de composants électroniques selon la revendication 1, dans lequel ledit bloc (1a) est découpé suivant plusieurs lignes de découpage (9, 10), perpendiculaires les unes aux autres, pour fournir une pluralité de composants électroniques puces et lesdites rainures (5) sont tracées le long des premières lignes de découpage (9), ledit procédé comportant en outre une étape de découpage dudit bloc (1a) suivant les secondes lignes de découpage (10).

10 8. Procédé de fabrication d'une batterie de composants électroniques (11) comportant une pluralité d'éléments de composants électroniques (14), chacun étant pourvu d'électrodes externes (12, 13) sur ses deux extrémités, et une base de support (15) pour maintenir lesdits éléments de composants électroniques (14) ensemble avec des espacements (16) entre eux définis, ledit procédé comportant les étapes de:

15 préparation d'un bloc (18) comprenant lesdits éléments de composants électroniques (14) et ladite base de support (15);

20 traçage de rainures dans ledit bloc (18) entre lesdits éléments de composants électroniques, sans aller jusqu'à la base de support (15) afin de former sur lesdits éléments de composants électroniques des faces à pourvoir d'électrodes externes (12, 13);

25 application d'une pâte métallique dans lesdites rainures; et

30 découpage en deux de ladite pâte métallique remplissant chacune desdites rainures pour former ainsi sur lesdites faces desdits éléments de composants électroniques une électrode externe comportant un film de pâte métallique de l'épaisseur souhaitée.

35 9. Procédé de fabrication d'une batterie de composants électroniques selon la revendication 8, dans lequel chacun desdits éléments de composants électroniques constitue un condensateur.

40 10. Procédé de fabrication d'une batterie de composants électroniques selon la revendication 8, dans lequel ledit bloc (18) contient un matériau céramique vert, ledit procédé comportant en outre une étape de cuisson simultanée de ladite pâte métallique et dudit matériau céramique vert après ladite étape de découpage de ladite pâte métallique.

45 11. Procédé de fabrication d'une batterie de composants électroniques selon la revendication 8,



dans lequel ledit bloc (18) contient un matériau céramique vert, ledit procédé comportant en outre une étape de cuisson dudit matériau céramique vert avant ladite étape de formation des rainures.

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