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Stelzl et al.(10) **Pub. No.: US 2003/0047806 A1**(43) **Pub. Date: Mar. 13, 2003**(54) **COMPONENT PROVIDED WITH A DESCRIPTION**(76) Inventors: **Alois Stelzl**, Munchen (DE); **Hans Kruger**, Munchen (DE); **Ernst Christl**, Vilsbiburg (DE)Correspondence Address:
SCHIFF HARDIN & WAITE
6600 SEARS TOWER
233 S WACKER DR
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438/107(57) **ABSTRACT**

For labeling a component (2) provided with a metallic cover layer (13), it is proposed that at least one further contrast layer (14) be arranged over the cover layer, said at least one further contrast layer (14) producing an optical contrast with the metallic cover layer and being capable of being eroded by means of a laser for producing a labeling.

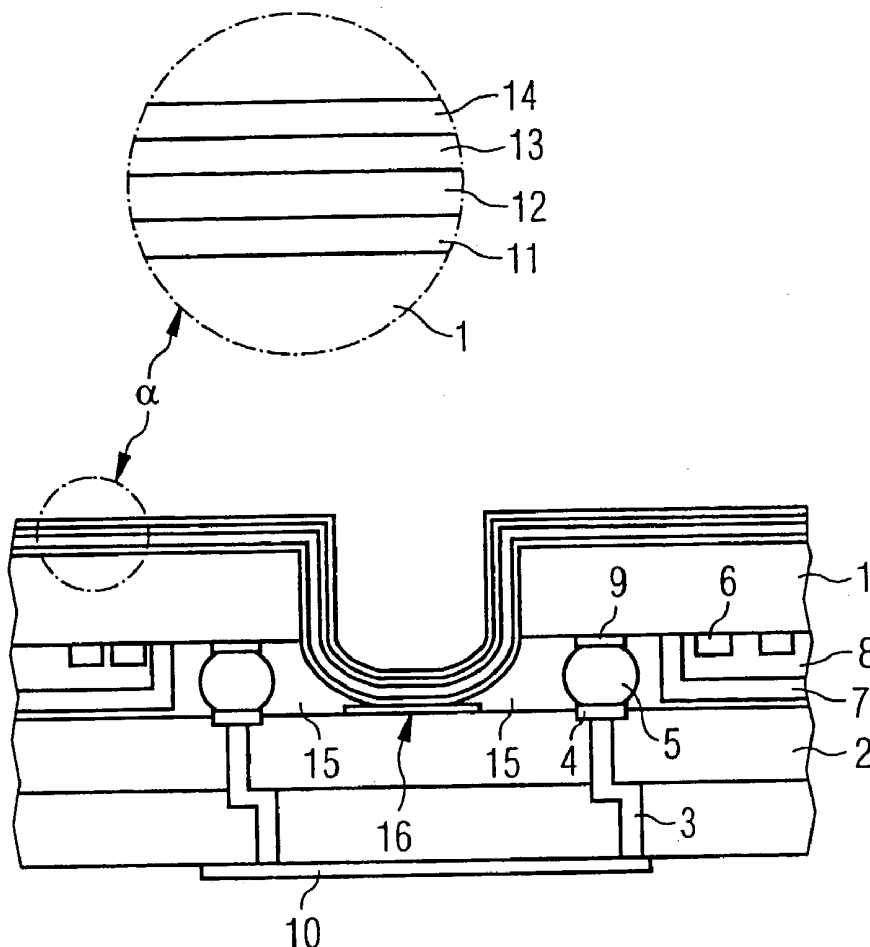


FIG 1

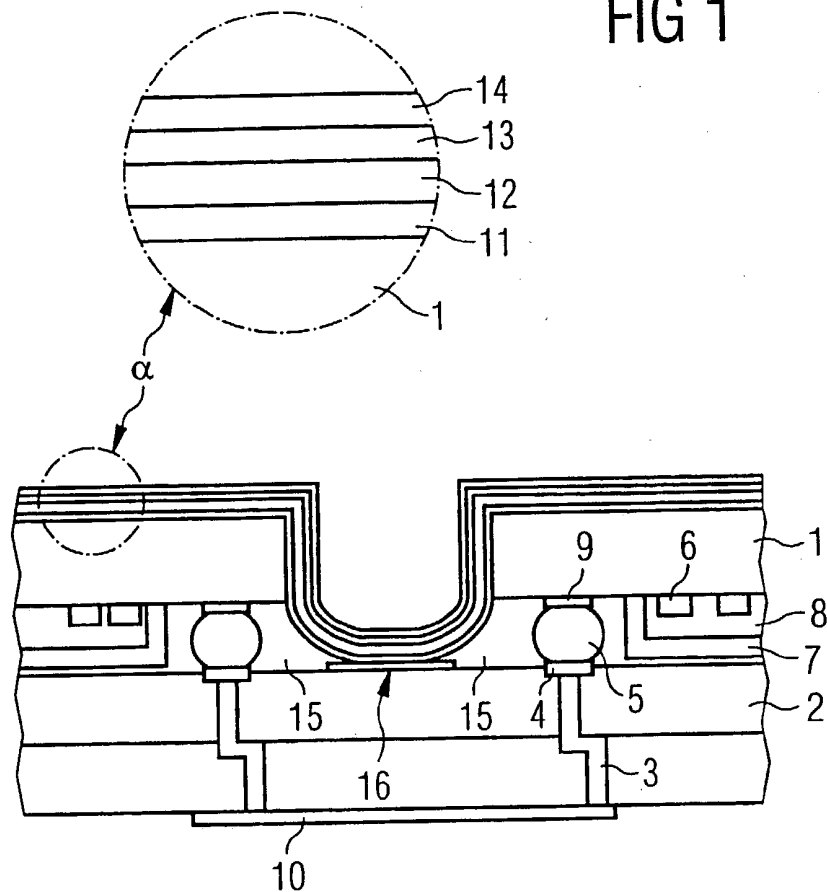
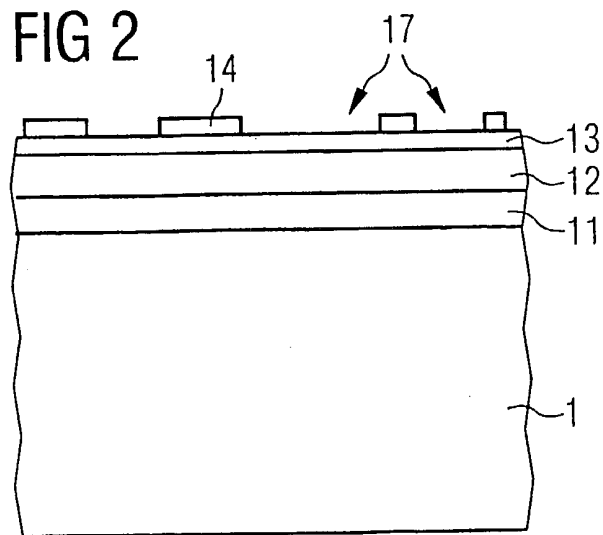


FIG 2



COMPONENT PROVIDED WITH A DESCRIPTION

[0001] The invention is directed to a component, particularly to a miniaturized, passive component.

[0002] For identifying electrical, electronic and, in particular, passive components, these are usually provided with a labeling. This can provide information about the manufacturer, the type or the specifications of the component and, potentially, the serial number or article designation. Larger components that comprise adequately large surfaces for the acceptance of a labeling can, for example, be printed with silkscreening in a simple way. Given smaller components having dimensions of, for example, below 1 mm, enough printable surface for producing a labeling is not available. Alternatively, these components can be labeled with a laser that still enables even the minutest font sizes to be produced.

[0003] Only labels that are difficult to read or no labels at all can be generated with laser labeling on miniaturized components that comprise a metallic layer on the surfaces available for a labeling since adequate contrast cannot be achieved there by erosion of material.

[0004] It is therefore an object of the present invention to specify a component with, in particular, a metallic cover layer on which a high-contrast labeling is possible.

[0005] This object is inventively achieved by a component according to claim 1. Advantageous developments of the invention proceed from the subclaims.

[0006] In a component that comprises a metallic layer, particularly a cover layer, on a surface available for labeling, it is proposed that a contrast layer that can be eroded with a laser be applied over the metallic layer. In this way, one succeeds in fashioning a highly legible labeling with high optical contrast in a simple way in the contrast layer by means of laser labeling, i.e. by means of partial layer erosion.

[0007] All layers that are simply to apply and that comprise a good optical contrast relative to the metallic cover layer fundamentally come into consideration for the contrast layer. Particularly simple to apply are those contrast layers that are compatible with the manufacturing steps of the component. Those cover [sic] layers are especially preferred whose application can be seamlessly introduced into the manufacturing process of the component and that, in particular, can use the same apparatus that are required for preceding method steps in the manufacture of the component.

[0008] In an advantageous development of the invention, the contrast layer is generated immediately after the manufacture of the metallic cover layer, whereby the contrast layer is also preferably a metallic layer that differs from the metallic cover layer with respect to its optical properties. A distinction between two metallic layers can, for example, be achieved via the reflection behavior of the metallic layers that, in particular, is dependent on the modification or, respectively, fine structure of the layer. Alternatively or additionally, the contrast layer can differ from the cover layer in color or, respectively, differently colored metals can be employed for the layers.

[0009] However, other materials can be selected for the contrast layer, for example lacquer layers and, in particular, colored lacquer layers, especially lacquer layers colored

black. In general, it is advantageous when the contrast layer exhibits a different color compared to the metal layer or, in particular, is a black layer.

[0010] Purely metallic layer combinations generated on top of one another wherein a good optical contrast can be generated by laser labeling and that can be serially applied and, in particular, with the same apparatus or a similar apparatus are, for:

[0011] a) copper/bright nickel/black nickel

[0012] b) bright copper/nickel/black nickel

[0013] c) copper/nickel (matte)/nickel (gray)

[0014] d) copper/aluminum/anodized aluminum

[0015] These layer combinations can be additionally applied over the metallic cover layer. One or two metal layers of said layer sequences, however, can also form the cover layer or co-assume functional tasks of the cover layer.

[0016] Preferred layer combinations are those that comprise two different modifications of one and the same metal. In particular, these are produced by means of different manufacturing conditions. Given application of the metallic layers by sputtering, currentless deposition or galvanic deposition, for example, the composition or the corresponding optical layer properties can be set by varying the method parameters or deposition conditions.

[0017] The following metal/metal combinations, which are also distinguished by different metal coloration, are layer sequences that can be serially applied and comprise a metal layer (cover layer, too), that develop an optical contrast relative to one another and that can be labeled or, respectively, eroded with a laser:

[0018] e) nickel/gold

[0019] f) copper/nickel

[0020] g) copper/aluminum

[0021] h) copper/tin

[0022] i) copper/silver

[0023] The same deposition conditions are preferred for these differently colored metal layer combinations, whereof at least the lower layer can be the metallic cover layer or part of the metallic cover layer. Even though the contrast is produced here merely by means of differently colored metal layers or, respectively, the metal layer regions remaining after the laser labeling, a contrast in reflection can also be produced in addition to the contrast in color. It is thereby preferred when the upper layer (contrast layer) has poor reflectivity, but the lower layer that can be uncovered by laser labeling comprises good reflective properties.

[0024] An electrophoretic process is also suitable for applying a contrast layer composed of lacquer and, in particular, of black lacquer. A number of different lacquers are suitable for this, no or few demands other than the contrast having to be made of their material or, respectively, composition. However, it is also possible to print the contrast layer comprising a lacquer on, to dribble it on or to cast it.

[0025] The invention encounters advantageous application in components that comprise or require a metallic cover

layer as functional layer. For example, such a metallic cover layer can be a metallic cap. However, the metallic cover layer can also be a metallic housing or a part thereof in which an arbitrary component is arranged. Metallic cover layers are also particularly employed as shielding layers against electromagnetic radiation. Such a shielding can be required in order to prevent the emission of electromagnetic radiation from the component itself. However, a component is also possible that comprises a metallic cover layer that serves the purpose of shielding against electromagnetic radiation acting from the outside, particularly when the component is sensitive to the electromagnetic radiation. The components are therefore preferably components operated at high-frequency, particularly surface-wave components for the RF range.

[0026] The invention is explained in greater detail below on the basis of an exemplary embodiment and the two Figures appertaining thereto.

[0027] FIG. 1 shows a schematic crossection of components applied on a carrier with a multi-layer metallization;

[0028] FIG. 2 shows a schematic crossection of a labeling produced in the multi-layer metallization.

[0029] Exemplary Embodiment:

[0030] FIG. 1: The preferred application of the invention is given surface-wave components, particularly surface-wave filters that are applied on base substrates **2** in flip-chip technology. The piezoelectric component substrate **1** that carries the active component structure **6** is thereby connected face-down to the panel **2** via suitable solder connections **5**, particularly via bumps, so that the component structures are arranged protected between component substrate and panel at a clear distance from the latter. Preferably, a plurality of components are thereby applied on one panel and only separated after the completion of all cover layers. As shown, the active component structures **6** can also be additionally covered with a cover cap **7** that is generated directly on the surface of the component substrate **1** (chip) in an integrated process called PROTEC by the assignee. This leaves a clear cavity over the component structures that mechanically protects it during the process.

[0031] The bumps **5** connect the terminal pads **9** on the chip **1**, which are electrically conductively connected to the active component structures **6**, to the under-bump metallization on the base **2**. An electrically conductive connection to the terminal metallizations **10** on the underside of the panel **2** is produced via through-contactings **3** in the panel; the assistance thereof makes it possible to connect the component to, for example, a circuit in SMD structure that is produced on a printed circuit board or a module. The panel is fashioned of plastic or ceramic and is preferably two-layer. This creates a metallization level between the layers, so that interconnects can be laid without intersecting. Moreover, this allows through-contactings **3** that are laterally offset relative to one another, these being capable of being manufactured hermetically tight in contrast to through-contactings that lead through the panel **2** on a straight line.

[0032] For shielding from electromagnetic radiation, a metallic layer that comprises a plurality of layers **11**, **12**, **13**, **14** here is applied such on the back side of the component substrate that it terminates hermetically tight relative to the panel **2** and thus hermetically seals the entire component. To

this end, an under-filler **15** can be applied as seal in a previous step, said under-filler **15** annularly surrounding the component substrate **1** and closing the clearance between component substrate **1** and panel **2** at least in the outer region of the component substrate (see FIG. 1). The under-filler **15** can be produced by applying and curing a liquid sealing compound, particularly a lacquer or resin. For sealing, however, it is also possible to apply a plastic film, metal foil or laminate foil (not shown in the Figure) that lies tightly against the component and the base substrate.

[0033] The metallic cover layer can now be applied on the component substrate or, potentially, on the seal by means of foil. For, this can ensue in the form of a metallic foil. However, the metallic layer can also be the outer layer of a multi-layer laminate foil that is utilized for sealing the component. It is also possible, however, to produce the metallic cover layer by metallization and subsequent galvanic reinforcement. This has the advantage that the contrast layer can be generated in the same way immediately thereafter, preferably as further metallic layer.

[0034] To that end, the surface to be metallized (back side of the chip **1**, surface of the under-filler **15** and exposed surface of the panel **2** next to the applied chip **1**) is first activated, for example with PdCl_2 solution at slightly elevated temperature. As first layer, a chemical metallization is then deposited currentless on the surface activated in this way, for example an approximately 2-3 μm thick copper layer **11** in a highly alkaline, chemical copper bath.

[0035] The copper layer **11** is subsequently galvanically reinforced, for example with a further copper layer **12** in an acidic copper bath at room temperature. As passivation layer, a nickel layer **13** is now deposited thereover in an acidic matte nickel bath, this representing a partial layer for the contrast of the later labeling. As contrast layer belonging thereto, an approximately 0.3 μm thin black nickel-plating is then produced thereover in an acidic black nickel bath.

[0036] FIG. 2: By means of selective exposure with a laser, for example an NdYAG laser, a part of the contrast layer **14** is now selectively removed, this being promoted by the high absorption of the dark, black nickel layer. The surface of the metallically bright nickel layer **13** now appears in the regions uncovered in this way and forms a highly visible contrast together with the remaining layer regions of the black nickel layer **14**.

[0037] As stated, the invention is advantageously utilized given components that are applied and enveloped according to the method called CSSP (Chip Sized SAW Package) by the assignee. In contrast to traditional technique, the component substrate **1** applied on a panel **2** by means of flip-chip technology comprises essentially the same dimensions as the panel **2** and therefore enables a further miniaturization of the component or, respectively, of the component package. A plurality of components applied in common on a panel **2** and inventively covered are subsequently separated, for example by sawing at a parting location **16** between the soldered-on component substrates (see FIG. 1).

[0038] Of course, the invention is not limited to the employment given SAW components. However, it is preferably employed for miniaturized components that do not

enable a traditional labeling by means of printing because of the slight available surface and wherein a direct laser labeling is not possible due to the metallic cover layer or can only be produced with poor contrast.

1. Component having a metallic cover layer (11, 12, 13), whereby at least one further contrast layer (14) is arranged over the metallic cover layer, said at least one further contrast layer (14) producing an optical contrast with the metallic cover layer and being capable of being eroded by means of a laser for producing a labeling.

2. Component according to claim 1, whereby the contrast layer (14) is a metal layer.

3. Component according to claim 2, whereby the optical contrast is achieved in that the cover layer (13) is a reflective layer and the contrast layer (14) is a matte layer or vice versa.

4. Component according to one of the claims 1-3, whereby the optical contrast is achieved in that cover layer (13) and contrast layer (14) are differently colored.

5. Component according to one of the claims 1-4, whereby the contrast layer (14) is a black layer and the cover layer (13) is metallically bright.

6. Component according to one of the claims 1-5, whereby the contrast layer (14) is a black nickel layer.

7. Component according to one of the claims 1-5, whereby the contrast layer (14) is an electrophoretically applied lacquer layer, a cast-on glob top compound or a printed-on lacquer layer.

8. Component according to one of the claims 1-6, whereby the contrast layer (14) is a further metal layer that is colored differently compared to the cover layer (13).

9. Component according to claim 8, whereby the combination of cover layer (13) and contrast layer (14) comprises one of the following material combinations: Ni/Au; Cu/Ni; Cu/Al; Cu/Sn; Cu/Au.

10. Component according to one of the claims 1-9 provided with at least one contrast layer (14) over the metallic cover layer (13), given [sic] regions (17) of the contrast layer are lifted off with a laser labeling while uncovering the cover layer (13).

11. Component according to claim 10 fashioned as a SAW component with an RF-shielding cover layer (11, 12, 13).

12. Component according to claim 11 that is secured on a panel (2) in flip-chip technique, and whereby the metallic cover layer (13) is applied on the back side of the component (1) and hermetically closes this off from the panel (2).

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