Description

Field of the Invention

This invention is concerned with apparatus for and process of surface mount assembly of devices using AdCon interconnections.

Background of the Invention

Electrically conductive adhesives are widely used in the electronics industry. Important applications include die-attach and assembly of printed wiring boards (PWBs). An example of a device, 2, with a quad arrangement of leads, 3, surface mounted on a PWB, 4, to a corresponding plurality of conductor pads, 5, which, in turn, are connected to conductors, 6, on the PWB forming a part of a larger assembly, 1, is shown schematically in FIG. 1. As device dimensions continue to shrink, the numbers of leads on devices to be connected to the PWBs continue to increase and the distance between centers of adjacent leads or pads (known as a "pitch") continues to decrease, it becomes more difficult to accurately place isotropically conductive adhesives without shorting adjacent leads. An alternative approach is to use anisotropically conductive adhesives which conduct only in the direction perpendicular to the board (z-direction).

Anisotropically conductive adhesives, hereinafter called AdCons (for Adhesive Connectors), is a class of electrically conductive adhesive materials formulated on the "bridging" concept. The materials are prepared by dispersing electrically conductive particles in an insulating polymer matrix forming an adhesive composite. Typically, the adhesive composite is applied to the surface of a PWB by stencil printing, screen-printing or laminating a film of the conductive adhesive. A schematic representation of a portion of PWB, 4, with conductor pads 5, a region of AdCon, 7, on the PWB and a device 2 with leads 3 to be connected to the conductor pads, is shown in FIG. 2. After the device is placed onto the PWB and a placement force displaces the AdCon from between the conductor pads on the PWB substrate and the leads on the device, a layer of AdCon with a thickness of a single particle remains between each lead and conductor pad, as is shown schematically in FIG. 3. Individual particles span the gap between the device and PWB and form an electrical interconnection. Similarly, semiconductor chips with conductive pads may be surface mounted on the PWB.

In the past, the formation of AdCon interconnections was typically conducted via serial processes where each package was aligned, placed under pressure, and cured individually in a curing oven. Examples of such processing may be seen from U.S. Patent 4,667,401 issued on May 26, 1987 and U.S. Patent 4,868,637 issued on September 19, 1989, both to James R. Clements et al. or from an article by Brian Sun "The Paste Connector' - Vertically Conductive Adhesive", Connection Technology, August 1988, pp. 31-32. However, this type of processing leads to an inadequate control of applied pressure which could vary from insufficient with formation of non-conducting joints to excessive with resultant damage of leads and interconnections. These processes were difficult to implement both for high input/output (I/O) surface-mount packages and for very small chips, not only because of their low throughput, but also because the assembly processes require coplanarity of the PWB, the package, and an assembly implement. Non-planarity in the system can lead to problems with yield and reliability performance. Furthermore, very small semiconductor chips need an application of high forces per small areas, without the danger of damaging the chips. Therefore, there is a need for an efficient manner for overcoming the above-noted problems, including a need for a process of applying a pressure uniformly across a device or devices of differing dimensions and heights, as well as for an apparatus for implementing the process.

Summary of the Invention

An apparatus according to the present invention is defined in claim 1 and a process according to the invention is defined in claim 13. Such apparatus and method, e.g. an apparatus for and a process of batch assembly of sundry leaded or padded devices, encapsulated and non-encapsulated, onto a printed wiring board (PWB), exhibits significant improvements in both manufacturability and reliability. In an embodiment of the invention a pressure frame assembly apparatus permits an application of uniformly distributed pressures to a variety of leaded packages and padded semiconductor chips during cure of AdCons, and leads to the reduction of variations in initial interconnection resistance, and thereby to the enhancement of the reliability of AdCon interconnections. The pressures are applied to the devices by an external application of a fluid under pressure to a flexible, resiliently stretchable membrane which conformably envelops outlines of the devices and adjacent areas of the PWB. The external application of pressure enhances thermal conductivity needed for curing the AdCon, increases the range of processing parameters usable for this technique and reduces assembly times. Assembly yields of 100% were observed for a variety of surface mounted packages indicating that the system will be highly reliable.

Brief Description of the Drawings

FIG. 1 is a schematic perspective representation of a portion of a PWB and of a quad device sur-

face-mounted on the PWB;

FIG. 2 is a schematic representation of a section of a PWB with a thin layer of AdCon thereon and a leaded conductive element prior to the assembly;

FIG. 3 is a schematic representation of the arrangement shown in FIG. 2 but with conductive elements (pads) on the PWB in electrical contact with leads of the device via conductive particles of the AdCon after an application of pressure;

FIG. 4 is a frontal schematic exploded view of a cross-section of the pressure frame apparatus used for the batch assembly of AdCon interconnections;

FIG. 5 is a frontal schematic view of a cross-section of the pressure frame apparatus of FIG. 4 but shown in a closed, operating position;

FIG. 6 is a schematic perspective exploded view of the apparatus shown in FIG. 4;

FIG. 7 is a schematic perspective view of the apparatus shown in FIG. 5;

FIG 8 is a schematic perspective representation of a portion of a PWB with a quad device surface mounted on the PWB and a cable pigtail connection to the device.

FIG. 9 is a schematic perspective view of the apparatus shown in FIG. 6 including a cable pigtail connection.

Detailed Description

The assembly of electronic circuits with electrically anisotropic conductive adhesives (AdCons) versus the solder technology offers numerous advantages for the manufacture of PWBs as well as for the effect on the environment. Low temperatures required to cure the adhesives minimize damage, both thermal and physical, to packages and PWBs. Adhesive systems permit the assembly of fine pitch components without the formation of solder shorts or insufficients, and lead to a reduced cost assembly processing. Environmentally, anisotropically conductive adhesives eliminate the need for cleaning flux residues with environmentally harmful chemicals, such as chlorofluorocarbons (CFCs), and reduce worker exposures to lead from molten wave solder baths or reflow ovens.

The apparatus for practicing the invention is schematically represented in FIGs. 4 and 5. Corresponding perspective views of the apparatus are also shown in FIGs. 6 and 7, respectively. For reasons of clarity the elements of the apparatus and the devices are not drawn to scale. The apparatus, shown in an exploded view in FIG. 4 and generally denoted by numeral 11, includes a base, 12, a spacer, 13, a membrane, 14, and a lid, 15, provided with an inlet, 16, for introducing a suitable fluid, such as air, under pressure on top of cover 14. Membrane 14 is of flexible, resiliently stretchable material, such as polysiloxane rubber; secured at the periphery between the spacer and the lid. When subjected to pressure by introduction of fluid into the restricted volume, bounded by the membrane and the lid, the membrane compliably conforms to the outlines of the surfaces of devices, leads and adjacent surfaces of the PWB on the base 12. Care should be taken that the membrane, prior to the application of the pressure, evenly spans the space above the devices, preferably in a taut manner, without kinks and wrinkles which could affect the conformity of the cover with the PWB and devices. Spacer 13 is provided with at least one exhaust port 18, permitting expulsion of air from beneath cover 14. Spacer 13 is provided as a removable unit, primarily for the purposes of facilitating cleaning of floor, 19, of base 12. However, spacer 13 may be secured to base 12 either permanently or removably. A grid (not shown) may be provided, optionally, on or in the floor, 19 of base 12. The grid could be in the form of a screen or an array of rods on the floor or a grating formed in or on the floor of the base, and others. The main purpose of the grid is to reduce the possibility of presence of air pockets between the bottom of the PWB and the floor of the base, and to facilitate removal of the PWBs from the base after the application of pressure and heat.

Introduction of the fluid under pressure leads to a tendency for component parts of apparatus, 11, e.g. base 12 and lid 15, to separate each from another. Therefore, the apparatus should be provided with some means to keep the parts together. The apparatus may be held together by means of clamps or bolts or some other securing means. However, these may be cumbersome to use and assemble, and may present a danger of failure. A viable alternative could be the use of a simple press, such as a bookbinder's press, operable in a suitable manner, e.g. by means of a vertical screw or a lever. A more viable alternative would be the use of an industrial type of a press, such as a laminating press.

In the preferred embodiment, apparatus 11 is positionable between an upper and a lower platens 20 and 21, respectively, of a typical laminating press (not shown). The pressure exhibited by the press by the press transversely of the apparatus should be sufficient to keep parts of the apparatus together and to prevent leakage of the fluid between the membrane and the lid, but not so great as to damage portions of membrane 14 located between adjacent portions of the spacer and the lid. Base 12, spacer 13 and the flexible membrane 14 are removable from the press for the purposes of placing on the base articles to be processed and removing the processed articles. Lid 15 may be also removable from the press along with the rest of the apparatus. Alternatively, lid 15 may be secured to and shall be movable vertically with upper platen 20 of the press. Also, base 12 may be secured to lower platen 21. In the preferred em-

bodiment, spacer 13 is removable from base 12; however, spacer 13 may be secured on the base. Alternatively, spacer 13 may be attached to upper platen 20 and may be moved vertically with the lid. In the latter instance, arrangements should be made for securing membrane 14 between the spacer and the lid or for being capable of replacing the membrane as needed. This could necessitate attachment of spacer 13 removably to the lid.

The size of apparatus 11 may be sufficient to accommodate only one PWB. Alternatively, it may be of a size capable of accommodating several PWBs or PWB sheets which are each a multiple of several standard PWB's in size, and may be limited only by the size of the laminating press.

In operation, an assembly of a PWB, AdCon on the contact pads of the PWB, and at least one device (or semiconductor chip) with leads (or pads) in contact with the AdCon is placed onto floor 19 of base 12, spacer 13 is placed onto the peripheral section of base 12, membrane 14 is placed onto the spacer 13 enclosing a cavity formed by the base and the spacer, and lid 15 is placed over the membrane 14 securing the peripheral area of the membrane between the spacer and the lid. Thereafter apparatus 11 is placed onto lower platen 21, and the press is activated to bring platen 20 in contact with the lid. A suitable fluid, such as air, under pressure is introduced on top of membrane 14 via inlet 16, forcing cover 14 in conforming contact with the device or devices and with exposed upper surface of the PWB and of base 12. The pressure is preselected to force the devices toward the PWB so as to displace an excess of the adhesive from between contacting surfaces of the leads or pads 3 on the devices and pads 5 on the PWB leaving a thin adhesive layer in a thickness of a single particle, with particles in the adhesive layer forming an electrical connection between the contacting surfaces. However, the pressure should not be so excessive as to cause any damage to the device, e.g. to flatten, bend or even break off the leads.

The fluid is applied onto membrane 14 via inlet 16 connected to a suitable source (not shown) of pressurized fluid, e.g. air, forcing the membrane toward the PWB and devices thereon. The pressure exerted by the membrane onto the devices should only be sufficient to bring the leads (or pads) in contact with the metal particles in the AdCon so as to establish continuous conductive paths between the leads (or pads) of the device and the metallizations on the PWB without causing any damage to the assembly. Commercially available air compressor capable of providing pressure required for the bonding purpose, would be useful as the source of air pressure. A fluid pressure within a range of from 5 to 500 psi (1 psi = $6.89476 \cdot 10^3$ Pa) could be applied to the membrane. The actual pressure acting on the devices via the membrane is somewhat greater than the applied pressure being a combination of the pressure due to the applied pressure and due to forces exhibited by stretching of the membrane. Typically fluid pressures ranging from 5 and 25 psi, preferably 15 psi (1 psi = $6.89476 \cdot 10^3$ Pa), are sufficient for most of IC package applications. An exception could be extremely small packages, such as non-encapsulated semiconductor chips, e.g. 1/8th an inch square or smaller, which may require application of higher pressures e.g. of the order of 200-300 psi (1 psi = $6.89476 \cdot 10^3$ Pa).

In an exemplary embodiment, the polymer matrix for the AdCon used for these experiments was prepared from diglycidyl ether of bisphenol F (Dainippon Ink and Chemical Co., Epiclon 830®). A fumed silica thixotrope (Cabot, TS-720) was dispersed in the epoxy resin with a Waring® blender at a concentration of 5 parts per hundred resin (phr). Thixotrope concentrations ranging from 1 to 10 parts per hundred resin may be useful. To aliquots of this mixture, 10 phr of a 2-ethyl,4-methylimidazole curing agent (Pacific Anchor Chemical, EMI-24) was added along with conductive particles. For the successful implementation of AdCon, the concentration of metal particles must be controlled such that a sufficient number of particles is present in the adhesive composite to assure reliable electrical conductivity between the PWB and the leads or pads of the device (z-direction), while electrical isolation is maintained between adjacent conductor pads and leads (x-y direction). Actually, one should strive for such required volume concentration of metallic particles in the adhesive composite which will provide a maximum amount of conductive particles without causing any shorts between adjacent leads 3 or adjacent conductor pads 5. In addition, adequate adhesive performance is necessary to maintain a mechanically robust interconnection. The formulations were mixed by hand and degassed under vacuum (15 micrometers of Hg) for 30 minutes before use. In the exemplary embodiment, the particles were silver plated glass spheres from 8 to 20 μm in size with an average diameter of 14 μm (obtainable from Potters Industries). They were added in an amount of from 10 to 15 volume % (26 to 32 wt. %), preferably 12.5 volume % (29 wt. %).

Assembly of packages on test PWBs was achieved by following a multistep process. The AdCon was mixed, degassed and stenciled onto a PWB in a thickness of about 2 mils using a doctor blade and shims or in a thickness of about 5 mils by means of a manually operated stencil printer (Henry Mann AP-810). Some of the packages were placed onto the stenciled PWBs manually and some using an appropriate tool (e.g. Manix or a Single Site Solder Machine or [SSSM]). Assembled boards were placed into apparatus 11 which was then placed between platens 20 and 21 where the adhesive interconnection was cured under heat and pressure as illustrated in FIG. 5.

The PWB is heated primarily from the bottom of base 12 at a temperature ranging from 100 to 350 °C, preferably 125 °C. Higher temperatures may be useful depending on the components, adhesive matrix formulations, and cure speed requirements. Heat may be supplied in a variety of ways, such as a) hot plates positioned between base 12 and lower platen, 21; b) heating coils imbedded in the base; or c) suitable heating means provided in the lower platen, e.g. heating coils, electrical, hot water or steam heating to provide heat within the desired range. Additional heating may be provided from the top of the apparatus in the manner similar to that for heating the bottom portion of the apparatus. However, the overhead heating need to be only a fraction of that needed for the bottom heating and is primarily to avoid cooling of base 12 and lower platen 21 by parts of the apparatus, e.g. lid 15 and upper platen 20, so as to avoid increase in the curing time. The overhead heating temperature may range from 30 to 350 degreesC, and is preferably 55 °C. Alternatively, the heating arrangement may be reversed, with the higher preferred temperatures being applied from above and the lower from below apparatus 11.

Pressure is applied to the assembly on the base by means of flexible stretchable membrane 14 positioned over the cavity formed by base 12 and spacer 13. The pressure exerted by the fluid onto membrane 14 stretches the membrane and forces it into a conformable contact with the packages. The membrane should be sufficiently stretchable to conform under pressure about the individual package dimensions, thus insuring uniform pressure application in the direction normal to the PWB. The member should be of such resilient material as to permit the member to return to its original unstretched position upon removal of forces applied by the fluid. A wire screen, used as a grid separating the PWB from the heated base, prevents the membrane from sealing off access to exhaust port 18 in spacer 13. Cure times of from 30 seconds to 60 minutes, with 2 to 4 minutes being average, were used for each assembly curing operation.

The versatility of the above apparatus was tested using devices with a variety of leads or connections. These included 100 two-leaded discrete resistors, 12 14-leaded Small Outline Integrated Circuits (SOICs) with 50 mil pitch solder plated gull-wing leads, and 45 132-leaded daisy-chained Plastic Quad Flat Packages (PQFPs) with 25 mil pitch solder plated gull-wing leads (a total of 3,148 interconnections). PWBs used were fire resistant grade 4 (FR-4) boards made of glass fiber reinforced epoxy, clad with copper foil and coated with solder.

The resistors, SOICs and PQFPs, assembled and cured as described above, were tested for shorts and interconnections. Assembly yields of 100% of viable interconnections were observed for all packages. A viable interconnection was defined as one having a resistance value of < 100 mΩ for two-leaded resistors and 14-leaded SOICs and < 1 Ω (including resistance contributions from the PWB and the internal package daisy chain) per each 16 leads for the 132-leaded PQFPs. No shorts were observed between any of the adjacent leads and pads.

The invention may be used for connection of a flexible flat cable (or cable pigtail) to conductors on a PWB. For example, as shown in FIGs. 8 and 9, an end portion of a flat cable, 17, provided with contacts (not shown) may be connected to conductors 6 on a PWB by means of AdCon deposited on the PWB. In FIG. 8 is shown such a connection to a single device, while in FIG. 9 the cable is connected to at least two devices. When the cable is of such length as to extend beyond the perimeter of apparatus 11, spacer 13 would be provided with an elongated aperture 22, in place of or in addition to exhaust ports 18, permitting the cable to extend through aperture 22 beyond apparatus 11.

Claims

1. An apparatus for surface mounting devices, which comprises

   a base (12),

   a spacer (13) positioned on a peripheral portion of the base and defining with the base a cavity into which is placed an assembly of a printed wiring board, electrically anisotrop conductive adhesive (6) and at least one device (2) having leads (3) or pads which are to be electroconductively interconnected via the electrically anisotrop conductive adhesive to pads (5) or conductors on the printed wiring board (4),

   a flexible resiliently stretchable membrane (14) enclosing the cavity and peripherally engaging the spacer, and

   a solid lid (15) overlying the membrane and securing peripherally the membrane between the spacer and the peripheral region of the lid, said lid being provided with an inlet (16) for introducing a fluid under pressure between the lid and the membrane.

2. The apparatus of claim 1, in which securing means is provided for keeping parts of the apparatus from separating under the influence of the pressurized fluid.

3. The apparatus of claim 2, in which said securing means comprises a press device having platens (20) for keeping parts of the apparatus from separating under pressure applied on top of the membrane.

4. The apparatus of claim 1 in which the material of

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The PWB is heated primarily from the bottom of base 12 at a temperature ranging from 100 to 350 °C, preferably 125 °C. Higher temperatures may be useful depending on the components, adhesive matrix formulations, and cure speed requirements. Heat may be supplied in a variety of ways, such as a) hot plates positioned between base 12 and lower platen, 21; b) heating coils imbedded in the base; or c) suitable heating means provided in the lower platen, e.g. heating coils, electrical, hot water or steam heating to provide heat within the desired range. Additional heating may be provided from the top of the apparatus in the manner similar to that for heating the bottom portion of the apparatus. However, the overhead heating need to be only a fraction of that needed for the bottom heating and is primarily to avoid cooling of base 12 and lower platen 21 by parts of the apparatus, e.g. lid 15 and upper platen 20, so as to avoid increase in the curing time. The overhead heating temperature may range from 30 to 350 degreesC, and is preferably 55 °C. Alternatively, the heating arrangement may be reversed, with the higher preferred temperatures being applied from above and the lower from below apparatus 11.

Pressure is applied to the assembly on the base by means of flexible stretchable membrane 14 positioned over the cavity formed by base 12 and spacer 13. The pressure exerted by the fluid onto membrane 14 stretches the membrane and forces it into a conformable contact with the packages. The membrane should be sufficiently stretchable to conform under pressure about the individual package dimensions, thus insuring uniform pressure application in the direction normal to the PWB. The member should be of such resilient material as to permit the member to return to its original unstretched position upon removal of forces applied by the fluid. A wire screen, used as a grid separating the PWB from the heated base, prevents the membrane from sealing off access to exhaust port 18 in spacer 13. Cure times of from 30 seconds to 60 minutes, with 2 to 4 minutes being average, were used for each assembly curing operation.

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The resistors, SOICs and PQFPs, assembled and cured as described above, were tested for shorts and interconnections. Assembly yields of 100% of viable interconnections were observed for all packages. A viable interconnection was defined as one having a resistance value of < 100 mΩ for two-leaded resistors and 14-leaded SOICs and < 1 Ω (including resistance contributions from the PWB and the internal package daisy chain) per each 16 leads for the 132-leaded PQFPs. No shorts were observed between any of the adjacent leads and pads.

The invention may be used for connection of a flexible flat cable (or cable pigtail) to conductors on a PWB. For example, as shown in FIGs. 8 and 9, an end portion of a flat cable, 17, provided with contacts (not shown) may be connected to conductors 6 on a PWB by means of AdCon deposited on the PWB. In FIG. 8 is shown such a connection to a single device, while in FIG. 9 the cable is connected to at least two devices. When the cable is of such length as to extend beyond the perimeter of apparatus 11, spacer 13 would be provided with an elongated aperture 22, in place of or in addition to exhaust ports 18, permitting the cable to extend through aperture 22 beyond apparatus 11.

Claims

1. An apparatus for surface mounting devices, which comprises

   a base (12),

   a spacer (13) positioned on a peripheral portion of the base and defining with the base a cavity into which is placed an assembly of a printed wiring board, electrically anisotrop conductive adhesive (6) and at least one device (2) having leads (3) or pads which are to be electroconductively interconnected via the electrically anisotrop conductive adhesive to pads (5) or conductors on the printed wiring board (4),

   a flexible resiliently stretchable membrane (14) enclosing the cavity and peripherally engaging the spacer, and

   a solid lid (15) overlying the membrane and securing peripherally the membrane between the spacer and the peripheral region of the lid, said lid being provided with an inlet (16) for introducing a fluid under pressure between the lid and the membrane.

2. The apparatus of claim 1, in which securing means is provided for keeping parts of the apparatus from separating under the influence of the pressurized fluid.

3. The apparatus of claim 2, in which said securing means comprises a press device having platens (20) for keeping parts of the apparatus from separating under pressure applied on top of the membrane.

4. The apparatus of claim 1 in which the material of

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said flexible resilient membrane comprises polysiloxane.

5. The apparatus of claim 1 in which heating means are provided for heating at least the base to expedite the curing of the electrically anisotrop conductive adhesive.

6. The apparatus of claim 1, in which the heating mans are provided for heating the base to a temperature of from 100 to 350 °C.

7. The apparatus of claim 6, in which said temperature is about 125 °C.

8. The apparatus of claim 1, in which heating means are provided for heating the lid to a temperature of from 30 to 350 °C.

9. The apparatus of claim 8, in which said lid heating temperature is about 55 °C.

10. The apparatus of claim 1, in which the fluid is supplied under pressure within a range of from $34.47 \cdot 10^3$ Pa to $34.47 \cdot 10^5$ Pa (5 to 500 psi).

11. The apparatus of claim 10, in which said pressure ranges from $34.47 \cdot 10^3$Pa to $172.37 \cdot 10^3$Pa (5 to 25 psi).

12. The apparatus of claim 1, in which said fluid comprises air.

13. A process for surface mounting at least one device having conductive leads or pads onto printed wiring boards, which comprises

applying electrically anisotrop conductive adhesive (6) over conductor pads (5) on the printed wiring board (4),

assembling at least one device (2) having conductive leads (3) or pads in contact with the electrically anisotrop conductive adhesive, the leads or pads on said at least one device being in aligned registration with conductor pads on the printed wiring board (4),

placing the assembly into a cavity defined by a base (12) and a spacer (13) positioned on a peripheral portion of the base,

enclosing the cavity with a membrane (14) of flexible resiliently stretchable material,

applying an evenly distributed fluid pressure on top of the membrane so as to stretch the membrane and to force it into a comformable contact with the said at least one device, and

curing the electrically anisotrop conductive adhesive so as to retain conductors on the devices and on the printed wiring board (4) in electrically conductive interconnection.

14. The method of claim 13 in which said membrane comprises polysiloxane.

15. The method of claim 13 in which said curing is expedited by heating the assembly.

16. The method of claim 15, in which said heating is conducted by heating the assembly from the bottom at a temperature ranging from 100 to 350 °C.

17. The method of claim 16, in which said temperature is about 125 °C.

18. The method of claim 15, in which said heating is additionally conducted by heating the assembly from above at a temperature ranging from 30 to 350°C.

19. The method of claim 18, in which said temperature is about 55 °C.

20. The method of claim 13, in which said fluid pressure is applied with a pressure ranging from $34.47 \cdot 10^3$ Pa to $34.47 \cdot 10^5$ Pa (5 to 500 psi).

21. The method of claim 20, in which said pressure ranges from $34.47 \cdot 10^3$ Pa to $172.37 \cdot 10^3$ Pa (5 to 25 psi).

Patentansprüche

1. Vorrichtung zur Oberflächenmontage von Bauteilen, umfassend:
eine Basis (12), ein Abstandsstück (13), das an einem umfänglichen Abschnitt der Basis angeordnet ist und mit der Basis einen Raum definiert, in welchem eine Baugruppe einer gedruckten Schaltungsplatine angeordnet wird, wobei ein elektrisch anisotrop leitfähiger Kleber (6) und wenigstens ein Bauteil (2) Leitungen (3) oder Anschlußflächen hat, die elektroleitfähig durch den elektrisch anisotrop leitfähigen Kleber an die Anschlußfläche (5) oder Leiter an der gedruckten Schaltungsplatine (4) angeschlossen werden,
eine elastisch dehnbare Membran (14), welche den Raum schließt und am Umfang mit dem Abstandsstück (13) in Kontakt steht, und einen festen Deckel (15), der über der Membran liegt und die Membran am Umfang zwischen dem Abstandsstück und dem umfänglichen Bereich des Deckels sichert, wobei der Deckel mit einem Einlaß (16) für das Einführen eines Fluids unter Druck zwischen den Deckel und die Membran versehen ist.

2. Vorrichtung nach Anspruch 1,
in welcher die Einrichtung zum Sichern bereitge-

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stellt ist, um Teile der Vorrichtung davon abzuhalten, sich unter dem Einfluß von unter Druck stehendem Fluid zu trennen.

3. Vorrichtung nach Anspruch 2, in welcher die Einrichtung zum Sichern eine Druckeinrichtung mit Platten (20) umfaßt, um Teile der Vorrichtung davon abzuhalten, sich unter auf das Obere der Membran aufgebrachtem Druck zu trennen.

4. Vorrichtung nach Anspruch 1, in welcher das Material der flexiblen elastischen Membran Polysiloxan umfaßt.

5. Vorrichtung nach Anspruch 1, bei welcher eine Heizeinrichtung bereitgestellt ist zum Erhitzen von wenigstens der Basis, um das Aushärten des elektrisch anisotrop leitenden Klebers zu fördern.

6. Vorrichtung nach Anspruch 1, in welcher die Heizeinrichtung bereitgestellt ist zum Heizen der Basis auf eine Temperatur von 100 bis 350°C.

7. Vorrichtung nach Anspruch 6, in welcher die Temperatur ungefähr 125°C beträgt.

8. Vorrichtung nach Anspruch 1, in welcher die Heizeinrichtung zum Erhitzen des Deckels auf eine Temperatur von 30 bis 350°C bereitgestellt ist.

9. Vorrichtung nach Anspruch 8, in welcher die Deckelheiztemperatur ungefähr 55°C beträgt.

10. Vorrichtung nach Anspruch 1, in welcher das Fluid unter Druck in einem Bereich von 34,47 x 10^3 Pa bis 34,47 x 10^5 Pa (5 bis 500 Psi) zugeführt wird.

11. Vorrichtung nach Anspruch 10, in welcher der Druck von 34,47 x 10^3 Pa bis 172,37 x 10^3 Pa (5 bis 25 Psi) reicht.

12. Vorrichtung nach Anspruch 1, in welcher das Fluid Luft umfaßt.

13. Verfahren zur Oberflächenmontage wenigstens eines Bauteils mit einer leitfähigen Leitung oder mit einer Anschlußfläche an gedruckte Schaltungsplatinen, umfassend:
das Aufbringen eines elektrisch anisotrop leitenden Klebers (6) über den Leiteranschlußflächen (5) an der gedruckten Schaltungsplatine (4), das Montieren wenigstens eines Bauteils (2) mit leitenden Leitungen (3) oder Anschlußflächen in Kontakt mit dem elektrisch anisotrop leitenden Kleber, wobei die Leitungen oder Anschlußflächen an dem wenigstens einen Bauteil in Ausrichtung zu den Leiteranschlußflächen an der gedruckten Schaltungsplatine (4) stehen,
Anordnen der Baugruppe in einem Raum, der definiert ist durch eine Basis (12) und ein Abstandsstück (13), das in einem umfänglichen Abschnitt an der Basis angeordnet ist,
Schließen des Raumes mit einer Membran (14) aus schmiegsamem, elastisch dehnbarem Material, Aufbringen eines gleich verteilten Fluiddrucks auf das Obere der Membran, um so die Membran zu dehnen und diese in einen gleichförmigen Kontakt mit dem wenigstens einen Bauteil zu zwingen, und
Härten des elektrisch anisotrop leitenden Klebers, um so Leiter an den Bauteilen und an der gedruckten Schaltungsplatine in elektrisch leitender Verbindung zu halten.

14. Verfahren nach Anspruch 13, in welchem die Membran Polysiloxan enthält.

15. Verfahren nach Anspruch 13, in welchem das Aushärten durch Heizen der Baugruppe gefördert wird.

16. Verfahren nach Anspruch 15, in welchem das Heizen durch Heizen der Baugruppe vom Boden her bei einer Temperatur im Bereich von 100 bis 350°C durchgeführt wird.

17. Verfahren nach Anspruch 16, in welchem die Temperatur ungefähr 125°C beträgt.

18. Verfahren nach Anspruch 15, in welchem das Heizen zusätzlich durch Heizen der Baugruppe von oben bei einer Temperatur im Bereich von 30 bis 350°C durchgeführt wird.

19. Verfahren nach Anspruch 18, in welchem die Temperatur ungefähr 55°C beträgt.

20. Verfahren nach Anspruch 13, in welchem der Fluiddruck mit einem Druck im Bereich von 34,47 x 10^3 Pa bis 34,47 x 10^5 Pa (5 bis 500 Psi) angelegt wird.

21. Verfahren nach Anspruch 20, bei welchem der Druck von 34,47 x 10^3 Pa bis 172,37 x 10^3 Pa (5 bis 25 Psi) reicht.

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Revendications

1. Un appareil pour le montage en surface de dispositifs, comprenant
une base (12),
une entretoise (13) placée sur une partie périphérique de la base et définissant avec la base une cavité à l'intérieur de laquelle est placé un assemblage d'une carte de circuit imprimé, d'un adhésif conducteur électriquement anisotrope (6) et d'au moins un dispositif (2) comportant des broches (3) ou des plages de connexion qui doivent être interconnectées de manière conductrice de l'électricité, par l'intermédiaire de l'adhésif conducteur électriquement anisotrope, à des plages de connexion (5) ou des conducteurs sur la carte de circuit imprimé (4),
une membrane flexible, extensible de façon élastique (14), fermant la cavité et venant en contact à sa périphérie avec l'entretoise, et
un couvercle rigide (15) recouvrent la membrane et fixant la membrane, à sa périphérie, entre l'entretoise et la région périphérique du couvercle, ce couvercle comportant un raccord d'entrée (16) pour introduire un fluide sous pression entre le couvercle et la membrane.

2. L'appareil de la revendication 1, dans lequel des moyens de fixation sont incorporés pour empêcher que des éléments de l'appareil ne se séparent sous l'influence du fluide sous pression.

3. L'appareil de la revendication 2, dans lequel les moyens de fixation comprennent un dispositif consistant en une presse, ayant des plateaux (20) pour empêcher que des éléments de l'appareil ne se séparent sous l'effet de la pression qui est appliquée au-dessus de la membrane.

4. L'appareil de la revendication 1, dans lequel la matière de la membrane flexible de façon élastique comprend du polysiloxane.

5. L'appareil de la revendication 1, dans lequel des moyens de chauffage sont incorporés pour chauffer au moins la base, de façon à accélérer la polymérisation de l'adhésif conducteur électriquement anisotrope.

6. L'appareil de la revendication 1, dans lequel les moyens de chauffage sont incorporés pour chauffer la base à une température de 100 à 350°C.

7. L'appareil de la revendication 6, dans lequel la température précitée est d'environ 125°C.

8. L'appareil de la revendication 1, dans lequel des moyens de chauffage sont incorporés pour chauffer le couvercle à une température de 30 à 350°C.

9. L'appareil de la revendication 8, dans lequel la température de chauffage du couvercle est d'environ 55°C.

10. L'appareil de la revendication 1, dans lequel le fluide est fourni sous une pression dans une plage allant de 34,47 x 10^3 Pa à 34,47 x 10^5 Pa (5 à 500 psi).

11. L'appareil de la revendication 10, dans lequel la pression est comprise dans une plage de 34,47 x 10^3 à 172,37 x 10^3 Pa (5 à 25 psi).

12. L'appareil de la revendication 1, dans lequel le fluide comprend de l'air.

13. Un procédé pour le montage en surface d'au moins un dispositif ayant des broches ou des plages de connexion conductrices, sur des cartes de circuits imprimés, comprenant les étapes suivantes : on applique un adhésif conducteur électriquement anisotrope (6) sur des plages de connexion conductrices (5) sur la carte de circuit imprimé (4),
on assemble au moins un dispositif ayant des plages de connexion ou des broches conductrices (3) en contact avec l'adhésif conducteur électriquement anisotrope, les broches ou les plages de connexion sur le ou les dispositifs étant alignées en coïncidence avec des plages de connexion conductrices sur la carte de circuit imprimé (4),
on place l'assemblage dans une cavité qui est définie par une base (12) et une entretoise (13) positionnée sur une partie périphérique de la base,
on ferme la cavité avec une membrane (14) d'une matière flexible et extensible de façon élastique,
on applique une pression de fluide uniformément répartie sur la surface supérieure de la membrane, de façon à étirer la membrane et à la forcer à venir en contact avec le ou les dispositifs, en se conformant à ceux-ci, et
on polymérise l'adhésif conducteur électriquement anisotrope, de façon à retenir des conducteurs sur les dispositifs et sur la carte de circuit imprimé (4) dans une condition d'interconnexion conductrice de l'électricité.

14. Le procédé de la revendication 13, dans lequel la membrane comprend du polysiloxane.

15. Le procédé de la revendication 13, dans lequel la

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polymérisation est accélérée par le chauffage de l'assemblage.

16. Le procédé de la revendication 15, dans lequel le chauffage est effectué en chauffant l'assemblage par le dessous à une température comprise dans une plage de 100 à 350°C.

17. Le procédé de la revendication 16, dans lequel la température est d'environ 125°C.

18. Le procédé de la revendication 15, dans lequel le chauffage est en outre effectué en chauffant l'assemblage par le dessus à une température comprise dans la plage de 30 a 350°C.

19. Le procédé de la revendication 18, dans lequel la température est d'environ 55°C.

20. Le procédé de la revendication 13, dans lequel la pression de fluide est appliquée dans une plage de pression allant de $34,47 \times 10^3$ Pa à $34,47 \times 10^5$ Pa (5 à 500 psi).

21. Le procédé de la revendication 20, dans lequel la pression est comprise dans une plage allant de $34,47 \times 10^3$ Pa à $172,37 \times 10^3$ Pa (5 à 25 psi).