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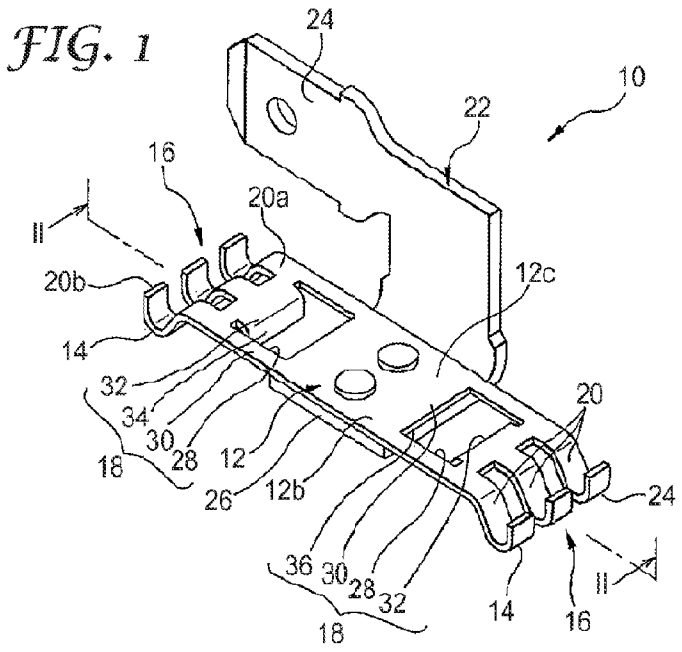

(57) **Abstract**: In the construction of a surface mounting type terminal mounted to an object surface via an adhesive, to secure sufficiently large mutual contact area of the solidified adhesive and the terminal irrespective of the viscosity of the adhesive or skill of workers. A terminal 10 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. The adhesive support portion 18 includes an anchoring section 30 having an opening 28 adapted to allow the adhesive to flow through the opening before the adhesive is solidified, and an outflow preventing section 32 arranged adjacent to the anchoring section 30. The outflow preventing section 32 includes a first wall 34 formed uprightly at the side of the first surface 12a of the base portion 12. The wall 34 restricts flow of the adhesive supplied to the anchoring section before the adhesive is solidified, and can prevent the adhesive before solidification from flowing out of the adhesive support portion 18.

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TERMINAL

Technical Field

The present invention relates to a terminal, and more particularly to a terminal mounted to a surface of an object.

Background

In a surface attachment type (or surface mount type) terminal that is mounted to a surface of an object and is connected to a conductor formed on the surface, the construction has been known in which the terminal is mounted via an adhesive to the surface of the object, and an electrical contact point of the terminal and the conductor on the surface of the object are connected to each other mainly under adhesive action of the adhesive.

For example, Patent Document 1 discloses a terminal mounting structure for mounting a terminal to a base plate having a conductor formed thereon. In Patent Document 1, there is a description that **"a** terminal 3 includes two fixed sections 31, a plurality of elastic sections 32 extending generally in parallel from one of the fixed sections to the other fixed section, and base plate contact sections 33 provided on the elastic sections 32 so as to be convex to the base plate I and electrically connected to the conductor **2.** The fixed section 31 are formed in a shape of generally flat plate, and a surface on the side of the base plate fixed firmly to the base plate 1 by joining means such as a double coated adhesive tape 4 or the like. The base plate contact section 33 of the terminal 3 is bonded via an adhesive 5 to the base plate 1 while it is in contact with the conductor 2 under repulsive force due to elastic deformation of the elastic sections **32."** and that **"a** terminal 303 includes a fixed section 331, a plurality of elastic section 332 extending in different directions (in mutually opposite directions in the example shown) from the fixed section 331, and base plate contact sections 333 provided on the elastic sections 332 so as to be convex to the base plate 302 and electrically connected to a conductor 302. The fixed section 331 is formed in a shape of generally flat plate, and a surface on the side of the base plate is firmly fixed to the base plate 301 by joining means such as a double coated adhesive tape 304 or the like. Also, the fixed section 331 is bonded via an adhesive 305 to the base plate 301 with the base plate contact section 333 of the terminal 303 in contact with the conductor 302 under the repulsive force due to elastic deformation of the elastic sections 332."

Patent Document 2 discloses a glass with a terminal wherein the terminal is bonded to the glass having silver print on the surface. In Patent Document 2, there is a description that "a terminal 14 is formed of two plates of different thickness, and includes a base portion 17 (having a thickness of, for example, 0.4 rom) with the lower surface bonded to the bonding layer 16 and a terminal portion 19 (having a thickness of, for example, 0.8 rom) formed uprightly from the base portion 17 with a female terminal portion 18 connected to a TV in the vehicle or the like", and that "the base portion 17 has

archshaped bending portions 21, 21, that are bent toward the silver print 12 at both ends, and the bonding layer 16 is composed of a first double coated adhesive tape 22, an adhesive 23, and a second double coated adhesive tape 24 arranged from left in the drawing along the longitudinal direction of the terminal 14. Reference numerals 26, 26 denote contact points at which the bending portions 21, 21 are brought into contact with the upper surface of the silver print 12. Thus, the terminal 14 is in contact with the upper surface of the silver print 12 at a plurality of contact points 26, 26."

Prior Art Documents

Patent Documents

Patent Document 1 Japanese Unexamined Patent Publication (Kokai) No. 2009-105036 (Paragraphs 0016, 0030)

Patent Document 2 International Patent Publication No. WO 2010/100961 (Paragraphs 0043, 0045)

Summary

In the construction wherein an electrical contact of a surface mounting type terminal and a conductor on a surface of an object are connected to each other mainly under the adhesive action of an adhesive, it is desirable, in order to maintain proper state of connection of the electrical contact to the conductor stably for a long period, to secure sufficiently large contact area of mutual contact of the solidified adhesive and the terminal irrespective of the viscosity of the adhesive and the skill of the workers.

In one aspect of the present invention, there is provided a terminal comprising a base portion having a first surface and a second surface, opposite to each other; a contact portion extending from the base portion, the contact portion provided with an electric contact point at a position beyond the first surface of the base portion; an adhesive support portion provided in the base portion separately from the contact portion, the adhesive support portion capable of supporting an adhesive for bonding the base portion to an object; the adhesive support portion comprising an anchoring section including an opening adapted to allow the adhesive to flow through the opening before the adhesive is solidified, the anchoring section capable of being engaged with and anchoring the adhesive penetrated through the opening after the adhesive is solidified; and an outflow preventing section arranged adjacent to the anchoring section, the outflow preventing section capable of restricting a flow of the adhesive supplied to the anchoring section before the adhesive is solidified, and preventing the adhesive from flowing out of the adhesive support portion before the adhesive is solidified; the outflow preventing section comprising a first wall bent L-shape configuration at a side of the first surface of the base portion and arranged between the contact portion and the opening.

In another aspect of the present invention, there is provided a terminal comprising a base portion having a first surface and a second surface, opposite to each other; a contact portion extending from the base portion, the contact portion provided with an electric contact point at a position beyond the first surface of the base portion; an adhesive support portion provided in the base portion separately from the contact portion, the adhesive support portion capable of supporting an adhesive for bonding the base portion to an object; the adhesive support portion comprising an anchoring section including an opening coplanar with the base portion and adapted to allow the adhesive to flow through the opening before the adhesive is solidified, the anchoring section capable of being engaged with and anchoring the adhesive penetrated through the opening after the adhesive is solidified; and an outflow preventing section arranged adjacent to the anchoring section, the outflow preventing section capable of restricting a flow of the adhesive supplied to the anchoring section before the adhesive is solidified, and preventing the adhesive from flowing out of the adhesive support portion before the adhesive is solidified; the outflow preventing section comprising a first wall formed uprightly at a side of the first surface of the base portion and arranged between the contact portion and the opening.

In the terminal according to one and the other aspects of the present invention, by providing an outflow preventing section in the adhesive support portion, it is possible to reduce the outflow (i.e., the loss) of liquid adhesive from the adhesive support portion to the outside. The first wall of the outflow preventing section is disposed between the contact portion and the opening at the side of the first surface of the base portion, so that, at the time of mounting the terminal to the surface of the object, it is possible to prevent the adhesive before solidification from flowing between the first surface of the base portion and the surface of the object and flowing out toward the contact portion. Therefore, by supplying minimum amount of required adhesive, the solidified adhesive in the shape of mushroom can be formed in shape and size sufficient to exhibit required anchoring force. Such an adhesive supplying operation ensures sufficiently large mutual contact area of the solidified adhesive and the terminal, and can be carried out reproducibly irrespective of the viscosity of the adhesive and the skill of the workers.

Brief Description of the Drawings

Fig. 1 is a perspective view showing a terminal according to a first embodiment of the present invention.

Fig. 2 is a sectional view taken along the line II-II of Fig. 1, showing an example of the procedure for mounting the terminal of Fig. 1 to a surface of an object, and showing the steps of (a) preparation for mounting, (b) provisional fixing and (c) bonding.

Fig. 3 is a perspective view showing a modification of the terminal of Fig. 1.

Fig. 4 is a view showing another modification of the terminal of Fig. 1, (a) in a perspective view, and (b) in a sectional view taken along the line IV-IV.

Fig. 5 is a perspective view showing a terminal according to a second embodiment of the present invention; (a) from the side of the upper surface, and (b) from the side of the lower surface.

Fig. 6 is a partial enlarged sectional view taken along the line VI-VI of Fig. 5, showing an example of the procedure for mounting the terminal of Fig. 5 to a surface of an object, and showing the steps of (a) provisional fixing and (b) bonding.

Fig. 7 is a perspective view showing a modification of the terminal of Fig. 5.

Fig. 8 is a perspective view showing another modification of the terminal of Fig. 5.

Fig. 9 is a perspective view showing a terminal according to a third embodiment of the present invention; (a) from the side of the upper surface, and (b) from the side of the lower surface.

Fig. 10 is a partial enlarged sectional view taken along the line x-x of Fig. 9, showing an example of the procedure for mounting the terminal of Fig. 9 to a surface of an object, and showing the steps of (a) provisional fixing and (b) bonding.

Fig. 11 is a perspective view showing a terminal according to a fourth embodiment of the present invention.

Fig. 12 is a perspective view showing a terminal according to a fifth embodiment of the present invention.

Fig. 13 is a view showing a terminal according to a sixth embodiment of the present invention, (a) in a perspective view, and (b) in a sectional view taken along the line XIII-XIII.

Fig. 14 is a view showing a terminal according to a seventh embodiment of the present invention, (a) in a perspective view, and (b) in a sectional view taken along the line XIV-XIV.

Fig. 15 is a view showing a terminal according to a eighth embodiment of the present invention, (a) in a perspective view, and (b) in a sectional view taken along the line XV-XV.

Detailed Description

The present invention will be described in detail below with reference to appended drawings showing embodiments thereof. Throughout the drawings, corresponding constituents are denoted by common reference numerals and symbols.

Fig. I is a view showing a terminal 10 according to a first embodiment of the present invention, and Fig. 2 is a view showing an example of procedure for mounting the terminal 10 to a surface of an object.

The terminal 10 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. The base portion 12 is an element in a shape of generally rectangular flat plate having a first surface (lower surface in the drawing) 12a and a second surface (upper surface in the drawing) 12b opposite to each other. As will be described later, the base portion 12 is fixed to a surface of

an object mainly via an adhesive and functions as a basic portion for positioning an electric contact point 14 of the contact portion 16 relative to a conductor formed on the surface of the object. The base portion as a whole may have suitable elasticity determined by its material, shape and size, etc.

In the terminal 10 shown, a pair of contact portions 16 is provided at both longitudinal ends of the base portion 12. Each contact portion 16 includes a plurality of (three in the drawing) arm portions 20 extending from the base portion 12. Each arm portion 20 is a cantilevered element with the basal end 20a connected to the base portion 12 and with the distal end 20b being a free end. The arm portion 20 has a generally U-shape that bends in the vicinity of the basal end 20a to extend in the direction (downward in the drawing) beyond the first surface 12a of the base portion 12, and reverses in the middle portion to extend in the opposite direction (upward in the drawing), and the outward bulging surface of the reversing region functions as the electric contact point 14. Thus, each contact portion 16 has a plurality of (three in the drawing) electric contact points 14 at positions beyond the first surface 12a of the base portion 12. Each arm portion 20 may have suitable elasticity determined by its material, shape and size, etc.

In the construction shown, the base portion 12 and the contact portion 16 are formed integrally in one unit from same electrically conductive material. For example, the base portion 12 and the contact portion 16 are formed from a single sheet metal material of a predetermined thickness by punching in a predetermined shape and bending integrally in one unit. It is also possible to form the base portion 12 and the contact portion 16 from mutually separate members and to join them to each other in a later process.

The terminal 10 may further include an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is an element in a shape of flat plate extending in the direction projecting from the second surface 12b (upward in the drawing) from the center region 12c of the base portion 12. At the distal end region of the electric wire connection portion 22, a distal end portion 24 capable of detachably connecting an external electric wire (not shown) thereto is formed. By connecting an external electric wire to the electric wire connection portion 22 of the terminal 10 mounted to a surface of an object, desired electric current can be supplied to the conductor on the surface of the object from the external electric wire.

In the construction shown, the electric wire connection portion 22 is formed from an electrically conductive material separately from the base portion 12 and the contact portion 16, and is joined to the center region 12c of the base portion 12 at an end region 26 opposite to the distal end portion 24 by a joining means such as calking or the like. The electric wire connection portion 22 may have various shapes and sizes not limited to the shape and size shown, provided that it does not hinder the above-described function of the base portion 12 and the contact portion 16.

In the terminal 10 shown, a pair of adhesive support portion 18 is respectively provided between the center region 12c of the base portion 12 and the contact portion 16 at both longitudinal ends. Each adhesive support portion 18 includes an anchoring section 30 having an opening 28 that allows the adhesive to flow through the opening before the adhesive is solidified, and an outflow preventing section

(or flow restricting section) 32 arranged adjacent to the anchoring section 30 and capable of restricting a flow of the adhesive supplied to the anchoring section 30 before the adhesive is solidified.

The opening 28 of the anchoring section 30 is formed to penetrate in the base portion 12 so as to have generally rectangular outline in a region between the center region 12c of the base portion 12 and one of the contact portion 16. The opening 28 has size sufficient to allow a liquid adhesive supplied to the adhesive support portion 18 to flow freely irrespective of the viscosity. The anchoring section 30 is composed of an annular region of the base portion 12 surrounding the opening 28. The anchoring section 30 functions to engage with the solidified adhesive that passes through the opening 28, so as to anchor the adhesive at predetermined position. Thus, the anchoring section 30 is configured by the predetermined annular region of the flat plate-like base portion 12, and the surface (the upper surface, in the drawing) of the anchoring section 30, which engages the bulging head of a solidified adhesive (described later), is disposed in the same plane as the second surface 12b of the base portion 12. Therefore, the opening 28 surrounded and defined by the anchoring section 30 is substantially coplanar with the base portion 12. The opening 28 and the anchoring section 30 can have various shapes and sizes not limited to the shape and size shown, as long as the adhesive for bonding the base portion 12 to an object can flow freely through the opening 28 before solidification and can be securely anchored by the anchoring section 30 after solidification.

The outflow preventing section 32 includes a first wall 34 formed uprightly at the side of the first surface 12a of the base portion 12. The wall 34 is arranged along the inner periphery of the opening 28 between the contact portion 16 and the opening 28. The wall 34 is an cantilevered element having a basal end 34a connected to the inner periphery of the opening 28 and a distal end 34b as a free end. The wall 34 extends in the direction generally perpendicular to the first surface 12a of the base portion 12 and has a flat plate portion. The outflow preventing section 32 having the wall 34 functions to restrict flow of an adhesive supplied to the anchoring section 30 before solidification so as to prevent outflow of the adhesive before solidification from the adhesive support portion 18 to the outside. In particular, when the terminal 10 is mounted to a surface of an object, the wall 34 can effectively prevent the adhesive before solidification from flowing between the first surface 12a of the base portion 12 and the surface of the object and flowing out toward the contact portion 16 on the near side of the adhesive support portion 18. Therefore, it can prevent the adhesive which has reached the contact portion 16 from affecting electrical conduction between the electric contact point 14 and the conductor on the object surface.

In the construction shown, the wall 34 of the outflow preventing section 32 is formed integrally with the base portion 12 in one unit from same electrically conductive material as the base portion 12. For example, when punching the base portion 12 in a predetermined shape from a sheet metal material of a predetermined thickness at a press step, the wall 34 can be formed at the same time by punching and bending process. It is also possible to form the wall 34 separately from the base portion 12 and to be joined to the base portion 12 in a later step. By forming the wall 34 integrally with the base portion 12 in

one unit, the number of fabrication steps can be reduced as compared to the method of joining a separate member to the base portion 12 in a later process. As shown in Fig. 2, a sectional shape of the first wall 34 and the anchoring section 30 (i.e., a part of the base portion 12) defining the opening 28 is a generally L-shape. Thus, the wall 34 is bent into a generally L-shape configuration at a side of the first surface 12a of the base portion 12.

In the terminal 10 shown, an edge portion on the side adjacent to the opening 28, of the end region 26 of the electric wire connection portion 24 joined to the center region 12c of the base portion 12 constitutes a second wall 36 of the outflow preventing section 32 formed uprightly at the side of the first surface 12a of the base portion 12. The wall 36 is arranged generally in parallel and opposed to the flat plate portion of the wall 34 with the opening 28 interposed between them, and extends in the direction generally perpendicular to the first surface 12a of the base portion 12. The second wall 36, like the first wall 34, functions to restrict flow of an adhesive supplied to the anchoring section 30 before solidification so as to prevent outflow of the adhesive before solidification from the adhesive support portion 18 to the outside. In particular, when the terminal 10 is mounted to a surface of an object, the wall 36 can effectively prevent the adhesive before solidification from flowing between the first surface 12a of the base portion 12 and the surface of the object and flowing out toward the center region 12c of the base portion 12.

As an example of procedure for mounting the terminal 10 to a surface 38a of an object 38 will be described below with reference to Fig. 2. A conductor 40 for connecting the terminal 10 has been formed in advance at a suitable position on the surface 38a of the object 38.

First, as a preliminary step, a double coat adhesive tape 42 is applied to a desired position (in the drawing, on the surface of the end region 26 of the electric wire connection portion 22) on the side of the first surface 12a of the base portion 12 of the terminal 10 except the contact portion 16 and the adhesive support portion 18 (Fig. 2(a)). Or, a double coat adhesive tape 42 may be applied to a suitable position on the surface 38a of the object 38 for fixing the desired location of the terminal 10. As the double coat adhesive tape, one which has three layer structure consisting of an intermediate soft base material layer 44 and adhesive layers 46 on both sides thereof, such as VHB (trade mark) acrylic foam structural bonding tape available from Sumitomo 3M Co., may be employed. Such a double coat adhesive tape 42 can resist tangential shear force applied in the plane of the surface of the double coat adhesive tape 42 by the stress dispersing effect of the soft base material layer 44, and can absorb dimensional change of the terminal 10 due to variation of ambient temperature, so that it can firmly fix the base portion 12 of the terminal 10 to the surface 38a of the object 38.

Next, the terminal 10 is fixed at the base portion 12 to the object surface 38a via the double coat adhesive tape 42 such that the plurality (three) of the electric contact points 14 of the contact portion 16 are arranged at positions and attitude opposed to the corresponding conductors 40 formed on the surface 38a of the object 38 (Fig. 2(b)). At this time, by applying a suitable pressing force P to the base portion

12, at least one of the base portion 12 and the contact portion 16 is elastically deformed so as to bring individual electric contact points 14 into contact with the conductor 40 under uniform contact pressure P'. This pressing force P should be large enough for the adhesive layers 46 on the double coat adhesive tape 42 to exhibit required adhesive force. Shape and size of the base portion 12 and the contact portion 16 (arm portion 20) and thickness of the double coat adhesive tape 42, and the like, are selected in advance so as to ensure sufficient contact pressure P'. Shape and size of the wall 34 of the outflow preventing section 34 of the adhesive support portion 18 are selected in advance so as not to hinder such elastic deformation of the base portion 12 and the contact portion 16. The double coat adhesive tape 42 is not intended to fix the terminal 10 permanently to the object 38, but needs only to exhibit temporary fixing function until solidification of the adhesive to be described later.

Next, the object 38 is arranged on the lower side in the direction of gravity of the terminal 10, and liquid adhesive 48 is supplied to each of a pair of adhesive support portions 18 of the terminal 10 fixed temporarily to the surface 38a of the object 38 by the double coat adhesive tape 42 (Fig. 2(b)). The liquid adhesive 48 is injected mainly into the opening 28 of the anchoring section 30 of each adhesive support portion 18. The liquid adhesive 48 that has passed through the opening 28 tends to flow between the first surface 12a of the base portion 12 and the object surface 38a in dependence on its characteristics such as viscosity and wettability to the object surface 38a. At this time, the first and second walls 34, 36 of the outflow preventing section 32 of each adhesive support portion 18 restrict the flow of the adhesive 48 in the space between the first surface 12a of the base portion 12 and the object surface 38a, and prevent the adhesive 48 from flowing out from adhesive support portion to the outside. As a result, the liquid adhesive 48 is substantially held in the region between a pair of walls 34, 36 of the outflow preventing section 32 while in contact with the object surface 38a, and is stored in the region under frictional force and surface tension. When a predetermined amount of adhesive 48 is supplied, the adhesive 48 overflows from the second surface 12b of the base portion 12, and comes into uniform contact with the anchoring section 30 surrounding the opening 28 to form a mushroom-like shape rising up from the second surface 12b of the base portion 12 (Fig. 2(c)). In the construction shown, the side edge of the double coat adhesive tape 42 adjacent to the wall 36 of the outflow preventing section 32 also exhibits outflow preventing function to the liquid adhesive 48.

When the adhesive 48 is solidified in the shape of a mushroom, the anchoring section 30 engages generally as a whole with the bulging head 50a of the solidified adhesive 50 (Fig. 2(c)). The solidified adhesive 50 is anchored at a definite position with the bulging head 50a in contact with the anchoring section 30 while in surface contact with generally entire first and second walls 34, 36 of the outflow preventing section 32, so that sufficiently large mutual contact area of the adhesive 50 and the terminal 10 can be secured. Since the bulging head 50a of the adhesive 50 is anchored at a definite position on the adhesive support portion 18 by the anchoring section 30, while the terminal 10 is mounted to the object surface 38a, the state in which at least one of the base portion 12 and the contact portion 16 of the

terminal 10 is elastically deformed is maintained in dependence on the adhesive force between the adhesive 50 and the object surface 38a (and the supplementary adhesive force of the double coat adhesive tape 42), so that the contact pressure P' between the individual electric contact points 14 and corresponding conductors 40 is maintained. As a result, proper connection between each electric contact point 14 of the terminal 10 and corresponding conductor 40 can be stably maintained for a long period without being affected by variation of ambient temperature or vibration of the object 38 or the like.

In the terminal 10, by providing the outflow preventing section 32 in the adhesive support portion 18, outflow (i.e., loss) of the liquid adhesive 48 from the adhesive support portion 18 to the outside can be reduced. The first wall 34 of the outflow preventing section 32 is arranged between the contact portion 16 and the opening 28 at the side of the first surface 12a of the base portion 12, so that, when the terminal 10 is mounted to the surface 38a of the object 38, the adhesive 48 before solidification can be prevented from flowing between the first surface 12a of the base portion 12 and the object surface 38a and flowing out toward the contact portion 16. Also, the second wall 36 is provided to be opposed to the first wall 34 with the opening 28 interposed therebetween, so that the adhesive 48 can be supplied so as to form a mushroom shape while reducing the amount of supplied adhesive 48. Therefore, with minimum required amount of supplied adhesive 48, solidified adhesive 50 in a shape of mushroom can be formed in shape and size sufficient to provide required anchoring force. As has been described above, such adhesive supply operation ensures sufficiently large mutual contact area of the solidified adhesive 50 with the terminal 10, and can be carried out reproducibly irrespective of viscosity of adhesive 48 before solidification or skill of workers.

The liquid adhesive 48 can exhibit adhesive force for holding the terminal 10 in a state firmly fixed to the surface 38a of the object 38 by hardening or solidification, and may be formed from resin capable of forming dense 3-dimensional network by chemical cross linking reaction. Examples of such resins include, for example, room temperature setting resins and heat curable resins such as epoxy-based resin, photocurable type acrylic resin, thermosetting type acrylic resin, unsaturated polyester resin, silicone resin, urethane resin, bismaleimide, cyanoacrylate, urea resin, etc. When a room temperature setting resin such as an epoxy resin is used as the adhesive 48, it is advantageous that work can be carried out at room temperature without applying heat and the terminal 10 and the object 38 are not affected by heat. It is also possible to use other resins such as an UV-curable resin or a thermoplastic resin as the adhesive 48. In the present application, hardening and solidification in narrow sense is referred to generally as "solidification".

In the terminal mounting procedure described above, by fixing the base portion 12 to the object surface 38a by means of the double coat adhesive tape 42, the terminal 10 is fixed temporarily to the object 38. In this construction, while the base portion 12 is fixed to the object surface 38a by means of the double coat adhesive tape 42, contact pressure P' between individual electric contact point 14 and corresponding conductor 40 can be ensured, and the contact pressure P' can be maintained for some time

period, so that, even if a resin such as a room temperature setting resin that requires some time for solidification is used as the adhesive 48, operation can proceed to next step without waiting for solidification of the adhesive 48. In place of the double coat adhesive tape 42, other suitable adhesive or jig can be used to temporarily fix the terminal 10 to the object 38.

An electrically insulating member can be used as the member interposed for temporarily fixing between the first surface 12a of the base portion 12 and the surface 38a of the object 38 such as the double coat adhesive tape 42, or the like. In this construction, even if there are other conductor (not shown) electrically independent of the conductor 40 on the surface 38a of the object 30, the base portion 12 of the terminal 10 can be disposed on the other conductor via an electrically insulating temporary fixing member, so that the terminal 10 can be mounted to the surface 38a of the object 38 having multiplicity of conductors in high density without worrying about selection of mounting position. A cheap, all-purpose double coat adhesive tape can be used as an electrically insulating double coat adhesive tape 42. When insulation between the terminal 10 and conductors other than the conductor 40 needs not be considered, electrically conductive member can be used as the temporary fixing member. With this construction, the terminal 10 can be connected, for example via the conductive temporary fixing member, to other portion of the conductor 40, so that electrically conductive path between the terminal 10 and the conductor 40 can be increased to improve connection reliability.

In the terminal mounting procedure described above, a pressing force P is applied to the base portion toward the object surface 38a, so that a plurality of electric contact points 14 of the contact portion 16 are brought into contact with the conductor 40 under uniform contact pressure P'. With this construction, in addition to the effect of the shape of electric contact point 14 formed as outward bulging surface of the arm portion 20, a relatively high contact pressure P' can be produced between the electric contact point 14 and the conductor 40. Thus, without requiring so-called wiping action, that is, sliding of the electric contact point 14 relative to the conductor 40 under contact pressure, electrical connection can be stably established by penetrating the oxide film formed on the surface of the electric contact point 14 and the conductor 40.

The terminal 10 shown includes a pair of contact portions 16 at both longitudinal ends of the base portion 12, and a plurality of (three, in the drawing) electric contact points 14 in each contact portion 16. With this construction, even when the surface 38a of the object 38 includes a curved surface, individual arm portion 20 having the electric contact point 14 can be displaced elastically and independently of each other, so that each electric contact point 14 can be brought stably into contact with corresponding conductor 40 under required contact pressure P'. In the construction shown in which each contact portion 16 includes a plurality of (three, in the drawing) comb-shaped arm portions 20, electric current flowing in individual arm portions 20 can be reduced to suppress heat generation, and heat discharging effect of the electric contact point 14 can be increased. The construction of the contact portion 16 is not limited to the construction shown including a plurality of arm portions 20, and the construction having single arm

portion bent in a generally U-shape, or the construction having a multiplicity of holes in single arm for discharging heat, or the like may be adopted.

The terminal 10 shown has the construction in which liquid adhesive 48 is supplied to the adhesive support portion 18 provided in the base portion 12, and the base portion 12 is fixed to the object 38 by the solidified adhesive 50. With such construction, the contact portion 16 needs not be joined directly to the conductor 40 on the object surface 38a, so that, when the dimension of the terminal 10 changes due to variation of the ambient temperature, for example, the electric contact point 14 of the contact portion 16 can be slid along the surface of the conductor 40 while maintaining proper contact. Therefore, even when such a dimensional change is produced in the terminal 10, adverse stress can be prevented from being applied to the terminal 10 or the object 38, and the electrically conductive connection of the terminal 10 and the conductor 40 can be stably maintained.

In the terminal 10 shown, the outflow preventing section 32 of the adhesive support portion 18 has the first wall 34 capable of preventing the liquid adhesive 48 from flowing out between the first surface 12a of the base portion 12 and the object surface 38a toward the contact portion on the side nearer to the adhesive support portion 18. However, arrangement and shape of the walls 34, 36 of the outflow preventing section 32 is not particularly limited. The outflow preventing section 32 may include walls of various shapes in various arrangement as long as adhesive 48 can be supplied to the adhesive support portion 18 such that loss of liquid adhesive can be reduced and the solidified adhesive 50 can have bulging head 50a of sufficiently large size capable of exhibiting required anchoring force.

Fig. 3 is a view showing a modification of the terminal 10 described above. In the terminal 10' according to the modification shown, each of a pair of adhesive support portions 18 has a plurality of separate walls 34, 36, 52 substantially surrounding the opening 28 in cooperation in the outflow preventing section 32. The terminal 10' has substantially same construction as the terminal 10 described above except the construction of the third wall 52 of the outflow preventing section 32. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The outflow preventing section 32 of each adhesive support portion 18 of the terminal 10' includes, in addition to the first and second walls 34, 36 described above, a pair of third walls 52 formed uprightly at the side of the first surface 12a (Fig. 2) of the base portion 12. The pair of walls 52 is arranged at positions near the opening 28 along both side edges 12d extending in longitudinal direction of the base portion 12. Each wall 52 is a cantilevered element connected at the basal end 52a to the side edge 12d of the base portion 12 with the distal end as a free end. The wall 52 extends in the direction generally perpendicular to the first surface 12a of the base portion 12, and also extends in the direction generally perpendicular to the first and second walls 34, 36, and in cooperation with the first and second walls 34, 36, substantially surrounds the opening 28 (i.e., in partially opened form between individual walls 34, 36, 52).

The outflow preventing section 32 having the first, second and third walls 34, 36, 52 functions to restrict the flow of the adhesive 48 before solidification supplied to the anchoring section 30 (Fig. 2), and to prevent the adhesive 48 before solidification from flowing out from the adhesive support portion 18 to the outside. In the terminal 10', in particular, since a plurality of separate walls 34, 36, 52 are formed so as to cooperate with each other to surround the opening 28 substantially, when the liquid adhesive 48 is supplied to the adhesive support portion 18, outflow (i.e., loss) of the adhesive 48 from the adhesive support portion 18 to the outside can be prevented more effectively. Therefore, it is possible to form solidified adhesive 50 (Fig. 2) in mushroom shape in shape and size capable of exhibiting required anchoring force while the amount of supplied adhesive 48 can be further reduced.

The solidified adhesive 50 is anchored at a definite position with the bulging head 50a (Fig. 2) in contact with the anchoring section 30, and is at the same time in surface contact with generally entire walls 34, 36, 52 of the outflow preventing section 32, so that larger mutual contact area of the adhesive 50 with the terminal 10' can be secured. As a result, proper connection of electric contact point 14 of the terminal 10' to the corresponding conductor 40 (Fig. 2) can be maintained stably for a long period without being affected by variation of ambient temperature or vibration of the object 38, or the like (Fig. 2). Operation of supplying adhesive to the adhesive support portion 18 of the terminal 10' can be carried out reproducibly irrespective of the viscosity of the adhesive 48 before solidification, or skill of the workers.

Fig. 4 is a view showing another modification of the terminal 10 described above. In the terminal 10" according to the modification shown, each of a pair of adhesive support portions 18 has a surrounding wall 54 that continuously surrounds an opening 28 in the overflow preventing section 32 (Fig. 4(a)). The terminal 10" has substantially the same construction as the terminal 10 described above except the construction of the surrounding wall 54 in the outflow preventing section 32. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The outflow preventing section 32 of each adhesive support portion 18 of the terminal 10" includes, in place of the first and second walls 34, 36 described above, a surrounding wall 54 formed uprightly at the side of the first surface 12a (Fig. 4(a)) of the base portion 12. The surrounding wall 54 is arranged continuously along the entire inner periphery of the opening 28. The surrounding wall 54 is a polygonal tube-shaped element connected at the basal end 54a to the inner periphery of the opening 28. The surrounding wall 54 extends in the direction generally perpendicular to the first surface 12a of the base portion 12 and has 4 flat plate portions, one of which corresponds to the first wall 34. Thus, the surrounding wall 54 includes the first wall 34 integrally.

The outflow preventing section 32 having the wall 54 functions to restrict the flow of the adhesive 48 before solidification supplied to the anchoring section 30(Fig. 2), and to prevent the adhesive 48 before solidification from flowing out from the adhesive support portion 18 to the outside. In the terminal 10", in particular, since the wall 54 is formed so as to continuously surround opening 28, when

the liquid adhesive 48 is supplied to the adhesive support portion 18, outflow (i.e., loss) of the adhesive 48 from the adhesive support portion 18 to the outside can be reduced more effectively. Therefore, it is possible to form solidified adhesive 50 (Fig. 2) in mushroom shape in shape and size capable of exhibiting required anchoring force while the amount of supplied adhesive 48 can be further reduced.

The solidified adhesive 50 is anchored at a definite position with the bulging head 50a (Fig. 2) in contact with the anchoring section 30, and is at the same time in surface contact with generally entire wall 54 of the outflow preventing section 32, so that larger mutual contact area of the adhesive 50 with the terminal 10" can be secured. As a result, proper connection of the electric contact point 14 of the terminal 10" to the corresponding conductor 40 (Fig. 2) can be maintained stably for a long period without being affected by variation of ambient temperature or vibration of the object 38, or the like (Fig. 2). Operation of supplying adhesive to the adhesive support portion 18 of the terminal 10" can be carried out reproducibly irrespective of the viscosity of the adhesive 48 before solidification, or skill of the workers.

Fig. 5 is a view showing a terminal 60 according to a second embodiment of the present invention, and Fig. 6 is a view showing an example of procedure for mounting the terminal 60 to a surface of an object. The terminal 60 has substantially same construction as the terminal 10 described above except the construction of an anchoring section 62 and an outflow preventing section 64 of the adhesive support portion 18. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The terminal 60 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 60 shown, a pair of adhesive support portions 18 is provided between the center region 12c of the base portion 12 and the contact portions 16 at both longitudinal ends, respectively. Each adhesive support portions 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section (or flow restricting section) 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62.

The opening 28 of the anchoring section 62 is formed to penetrate in the base portion 12 so as to have generally rectangular outline in a region between the center region 12c of the base portion 12 and one of the contact portion 16. The anchoring section 62 is composed of an annular region of the base portion 12 surrounding the opening 28. In the inner periphery of the opening 28 adjoining the center region 12c of the base portion 12, an extension 66 projecting horizontally from the center region 12c is formed as a part of the anchoring section 62. The anchoring section 62 functions to engage with the solidified adhesive that passes through the opening 28, so as to anchor the adhesive at predetermined position. The opening 28 surrounded and defined by the anchoring section 62 (including the extension 66) is substantially coplanar with the base portion 12.

The outflow preventing section 64 includes a first wall 34 formed uprightly at the side of the first surface 12a of the base portion 12. The first wall 34 is formed to be bent into a generally L-shape configuration at a side of the first surface 12a of the base portion 12. An edge portion, on the side adjacent to the opening 28, of the end region 26 of the electric wire connection portion 22 joined to the center region 12c of the base portion 12 constitutes a second wall 36 of the outflow preventing section 64 formed uprightly at the side of the first surface 12a of the base portion 12.

The outflow preventing section 64 further includes a pair of third walls 68 formed uprightly at the side of the first surface 12a of the base portion 12 (Fig. 5(b)). The pair of walls 68 is formed so as to extend from both side edges 12d of the base portion 12 extending longitudinally to the side of the first surface 12a, and to substantially surround the opening 28 in cooperation with the first and second walls 34, 36 (i.e., in partially opened form between the individual walls 34, 36, 68). Each wall 68 includes a basal end portion 68a connected to the side edge 12d of the base portion 12, a side wall portion 68b extending from the basal end portion 68a along the base portion side edge 12d to a region near the opening 28, and an end wall portion 68c extending from the basal end portion 68a to a region between the wall 34 and the electric contact point 14 of the contact portion 16 integrally in one unit. The wall 68 extends as a whole in the direction generally perpendicular to the first surface 12a of the base portion 12, with the basal end portion 68a and the side wall portion 68b extending in the direction generally perpendicular to the walls 34, 36, with the end wall portion 68c extending in the direction generally parallel to the walls 34, 36. As shown, an end edge 68d of the wall 68 farthest from the first surface 12a of the base portion 12 can be arranged at a position (i.e., height) nearer to the first surface 12a than the electric contact point 14 of the contact portion 16 and farther from the first surface 12a than the distal end 34b of the wall 34.

The outflow preventing section 64 having the first, second and third walls 34, 36, 68 functions to restrict the flow of the adhesive before solidification supplied to the anchoring section 62, and to prevent the adhesive before solidification from flowing out from the adhesive support portion 18 to the outside. In particular, the end wall portion 68c of the third wall 68 situated between the first wall 34 and the electric contact point 14 of the contact portion 16 can more effectively (i.e., so as to enhance the overflow preventing action of the first wall 34) prevent the adhesive before solidification from flowing between the first surface 12a of the base portion 12 and the object surface, and flowing out toward the electric contact point 14 of the contact portion 16 on the side near the adhesive support portion 18.

In the construction shown, the third wall 68 of the outflow preventing section 64 is formed integrally with the base portion 12 in one unit from same electrically conductive material as the base portion 12. For example, when punching the base portion 12 in a predetermined shape from a sheet metal material of a predetermined thickness at a press step, the wall 68 can be formed at the same time by punching and bending process. It is also possible to fabricate the wall 68 separately from the base portion 12 and to join it to the base portion 12 in a later step. The basal end portion 68a and the side wall portion

68b and the end wall portion 68c of the wall 68 may be fabricated separately from each other and may be joined into one unit in a later step.

The outflow preventing section 64 further includes a pair of walls 70 formed uprightly at the side of the second surface 12b of the base portion 12 (Fig. 5(a)). The pair of walls 70 is arranged respectively near the inner edge of the opening 28 forming the first wall 34 and near the inner edge of the opening 28 forming the extension 66 on the opposite side, and extends generally in parallel to each other, and generally in parallel to the first and second walls 34, 36 at the side of the first surface 12a. Each wall 70 is a rib-like element projecting from the second surface 12b of the base portion 12 and extending in a straight line. The wall 70 projects in the direction generally perpendicular to the second surface 12b up to a suitable height from the second surface 12b. The outflow preventing section 64 having the wall 70 functions to restrict the flow of the adhesive before solidification supplied to the anchoring section 62, especially on the second surface 12b of the base portion 12, and to prevent the adhesive before solidification from flowing out from the adhesive support portion 18 to the outside.

In the construction shown, the wall 70 of the outflow preventing section 64 is formed integrally with the base portion 12 in one unit from same electrically conductive material as the base portion 12. For example, when punching the base portion 12 in a predetermined shape from a sheet metal material of a predetermined thickness at a press step, the wall 70 can be formed at the same time by half-press. It is also possible to fabricate the wall 70 separately from the base portion 12 and to join it to the base portion 12 in a later step.

As an example of procedure for mounting the terminal 60 to a surface 38a of an object 38 will be described below with reference to Fig. 6. Although a conductor 40 for connecting the terminal 60 has been formed in advance at a suitable position on the surface 38a of the object 38, it is not shown in Fig. 6.

As in the procedure for mounting the terminal 10 described with reference to Fig. 2, first as a preliminary step, a double coat adhesive tape 42 is applied to a desired position (in the drawing, on the surface of the end region 26 of the electric wire connection portion 22) on the side of the first surface 12a of the base portion 12 of the terminal 60 except the contact portion 16 and the adhesive support portion 18 (Fig. 2(a)). Or, a double coat adhesive tape 42 may be applied to a suitable position on the surface 38a of the object 38 for fixing the desired location of the terminal 60.

Next, the terminal 60 is arranged at a position and attitude such that a plurality of (three) electric contact points 14 of each contact portion 16 are opposed to corresponding conductors 40 (Fig. 2) formed on the surface 38a of the object 38, and the base portion 12 is fixed to the object surface 38a via a double coat adhesive tape 42 (Fig. 6(a)). At this time, by applying a suitable pressing force P to the base portion 12, at least one of the base portion 12 and the contact portion 16 is elastically deformed so as to bring individual electric contact points 14 into contact with the conductor 40 under uniform contact pressure P'. This pressing force P should be large enough for the adhesive layers 46 on the double coat adhesive tape 42 to exhibit required adhesive force. Shape and size of the base portion 12 and the contact portion 16

(arm portion 20) and thickness of the double coat adhesive tape 42, and the like, are selected in advance so as to ensure sufficient contact pressure P'. Shape and size of the wall 34, 68, 70 of the outflow preventing section 64 of the adhesive support portion 18 are selected in advance so as not to hinder such elastic deformation of the base portion 12 and the contact portion 16.

Next, the object 38 is arranged on the lower side in the direction of gravity of the terminal 60, and liquid adhesive 48 is supplied to each of a pair of adhesive support portions 18 of the terminal 60 fixed temporarily to the surface 38a of the object 38 by the double coat adhesive tape 42. The liquid adhesive 48 is injected mainly into the opening 28 of the anchoring section 62 of each adhesive support portion 18. The liquid adhesive 48 that has passed through the opening 28 tends to flow between the first surface 12a of the base portion 12 and the object surface 38a in dependence on its characteristics such as viscosity and wettability to the object surface 38a. At this time, the first, second, third walls 34, 36, 68 of the outflow preventing section 64 of each adhesive support portion 18 restrict the flow of the adhesive 48 in the space between the first surface 12a of the base portion 12 and the object surface 38a, and prevent the adhesive 48 from flowing out from adhesive support portion 18 to the outside. As a result, the liquid adhesive 48 is substantially held in the region between the first and second walls 34, 36 and the side wall portion of the third wall 68 of the outflow preventing section 64 while in contact with the object surface 38a, and is stored in the region under frictional force and surface tension. Here, when the adhesive 48 flows over the first wall 34 and flows out toward the contact portion 16 due to excessively low viscosity of the adhesive 48 or due to excess amount of the supplied adhesive, the end wall portion 68c of the third wall 68 helps to prevent the flow of the adhesive 48 toward the contact portion 16. When a predetermined amount of adhesive 48 is supplied, the adhesive 48 overflows on the second surface 12b of the base portion 12. At this time, the wall 70 of the outflow preventing section 64 of each adhesive support portion 18 restricts the flow of the adhesive 48 on the second surface 12b of the base portion 12, and prevents the adhesive 48 from flowing out from the adhesive support portion 18 to the outside. As a result, the liquid adhesive that has flowed out over the second surface 12b of the base portion 12 is substantially held in the region between a pair of walls 70 of the outflow preventing section 64, and comes into uniform contact with the anchoring section 62 (including the extension 66) surrounding the opening 28 under frictional force and surface tension to form a mushroom-like shape rising up from the second surface 12b of the base portion 12 (Fig. 6(b)). In the construction shown, the side edge of the double coat adhesive tape 42 adjacent to the wall 36 of the outflow preventing section 64 also exhibits outflow preventing function to the liquid adhesive 48.

When the adhesive 48 is solidified in the shape of a mushroom, the anchoring section 62 engages generally as a whole with the bulging head 50a of the solidified adhesive 50 (Fig. 6(b)). The solidified adhesive 50 is anchored at a definite position with the bulging head 50a in contact with the anchoring section 62 while in surface contact with the walls 34, 36, 68, 70 of the outflow preventing section 64, so that sufficiently large mutual contact area of the adhesive 50 and the terminal 60 can be secured. Since the

bulging head 50a of the adhesive 50 is anchored at a definite position on the adhesive support portion 18 by the anchoring section 62, in dependence on the adhesive force between the adhesive 50 and the object surface 38a (and the supplementary adhesive force of the double coat adhesive tape 42), the terminal 60 is mounted to the object surface 38a, while the state in which at least one of the base portion 12 and the contact portion 16 of the terminal 60 is elastically deformed is maintained, so that the contact pressure P' between the individual electric contact points 14 and corresponding conductors 40 is maintained. As a result, proper connection between each electric contact point 14 of the terminal 60 and corresponding conductor 40 can be stably maintained for a long period without being affected by variation of ambient temperature or vibration of the object 38 or the like.

With the terminal 60, by providing the outflow preventing section 64 in the adhesive support portion 18, outflow (i.e., loss) of the liquid adhesive 48 from the adhesive support portion 18 to the outside can be reduced. Since the first wall 34 of the outflow preventing section 64 is arranged between the contact portion 16 and the opening 28 at the side of the first surface 12a of the base 12, when the terminal 10 is mounted to the surface 38a of the object 38, the adhesive 48 before solidification can be prevented from flowing between the first surface 12a of the base 12 and the object surface 38a and flowing out toward the contact portion 16. Since the second wall 36 is provided in opposition to the first wall 34 with the opening 28 interposed therebetween, the adhesive 48 can be supplied so as to present a mushroom shape while reducing the amount of supplied adhesive 48. Therefore, with minimum required amount of supplied adhesive 48, solidified adhesive 50 in a shape of mushroom can be formed in shape and size sufficient to provide required anchoring force. As has been described above, such adhesive supply operation ensures sufficiently large mutual contact area of the solidified adhesive 50 with the terminal 60, and can be carried out reproducibly irrespective of viscosity of adhesive 48 before solidification or skill of workers. Material and characteristics of the double coat adhesive tape 42 and the adhesive 48 may be the same as has been described above with reference to the terminal 10 according to the first embodiment.

In the terminal 60, the third wall 68 of the overflow preventing section 64 is formed so as to substantially surround the opening 28 in cooperation with the first and second walls 34, 36, so that, when liquid adhesive 48 is supplied to the adhesive support portion 18, outflow (i.e., loss) of the adhesive 48 from the adhesive support portion 18 to the outside can be more effectively reduced. In particular, the end wall portion 68c of the third wall 68 acts so as to assist the overflow preventing action of the first wall 34. Further, since the wall 70 is provided on the second surface 12b of the base portion 12, bulging head 50a of the solidified adhesive 50 in the shape of mushroom can be formed reliably. Such construction of the adhesive support portion 18 of the terminal 60 is particularly effective in case where viscosity of the liquid adhesive 48 is relatively low.

In the terminal 60, too, the outflow preventing section 64 may include walls of various shapes in various arrangement as long as the adhesive 48 can be supplied to the adhesive support portion 18 such

that, while loss of liquid adhesive is reduced, the solidified adhesive 50 can have bulging head 50a of sufficiently large size capable of exhibiting required anchoring force.

Fig. 7 is a view showing a modification of the terminal 60 described above. In the terminal 60' according to the modification shown, each of a pair of adhesive support portion 18 includes a pair of walls 72, 74 formed uprightly at the side of the first surface 12a of the base portion 12 (Fig. 6) and a pair of walls 76, 78 formed uprightly at the side of the second surface 12b of the base portion 12, in the outflow preventing section 64. The terminal 60' has substantially same construction as the terminal 60 described above except the construction of walls 72, 73, 76, 78 in the outflow preventing section 64. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof will be omitted.

The outflow preventing section 64 of each adhesive support portion 18 of the terminal 60' includes, in place of a pair of third walls 68 described above, a pair of third walls 72, 74 formed uprightly at the side of the first surface 12a of the base portion 12. The pair of walls 72, 74 is formed so as to extend from both side edges 12d extending longitudinally from the base portion 12 to the side of the first surface 12a, and to cooperate with the first and second walls 34, 36 to substantially surround the opening 28 (i.e., in a partially opened form between the individual walls 34, 36, 72, 74). One wall 72 includes, in one unit, a basal end portion 72a connected to one of the side edges 12d of the base portion 12, and a side wall portion 72b extending from the basal end portion 72a along the base portion side edge 12d to a region near the opening 28. The other wall 74 includes, in one unit, a basal end portion 74a connected to the other side edges 12d of the base portion 12, a side wall portion 74b extending from the basal end portion 74a along the base portion side edge 12d to a region near the opening 28, and an end wall portion 74c extending from the basal end portion 74a to a region between the wall 34 and the electric contact point 14. The walls 72, 74 extend as a whole in the direction generally perpendicular to the first surface 12a of the base portion 12, with the basal end portion 72a, 74a and the side wall portion 72b, 74b extending in the direction generally perpendicular to the walls 34, 36, with the end wall portion 74c extending in the direction generally parallel to the walls 34, 36. End edges 72d, 74d of the walls 72, 74 farthest from the first surface 12a of the base portion 12 can be arranged at positions (i.e., heights) nearer to the first surface 12a than the electric contact point 14 of the contact portion 16 and farther from the first surface 12a than the distal end 34b of the wall 34 (Fig. 6).

The outflow preventing section 64 of each adhesive support portion 18 of the terminal 60' includes, in place of the walls 70 described above, a pair of walls 76, 78 formed uprightly at the side of the second surface 12b of the base portion 12. The pair of walls 76, 78 is arranged respectively near the inner periphery of the opening 28 forming the first wall 34 and near the inner periphery of the opening 28 forming the extension 66 on the opposite side, and extends generally in parallel to each other, and generally in parallel to the first and second walls 34, 36 at the side of the first surface 12a. One wall 76 is a cantilevered element projecting from the second surface 12b of the base portion 12. The other wall 78

includes, in one unit, a basal end portion 78a connected to one side edge 12d of the base portion 12, and an end wall portion 78b extending from the basal end portion 78a to a region between the opening 28 and the contact portion 16. The walls 76, 78 project from the second surface 12b in the direction generally perpendicular to the second surface 12b of the base portion 12 up to a suitable height (a position higher than the wall described above).

The outflow preventing section 64 having the walls 34, 36, 72,74,76,78 functions to restrict the flow of the adhesive 48 before solidification supplied to the anchoring section 62 (Fig. 6), and to prevent the adhesive 48 before solidification from flowing out from the adhesive support portion 18 to the outside. In particular, in the terminal 60', the third walls 72, 74 provided at the side of the first surface 12a of the base portion 12 exhibits the same adhesive overflow preventing effect as the third wall 68 described above, while the walls 76, 78 provided at the side of the second surface 12b of the base portion 12 can prevent the overflow of the adhesive 48 more effectively, so that the bulging head 50a of the solidified adhesive 50 in the shape of a mushroom can be formed more reliably. Such construction of the adhesive support portion 18 of the terminal 60' is particularly effective in case where viscosity of the liquid adhesive 48 is relatively low.

The solidified adhesive 50 is anchored at a definite position with the bulging head 50a (Fig. 6) in contact with the anchoring section 62, and is at the same time in surface contact with the walls 34, 36, 72, 74, 76, 78 of the outflow preventing section 64, so that larger mutual contact area of the adhesive 50 with the terminal 60' can be secured. As a result, proper connection of the electric contact point 14 of the terminal 60' to the corresponding conductor 40 (Fig. 2) can be maintained stably for a long period without being affected by variation of ambient temperature or vibration of the object 38, or the like (Fig. 6). Operation of supplying adhesive to the adhesive support portion 18 of the terminal 60' can be carried out reproducibly irrespective of the viscosity of the adhesive 48 before solidification, or skill of the workers.

Fig. 8 is a view showing another modification of the terminal 60 described above. In the terminal 60" according to the modification shown, each of a pair of adhesive support portion 18 includes a pair of walls 80 formed uprightly at the side of the second surface 12b of the base portion 12 (Fig. 6). The terminal 60" has substantially same construction as the terminal 60 described above except the construction of walls 80 in the outflow preventing section 64. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof will be omitted.

The outflow preventing section 64 of each adhesive support portion 18 of the terminal 60" has, in place of the walls 68 described above, only the first and second walls 34, 36 at the side of the first surface 12a of the base portion 12. In place of the wall 70 described above, it also has a pair of walls 80 formed uprightly at the side of the second surface 12b of the base portion 12. The pair of walls 80 is arranged along both side edges 12d extending in the longitudinal direction of the base portion 12. Each wall 80 is a cantilevered element projecting from the second surface 12b of the base portion 12. The wall 80 projects

in the direction generally perpendicular to the second surface 12b of the base portion 12 up to a suitable height from the second surface 12b (to a position higher than the wall 70 described above).

The outflow preventing section 64 having the walls 34, 36, 80 functions to restrict the flow of the adhesive 48 before solidification supplied to the anchoring section 62 (Fig. 6), and to prevent the adhesive 48 before solidification from flowing out from the adhesive support portion 18 to the outside. In particular, in the terminal 60", the walls 80 provided at the side of the second surface 12b of the base portion 12 can prevent the overflow of the adhesive 48 more effectively than the wall 70 described above, so that the bulging head 50a of the solidified adhesive 50 in the shape of a mushroom can be formed more reliably.

The solidified adhesive 50 is anchored at a definite position with the bulging head 50a (Fig. 6) in contact with the anchoring section 62, and is at the same time in surface contact with the walls 34, 36, 80 of the outflow preventing section 64, so that larger mutual contact area of the adhesive 50 with the terminal 60" can be secured. As a result, proper connection of each electric contact point 14 of the terminal 60" to the corresponding conductor 40 (Fig. 2) can be maintained stably for a long period without being affected by variation of ambient temperature or vibration of the object 38, or the like (Fig. 6). Operation of supplying adhesive to the adhesive support portion 18 of the terminal 60" can be carried out reproducibly irrespective of the viscosity of the adhesive 48 before solidification, or skill of the workers.

Fig. 9 is a view showing a terminal 90 according to a third embodiment of the present invention, and Fig. 10 is a view showing an example of the procedure for mounting the terminal 90 to a surface of an object. Except for the construction of the overflow preventing section 92 of the adhesive support portion 18, the terminal 90 has substantially the same construction as the terminal 60 according to the second embodiment. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The terminal 90 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 90 shown, a pair of adhesive support portions 18 is provided respectively between the center region 12c of the base portion 12 and the contact portions at both longitudinal ends. Each adhesive support portions 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section (or flow restricting section) 92 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62.

The outflow preventing section 92 has a first wall 34 and a pair of third walls 68 formed uprightly at the side of the first surface 12a of the base portion 12 (Fig. 9(b)). The first wall 34 is formed to be bent into a generally L-shape configuration at a side of the first surface 12a of the base portion 12. Further, an

edge portion of the end region 26 on the side adjacent to the opening 28, of the electric wire connection portion 22 joined to the center region 12c of the base portion 12, constitutes a second wall 36 of the outflow preventing section 92 formed uprightly at the side of the first surface 12a of the base portion 12.

The outflow preventing section 92 further has, in place of the wall 70 of the terminal 60 of the second embodiment, a pair of grooves 94 recessed at the side of the second surface 12b of the base portion 12 (Fig. 9(a)). The pair of grooves 94 is disposed in proximity to an inner periphery of the opening 28 forming the first wall 34 and to an inner periphery of the opening 28 on the opposite side forming an extension 66, respectively, and extends generally parallel to each other and generally parallel to the first and second wall 34, 36 at the side of the first surface 12a. Each groove 94 is a slit-shaped element extending in straight line so as to penetrate between the second surface 12b and the first surface 12a of the base portion 12.

The outflow preventing section 92 having the walls 34, 36, 68 and the grooves 94, functions to restrict the flow of the adhesive before solidification supplied to the anchoring section 62, and to prevent the adhesive before solidification from flowing out from the adhesive support portion 18 to the outside. In particular, the groove 94 restricts flow of the adhesive before solidification that is supplied to the anchoring section 62, especially on the second surface 12b of the base portion 12, and prevents the adhesive before solidification from flowing out from the adhesive support portion 18 to the outside.

In the construction shown, the grooves 94 of the outflow preventing section 92 is formed by locally removing the material of the base portion 12 in one unit from same electrically conductive material as the base portion 12. For example, when punching the base portion 12 in a predetermined shape from a sheet metal material of a predetermined thickness at a press step, the groove 94 can be formed at the same time by punching. In place of the groove 94 penetrating the base portion 12, it is also possible to form a groove 94 having a bottom and not penetrating the base portion 12, for example, by half-press.

As an example of procedure for mounting the terminal 90 to a surface 38a of an object 38 will be described below with reference to Fig. 10. Although conductors 40 for connecting the terminal 90 has been formed in advance at a suitable position on the surface 38a of the object 38, it is not shown in Fig. 10.

As in the procedure for mounting the terminal 60 described with reference to Fig. 6, first as a preliminary step, a double coat adhesive tape 42 is applied to a desired position (in the drawing, on the surface of the end region 26 of the electric wire connection portion 22) on the side of the first surface 12a of the base portion 12 of the terminal 90 except the contact portion 16 and the adhesive support portion 18. Or, a double coat adhesive tape 42 may be applied to a suitable position on the surface 38a of the object 38 for fixing the desired location of the terminal 90.

Next, the terminal 90 is arranged at a position and attitude such that a plurality of (three) electric contact points 14 of each contact portion 16 are opposed to corresponding conductors 40 (Fig. 2) formed

on the surface 38a of the object 38, and the base portion 12 is fixed to the object surface 38a via a double coat adhesive tape 42 (Fig. 10(a)). At this time, by applying a suitable pressing force P to the base portion 12, at least one of the base portion 12 and the contact portion 16 is elastically deformed so as to bring individual electric contact points 14 into contact with the conductor 40 under uniform contact pressure P'. This pressing force P should be large enough for the adhesive layers 46 on the double coat adhesive tape 42 to exhibit required adhesive force.

Next, the object 38 is arranged on the lower side of the terminal 90 in the direction of gravity, and liquid adhesive 48 is supplied to each of a pair of adhesive support portions 18 of the terminal 90 fixed temporarily to the surface 38a of the object 38 by the double coat adhesive tape 42. The liquid adhesive 48 is injected mainly into the opening 28 of the anchoring section 62 of each adhesive support portion 18. The liquid adhesive 48 that has passed through the opening 28 tends to flow between the first surface 12a of the base portion 12 and the object surface 38a in dependence on its characteristics such as viscosity and wettability to the object surface 38a and the like. At this time, the first, second, third walls 34, 36, 68 of the outflow preventing section 92 of each adhesive support portion 18 restrict the flow of the adhesive 48 in the space between the first surface 12a of the base portion 12 and the object surface 38a, and prevent the adhesive 48 from flowing out from adhesive support portion 18 to the outside. As a result, the liquid adhesive 48 is substantially held in the region between the first and second walls 34, 36 and the side wall portion 68b of the third wall 68 of the outflow preventing section 64 while in contact with the object surface 38a, and is stored in the region under frictional force and surface tension. Here, when the adhesive 48 flows over the first wall 34 and flows out toward the contact portion 16 due to excessively low viscosity of the adhesive 48 or due to excess amount of the supplied adhesive, the end wall portion 68c of the third wall 68 helps to prevent the flow of the adhesive 48 toward the contact portion 16. When a predetermined amount of adhesive 48 is supplied, the adhesive 48 overflows on the second surface 12b of the base portion 12. At this time, the groove 94 of the outflow preventing section 92 of each adhesive support portion 18 receives the adhesive 48, and thereby restricts the flow of the adhesive 48 on the second surface 12b of the base portion 12, and prevents the adhesive 48 from flowing out from the adhesive support portion 18 to the outside. As a result, the liquid adhesive 48 that has flowed out over the second surface 12b of the base portion 12 is substantially held in the region between a pair of grooves 94 of the outflow preventing section 92, and comes into uniform contact with the anchoring section 62 (including the extension 66) surrounding the opening 28 under frictional force and surface tension to form a mushroom-like shape rising up from the second surface 12b of the base portion 12 (Fig. 10(b)).

When the adhesive 48 is solidified in the shape of a mushroom, the anchoring section 62 engages generally as a whole with the bulging head 50a of the solidified adhesive 50 (Fig. 10(b)). The solidified adhesive 50 is anchored at a definite position with the bulging head 50a in contact with the anchoring section 62 while in surface contact with the walls 34, 36, 68, and the grooves 94 of the outflow preventing section 92, so that sufficiently large mutual contact area of the adhesive 50 and the terminal 90 can be

secured. Since the bulging head 50a of the adhesive 50 is anchored at a definite position on the adhesive support portion 18 by the anchoring section 62, in dependence on the adhesive force between the adhesive 50 and the object surface 38a (and the supplementary adhesive force of the double coat adhesive tape 42), the terminal 90 is mounted to the object surface 38a, while the state in which at least one of the base portion 12 and the contact portion 16 of the terminal 90 is elastically deformed is maintained, so that the contact pressure P' between the individual electric contact points 14 and corresponding conductors 40 is maintained. As a result, proper connection between each electric contact point 14 of the terminal 90 and corresponding conductor 40 can be stably maintained for a long period without being affected by variation of ambient temperature, vibration of the object 38 or the like.

With the terminal 90, by providing the outflow preventing section 92 in the adhesive support portion 18, outflow (i.e., loss) of the liquid adhesive 48 from the adhesive support portion 18 to the outside can be reduced. Since the first wall 34 of the outflow preventing section 92 is arranged between the contact portion 16 and the opening 28 at the side of the first surface 12a of the base 12, when the terminal 10 is mounted to the surface 38a of the object 38, the adhesive 48 before solidification can be prevented from flowing between the first surface 12a of the base 12 and the object surface 38a and flowing out toward the contact portion 16. Since the second wall 36 is provided in opposition to the first wall 34 with the opening 28 interposed therebetween, the adhesive 48 can be supplied so as to present a mushroom shape while reducing the amount of supplied adhesive 48. Therefore, with minimum required amount of supplied adhesive 48, solidified adhesive 50 in a shape of mushroom can be formed in shape and size sufficient to provide required anchoring force. As has been described above, such adhesive supply operation ensures sufficiently large mutual contact area of the solidified adhesive 50 with the terminal 90, and can be carried out reproducibly irrespective of viscosity of adhesive 48 before solidification or skill of workers. Material and characteristics of the double coat adhesive tape 42 and the adhesive 48 may be the same as has been described above with reference to the terminal 10 according to the first embodiment.

With the terminal 90, since the third wall 68 of the outflow preventing section 92 is formed so as to substantially surround the opening 28 in cooperation with the first and the second walls 34, 36, when the liquid adhesive 48 is supplied to the adhesive support portion 18, outflow (i.e., loss) of the liquid adhesive 48 from the adhesive support portion 18 to the outside can be reduced. In particular, the end wall portion 68c of the third wall 68 acts so as to assist the overflow preventing action of the first wall 34. Further, since the grooves 94 is provided on the second surface 12b of the base portion 12, bulging head 50a of the solidified adhesive 50 in the shape of mushroom can be formed reliably. Such construction of the adhesive support portion 18 of the terminal 90 is particularly effective in case where viscosity of the liquid adhesive 48 is relatively low.

In the terminal 90, too, the outflow preventing section 92 may include walls and grooves of various shapes in various arrangement, as long as the adhesive 48 can be supplied to the adhesive support

portion 18 such that, while loss of liquid adhesive is reduced, the solidified adhesive 50 can have bulging head 50a of Sufficiently large size capable of exhibiting required anchoring force. The walls 70 (76, 78, 80) of the terminal 60 according to the second embodiment and the grooves 94 of the terminal 90 according to the third embodiment can be both provided in suitable number and at suitable positions on the second surface 12b of the base portion 12.

In the terminal 10, 60, 90 according to each embodiment, the electric wire connection portion 22 is formed from an electrically conductive material separately from the base portion 12 and the contact portion 16, and is joined to the center region 12c of the base portion 12 at an end region 26 by a joining means such as calking or the like. In general, it is required that the electric wire connection portion 22 having distal end portion 24 to be connected to an external electric wire should have certain thickness to ensure required heat resistance and mechanical strength while thickness of the base portion 12 and the contact portion 16 should be sufficiently small to be capable of producing elastic deformation to ensure the contact pressure P' relatively easily. The above construction in which the base portion 12 and the contact portion 16 and the electric wire connection portion 22 are fabricated separately and later joined to each other permits such different requirements for thickness to be satisfied easily.

In contrast, Figs. 11 and 12 respectively show terminals 100 and 110 according to a fourth and fifth embodiments of the present invention, in which the base portion 12 and the electric wire connection portion 22 can be fabricated from same electrically conductive material integrally in one unit. The terminals 100 and 110 have substantially same construction as the terminal 60 (Figs. 5 - 8) according to the second embodiment, except for the construction of the base 12 and the electric wire connection portion 22 in one unit. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The terminal 100 shown in Fig. 11 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 100 shown, a pair of adhesive support portions 18 is provided respectively between the center region 12c of the base portion 12 and the contact portions 16 at both longitudinal ends. Each adhesive support portions 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section (or flow restricting section) 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62. The anchoring section 62 and the outflow preventing section 64 have the same construction as the anchoring section 62 and the outflow preventing section 64 of the terminal 60' according to a modification shown in Fig. 7.

The terminal 100 includes an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is a flat plate element

extended in the direction projecting (upward in the drawing) from the second surface 12b in the center region 12c of the base portion 12, and is a cantilevered element with the basal end 22a connected to the base portion 12 and with the distal end 22b as a free end. At the tip region of the electric wire connection portion 22, a distal end portion 24 is formed to which an external electric wire (not shown) can be detachably connected. For example, by connecting an external electric wire to the electric wire connection portion 22 of the terminal 100 mounted to an object surface, desired electric current can be supplied to the conductor on the object surface from the external electric wire via the terminal 100.

The electric wire connection portion 22 is formed from the same electrically conductive material as the base portion 12 and the contact portion 16. For example, when the base portion 12 is formed by punching in a predetermined shape from a sheet metal material of predetermined thickness in press process, the electric wire connection portion 22 can be formed at the same time by punching and bending. At this time, the electric wire connection portion 22 can be constructed by superposing the sheet metal material in two-fold so as to have greater thickness (i.e., twice thicker) than the base portion 12 and the contact portion 16.

The terminal 110 shown in Fig. 12 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 110 shown, a pair of adhesive support portions 18 is provided between the center region 12c of the base portion 12 and the contact portions 16 at both longitudinal ends, respectively. Each adhesive support portions 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62.

The anchoring section 62 has a pair of extensions 112 that differs from the extension 66 of the anchoring section 62 of the terminal 60' shown in Fig. 7. The pair of extensions 112 is cantilevered elements that are disposed along a pair of mutually opposing inner peripheries of the opening 28 and project from the second surface 12b of the base 12 up to a suitable height. Each extension 112 cuts into and engages with the bulging head 50a of the solidified adhesive 50 (Fig. 10), and firmly anchors the bulging head 50a at a definite position. The outflow preventing section 64 has a pair of walls 114 that differs from the walls 34, 72, 74, 76, 78 of the outflow preventing section 64 of the terminal 60' shown in Fig. 7. The walls 114 exhibit similar adhesive outflow preventing function as a pair of walls 72, 74 described above. In the terminal 110 which has not the first wall 34 described above in the outflow preventing section 64, the end wall portion 114a of the wall 114 corresponding to the end wall portion 74c of the wall 72 described above, functions as the first wall arranged between the contact portion 16 and the opening 28.

The terminal 110 includes an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is a flat plate element extended in the direction projecting (upward in the drawing) from the second surface 12b in the center region 12c of the base portion 12, and is a cantilevered element with the basal end 22a connected to the base portion 12 and with the distal end 22b as a free end. At the tip region of the electric wire connection portion 22, a distal end portion 24 is formed to which an external electric wire (not shown) can be detachably connected. For example, by connecting an external electric wire to the electric wire connection portion 22 of the terminal 110 mounted to an object surface, desired electric current can be supplied to the conductor on the object surface from the external electric wire via the terminal 110.

The electric wire connection portion 22 is fabricated from the same electrically conductive material as the base portion 12 and the contact portion 16. For example, when the base portion 12 is formed by punching in a predetermined shape from a sheet metal material of predetermined thickness in press process, the electric wire connection portion 22 can be formed at the same time by punching and bending. At this time, by compressing and reducing thickness of the sheet metal material of the base portion except the center region 12c (the adhesive support portion included), a part of the base portion 12 and the contact portion 16 can be constructed so as to have thickness smaller than the electric wire connection portion 22.

In terminal 10, 60, 90, 100, 110 according to various embodiments described above, a pair of contact portions 16 is respectively provided at both longitudinal ends of the base portion 12, and a pair of adhesive support portions 18 is respectively provided between the center region 12c of the base portion 12 and the contact portions 16 at both longitudinal ends. Such construction of the terminal can stably maintain proper connection of the electric contact point 14 of the terminal 10, 60, 90, 100, 110 to the conductor 40 of the object surface 38a in good balance. In particular, in case where the mounting region of the object surface 38a for mounting the terminal 10, 60, 90, 100, 110 is concavely curved, contact pressure P' can be easily secured by fixing the center region 12c of the base portion 12 to the object surface 38a as described above.

In contrast, Figs. 13, 14 and 15 respectively show terminals 120, 130 and 140 according to sixth, seventh and eighth embodiments of the present invention having a single contact portion 16 and a single adhesive support portion 18. The terminals 120, 130 and 140 have substantially same construction as the terminal 60 according to the second embodiment (Figs. 5 - 8), the terminal 100 according to the fourth embodiment (Fig. 11) and the terminal 110 according to the fifth embodiment (Fig. 12) except for provision of single contact portion 16 and single adhesive support portion 18. Therefore, corresponding constituents are denoted by common reference numerals or symbols, and detailed description thereof is omitted.

The terminal 120 shown in Fig. 13 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion

18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 120 shown, a single contact portion 16 is provided at one longitudinal end of the base portion 12, while a single adhesive support portions 18 is provided between the other longitudinal end region 12c of the base portion 12 and the contact portions 16 (Fig. 13(a)). The adhesive support portion 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62.

The anchoring section 62 has an extension 122 that differs from the extension 66 of the anchoring section 62 of the terminal 60 shown in Fig. 5. The extension 122 is a cantilevered element that is disposed along an inner periphery of the opening 28 adjoining the other longitudinal end region 12c of the base portion 12 and projects from the second surface 12b of the base 12 up to a suitable height (Fig. 13(b)). The extension 122 cuts into and engages with the bulging head 50a of the solidified adhesive 50 (Fig. 6), and firmly anchors the bulging head 50a at a definite position. The construction of the outflow preventing section 64 is the same as the outflow preventing section 64 of the terminal 60 shown in Fig. 5.

The terminal 120 includes an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is a flat plate element extended in the direction projecting (upward in the drawing) from the second surface 12b in the center region 12c of the base portion 12. The electric wire connection portion 22 is fabricated from electrically conductive material separately from the base portion 12 and the contact portion 16, and is joined to the other longitudinal end region 12c of the base portion 12 at an end region 26 opposite to the distal end portion 24 by a joining means such as calking or the like.

The terminal 130 shown in Fig. 14 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 130 shown, a single contact portion 16 is provided at one longitudinal end of the base portion 12, while a single adhesive support portions 18 is provided between the other longitudinal end region 12c of the base portion 12 and the contact portions 16 (Fig. 14(a)). The adhesive support portion 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62. The construction of the anchoring section 62 and the outflow preventing section 64 is the same as the anchoring section 62 and the outflow preventing section 64 of the terminal 100 shown in Fig. 11 (Fig. 14(b)).

The terminal 130 includes an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is a flat plate

cantilevered element extended in the direction projecting (upward in the drawing) from the second surface 12b in the other longitudinal end region 12c of the base portion 12. The electric wire connection portion 22 is fabricated from same electrically conductive material as the base portion 12 and the contact portion 16, and in the construction shown, is constructed so as to have greater thickness (i.e., twice thicker) than the base portion 12 and the contact portion 16 by superposing the sheet metal material in two-fold.

The terminal 140 shown in Fig. 15 includes a base portion 12, a contact portion 16 extending from the base portion 12 and provided with an electric contact point 14, and an adhesive support portion 18 provided in the base portion 12 separately from the contact portion 16 and capable of supporting an adhesive for bonding the base portion 12 to an object. In the terminal 140 shown, a single contact portion 16 is provided at one longitudinal end of the base portion 12, while a single adhesive support portions 18 is provided between the other longitudinal end region 12c of the base portion 12 and the contact portions 16 (Fig. 15(a)). The adhesive support portion 18 includes an anchoring section 62 having an opening 28 that allows the adhesive before solidification to flow, and an outflow preventing section 64 that is arranged adjacent to the anchoring section 62 and restricts the flow of adhesive before solidification supplied to the anchoring section 62.

The anchoring section 62 has an extension 112 corresponding to one of the extensions 112 of the anchoring section 62 of the terminal 120 shown in Fig. 12 along an inner periphery of the opening 28 adjoining the other longitudinal end region 12c of the base portion 12. Also, the outflow preventing section 64 has, in addition to the wall 114 of the outflow preventing section 64 of the terminal 110 shown in Fig. 12, a first wall 34 corresponding to the first wall 34 of the outflow preventing section 64 of the terminal 60 shown in Fig. 5. Further, the outflow preventing section 64 has a groove 94 corresponding to one of the grooves 94 of the outflow preventing section 92 of the terminal 90 shown in Fig. 9 at a position adjoining the other longitudinal end region 12c of the base portion 12 (Fig. 15(b)).

The terminal 140 includes an electric wire connection portion 22 extending from the base portion 12 separately from the contact portion 16. The electric wire connection portion 22 is a flat plate cantilevered element extended in the direction projecting (upward in the drawing) from the second surface 12b in the other longitudinal end region 12c of the base portion 12. The electric wire connection portion 22 is fabricated from same electrically conductive material as the base portion 12 and the contact portion 16. In the construction shown, by compressing sheet metal material to reduce thickness in a part of the base portion 12 except the other longitudinal end region 12c (including the adhesive support portion 18) and the contact portion 16, a part of the base portion 12 and the contact portion 16 have smaller thickness than the electric wire connection portion 22.

Anyone of the terminals 120, 130, 140 shown in Figs. 13, 14, 15 has the outflow preventing section 64 provided in the single adhesive support portion 18, so that outflow (i.e., loss) of the liquid adhesive 48 (Fig. 6) from the adhesive support portion 18 to the outside can be reduced, so that, by supplying minimum amount of required adhesive 48, the solidified adhesive 50 (Fig. 6) in the shape of

mushroom can be formed in shape and size sufficient to exhibit required anchoring force. Such an adhesive supplying operation ensures sufficiently large mutual contact area of the solidified adhesive 50 and the terminal 120, 130, 140, and can be carried out reproducibly irrespective of the viscosity of the adhesive and the skill of the workers.

The terminal 10, 60, 90, 100, 110, 120, 130, 140 according to various embodiments can be used, for example, as a terminal for electric heating wire annexed as anti-tarnishing to a vehicle rear window. Electric heating wire for a rear window is formed in general by printing electrically conductive paste in a predetermined pattern to a glass plate, and terminals are provided at the ends of this electric heating wire. By using the terminal 10, 60, 90, 100, 110, 120, 130, 140, the electric heating wire can be connected to the terminal 10, 60, 90, 100, 110, 120, 130, 140 stably for a long period without using a solder.

The terminal 10, 60, 90, 100, 110, 120, 130, 140 according to various embodiments described above can be used, for example, by surface-mounting on a substrate board such as a print wiring board. The terminal 10, 60, 90, 100, 110, 120, 130, 140 can be easily and reliably connected to conductor that is difficult to be joined by soldering such as aluminum or conductive ceramics.

Description of Reference Numerals

10, 60, 90, 100, 110, 120, 130, 140 -----terminal

12 -----base portion

14 -----electric contact point

16 -----contact portion

18 -----adhesive support portion

20 -----arm portion

22 -----electric wire connection portion

28 -----opening

30, 62 -----anchoring section

32, 64, 92 -----outflow preventing section

34, 36, 52, 68, 72, 74, 114 -----wall (first surface)

48 -----adhesive (before solidification)

50 -----adhesive (after solidification)

54 -----surrounding wall

66, 112, 122 -----extension

70, 76, 78, 80 -----wall (second surface)

94 -----groove

Following are exemplary embodiments of a terminal according to aspects of the present invention.

Embodiment 1 is a terminal comprising: a base portion having a first surface and a second surface, opposite to each other; a contact portion extending from said base portion, said contact portion provided with an electric contact point at a position beyond said first surface of said base portion; an adhesive support portion provided in said base portion separately from said contact portion, said adhesive support portion capable of supporting an adhesive for bonding said base portion to an object; said adhesive support portion comprising: an anchoring section including an opening adapted to allow the adhesive to flow through said opening before the adhesive is solidified, said anchoring section capable of being engaged with and anchoring the adhesive penetrated through said opening after the adhesive is

solidified; and an outflow preventing section arranged adjacent to said anchoring section, said outflow preventing section capable of restricting a flow of the adhesive supplied to said anchoring section before the adhesive is solidified, and preventing the adhesive from flowing out of said adhesive support portion before the adhesive is solidified; said outflow preventing section comprising a first wall bent L-shape configuration at a side of said first surface of said base portion and arranged between said contact portion and said opening.

Embodiment 2 is a terminal comprising: a base portion having a first surface and a second surface, opposite to each other; a contact portion extending from said base portion, said contact portion provided with an electric contact point at a position beyond said first surface of said base portion; an adhesive support portion provided in said base portion separately from said contact portion, said adhesive support portion capable of supporting an adhesive for bonding said base portion to an object; said adhesive support portion comprising: an anchoring section including an opening coplanar with said base portion and adapted to allow the adhesive to flow through said opening before the adhesive is solidified, said anchoring section capable of being engaged with and anchoring the adhesive penetrated through said opening after the adhesive is solidified; and an outflow preventing section arranged adjacent to said anchoring section, said outflow preventing section capable of restricting a flow of the adhesive supplied to said anchoring section before the adhesive is solidified, and preventing the adhesive from flowing out of said adhesive support portion before the adhesive is solidified; said outflow preventing section comprising a first wall formed uprightly at a side of said first surface of said base portion and arranged between said contact portion and said opening.

Embodiment 3 is the terminal of embodiment 1 or 2, wherein said outflow preventing section comprises a second wall arranged in opposition to said first wall with said opening interposed therebetween.

Embodiment 4 is the terminal of embodiment 3, wherein said outflow preventing section comprises a third wall cooperating with said first wall and said second wall to substantially surround said opening.

Embodiment 5 is the terminal of embodiment 1 or 2, wherein said outflow preventing section comprises a single surrounding wall continuously surrounding said opening, said surrounding wall provided integrally with said first wall as a unitary structure.

Embodiment 6 is the terminal of anyone of embodiments 1-5, wherein said outflow preventing section comprises a wall formed uprightly at a side of said second surface of said base portion.

Embodiment 7 is the terminal of anyone of embodiments 1-6, wherein said outflow preventing section comprises a groove recessed in said second surface of said base portion.

Embodiment 8 is the terminal of anyone of embodiments 1-7, further comprising an electric wire connection portion formed integrally with said base portion as a unitary structure.

Embodiment 9 is the terminal of embodiment 8, wherein said base portion, said contact portion and said electric wire connection portion are formed from a common sheet metal; and wherein said electric wire connection portion is configured by superimposing sheet metals on each other and has a thickness larger than a thickness of said base portion.

Embodiment 10 is the terminal of embodiment 8, wherein said base portion, said contact portion and said electric wire connection portion are formed from a common sheet metal; and wherein said contact portion and a part of said base portion are configured by compressing a sheet metal and have a thickness less than a thickness of said electric wire connection portion.

Although specific embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations calculated to achieve the same purposes may be substituted for the specific embodiments shown and described without departing from the scope of the present invention. Those with skill in the mechanical, electro-mechanical, and electrical arts will readily appreciate that the present invention may be implemented in a very vide variety of embodiments. This application is intended to cover any adoptions or variations of the preferred embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.

What is claimed is:

1. A terminal comprising:

a base portion having a first surface and a second surface, opposite to each other;

a contact portion extending from said base portion, said contact portion provided with an electric contact point at a position beyond said first surface of said base portion;

an adhesive support portion provided in said base portion separately from said contact portion, said adhesive support portion capable of supporting an adhesive for bonding said base portion to an object;

said adhesive support portion comprising:

an anchoring section including an opening adapted to allow the adhesive to flow through said opening before the adhesive is solidified, said anchoring section capable of being engaged with and anchoring the adhesive penetrated through said opening after the adhesive is solidified; and

an outflow preventing section arranged adjacent to said anchoring section, said outflow preventing section capable of restricting a flow of the adhesive supplied to said anchoring section before the adhesive is solidified, and preventing the adhesive from flowing out of said adhesive support portion before the adhesive is solidified;

said outflow preventing section comprising a first wall bent L-shape configuration at a side of said first surface of said base portion and arranged between said contact portion and said opening.

2. A terminal comprising:

a base portion having a first surface and a second surface, opposite to each other;

a contact portion extending from said base portion, said contact portion provided with an electric contact point at a position beyond said first surface of said base portion;

an adhesive support portion provided in said base portion separately from said contact portion, said adhesive support portion capable of supporting an adhesive for bonding said base portion to an object;

said adhesive support portion comprising:

an anchoring section including an opening coplanar with said base portion and adapted to allow the adhesive to flow through said opening before the adhesive is solidified, said anchoring section capable of being engaged with and anchoring the adhesive penetrated through said opening after the adhesive is solidified; and

an outflow preventing section arranged adjacent to said anchoring section, said outflow preventing section capable of restricting a flow of the adhesive supplied to said anchoring section before

the adhesive is solidified, and preventing the adhesive from flowing out of said adhesive support portion before the adhesive is solidified;

said outflow preventing section comprising a first wall formed uprightly at a side of said first surface of said base portion and arranged between said contact portion and said opening.

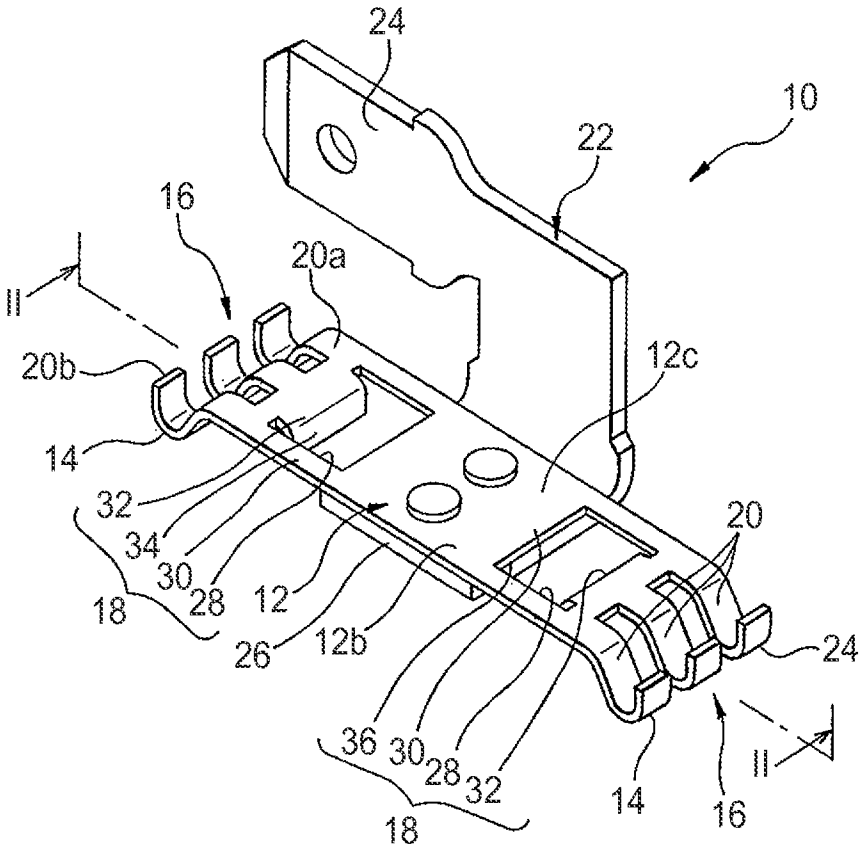
3. The terminal of claim 1 or 2, wherein said outflow preventing section comprises a second wall arranged in opposition to said first wall with said opening interposed therebetween.

4. The terminal of anyone of claims 1-3, wherein said outflow preventing section comprises a groove recessed in said second surface of said base portion.

5. The terminal of anyone of claims 1-4, further comprising an electric wire connection portion formed integrally with said base portion as a unitary structure.

6. The terminal of claim 5, wherein said base portion, said contact portion and said electric wire connection portion are formed from a common sheet metal; and wherein said electric wire connection portion is configured by superimposing sheet metals on each other and has a thickness larger than a thickness of said base portion.

7. The terminal of claim 5, wherein said base portion, said contact portion and said electric wire connection portion are formed from a common sheet metal; and wherein said contact portion and a part of said base portion are configured by compressing a sheet metal and have a thickness less than a thickness of said electric wire connection portion.


24
10
22
16
20a
II
20b
12c
14
32
34
30
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12
18
26
12b
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24
36
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28
32
14
16
II
18

FIG. 1

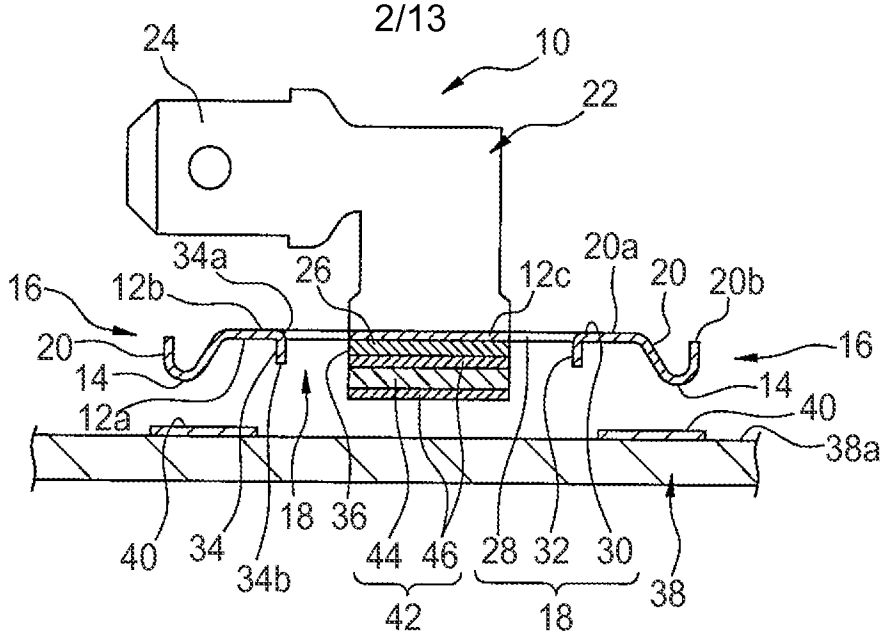

FIG. 2a

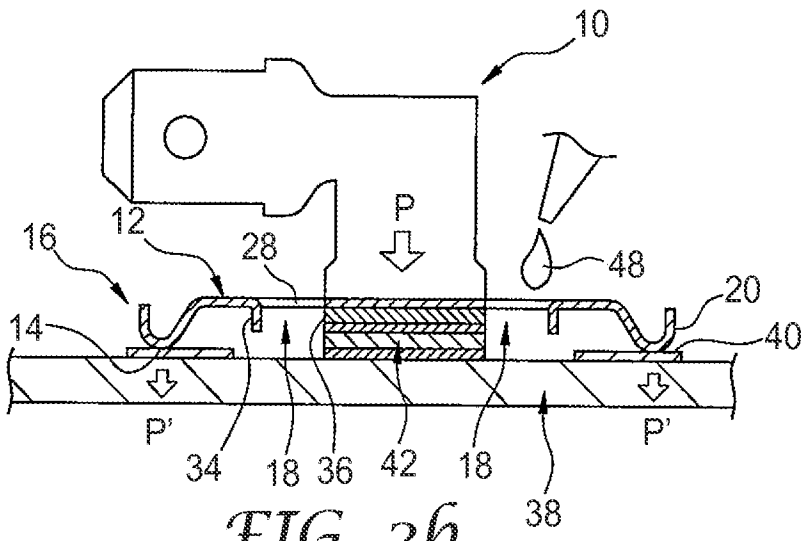

FIG. 2b

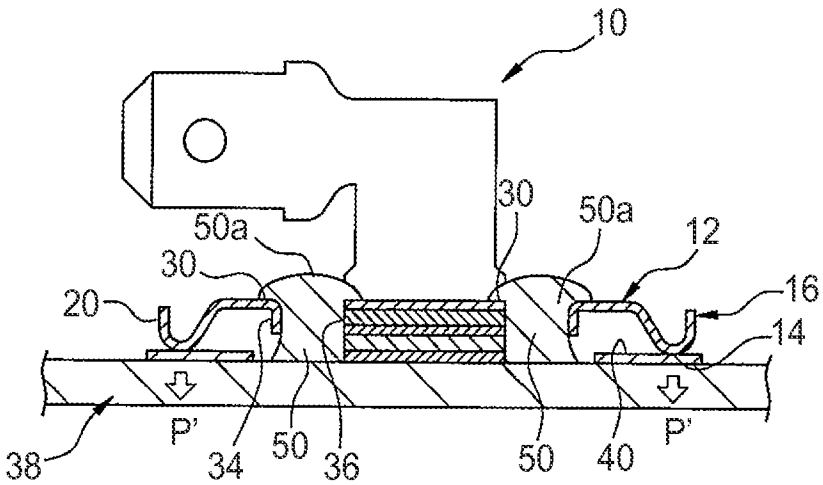

FIG. 2c

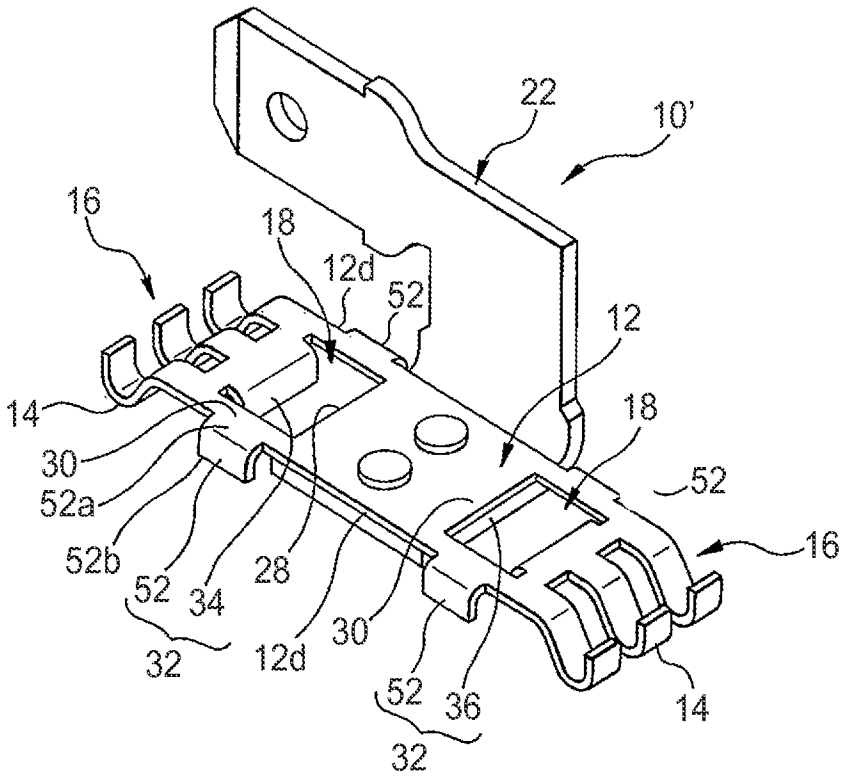
22
10'
16
18
12d
52
12
14
18
30
52
52a
16
52b
52
34
28
30
12d
52
36
14
32
32

FIG. 3

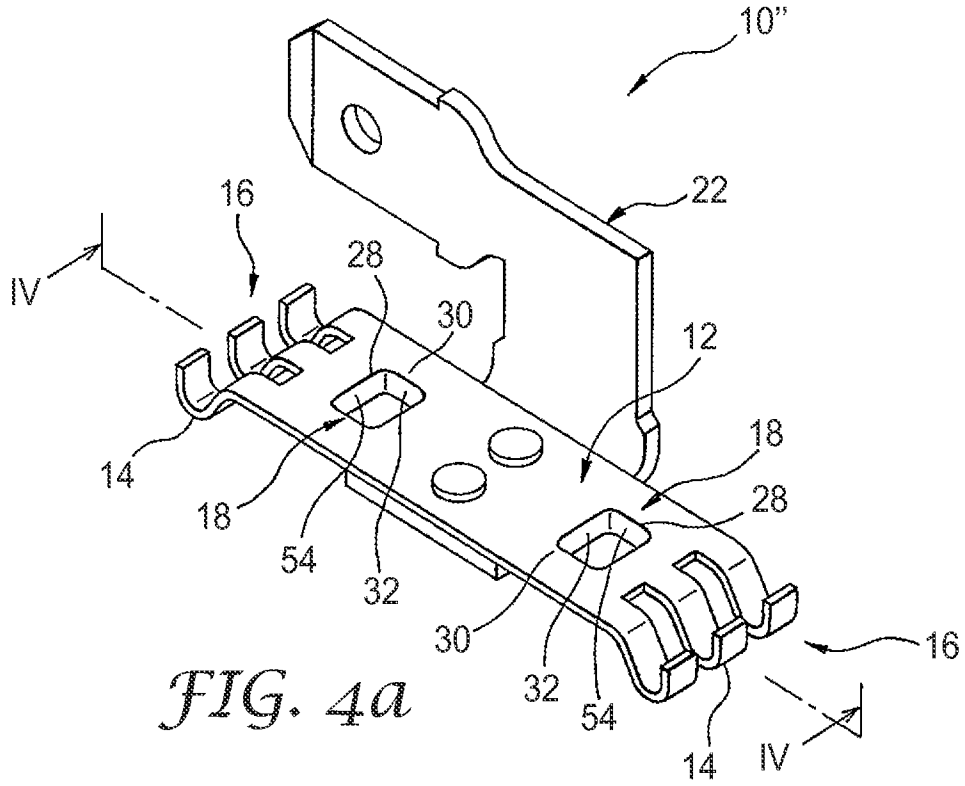
10''
22
16
IV
28
30
12
14
18
18
28
54
32
30
32
54
16
14
IV

FIG. 4a

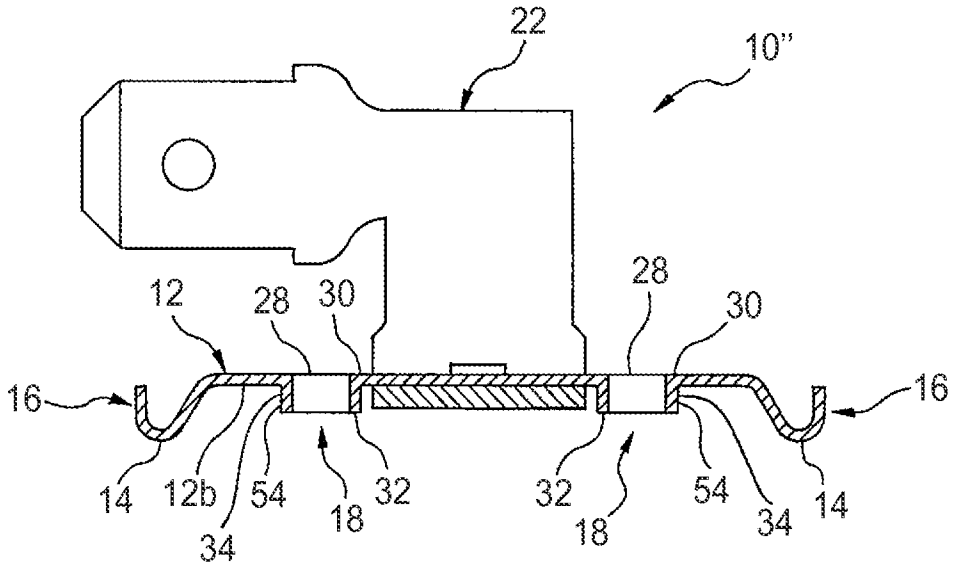
22
10''
12
28
30
28
30
16
16
14
12b
54
18
32
32
18
54
34
14
34

FIG. 4b

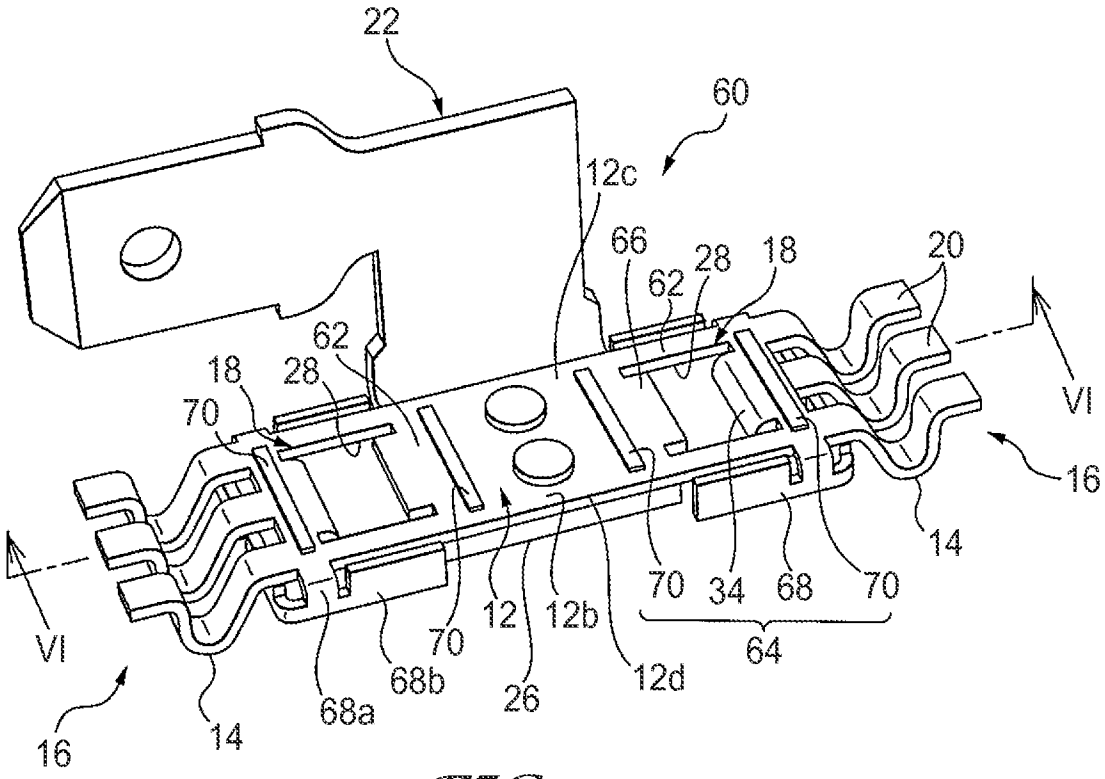
22
60
12c
66
62
28
18
20
62
18
28
70
VI
16
14
70
34
68
70
12
12b
64
VI
16
14
68a
68b
70
26
12d

FIG. 5a

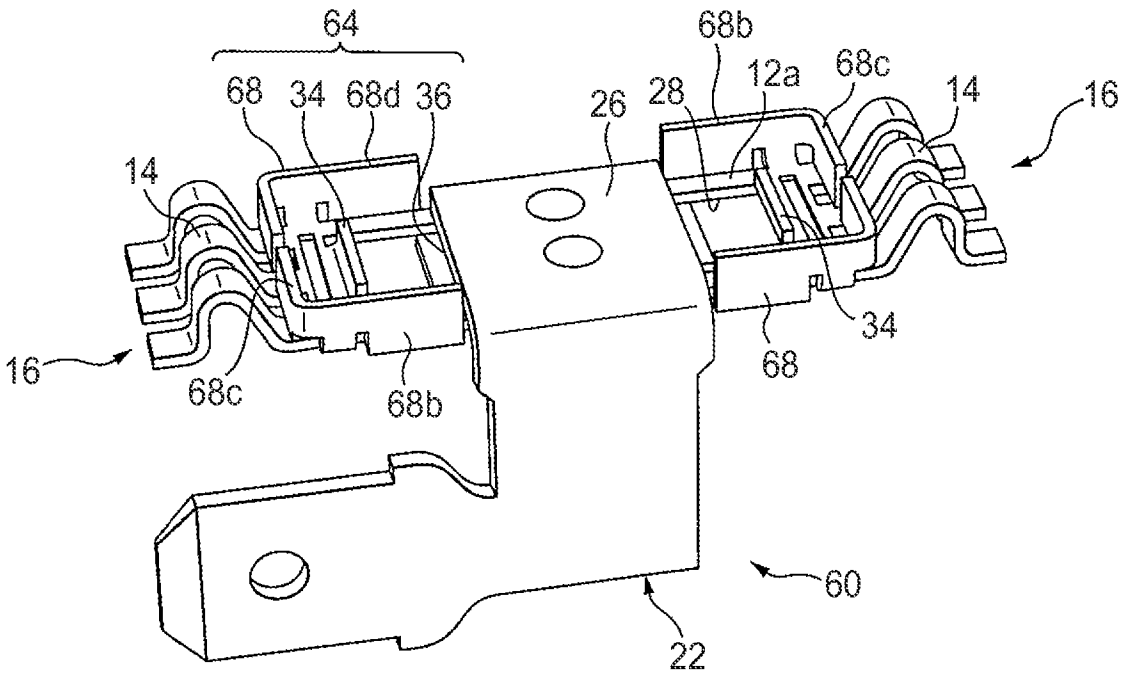
64
68b
68
34
68d
36
26
28
12a
68c
14
16
14
16
68c
68b
34
68
60
22

FIG. 5b

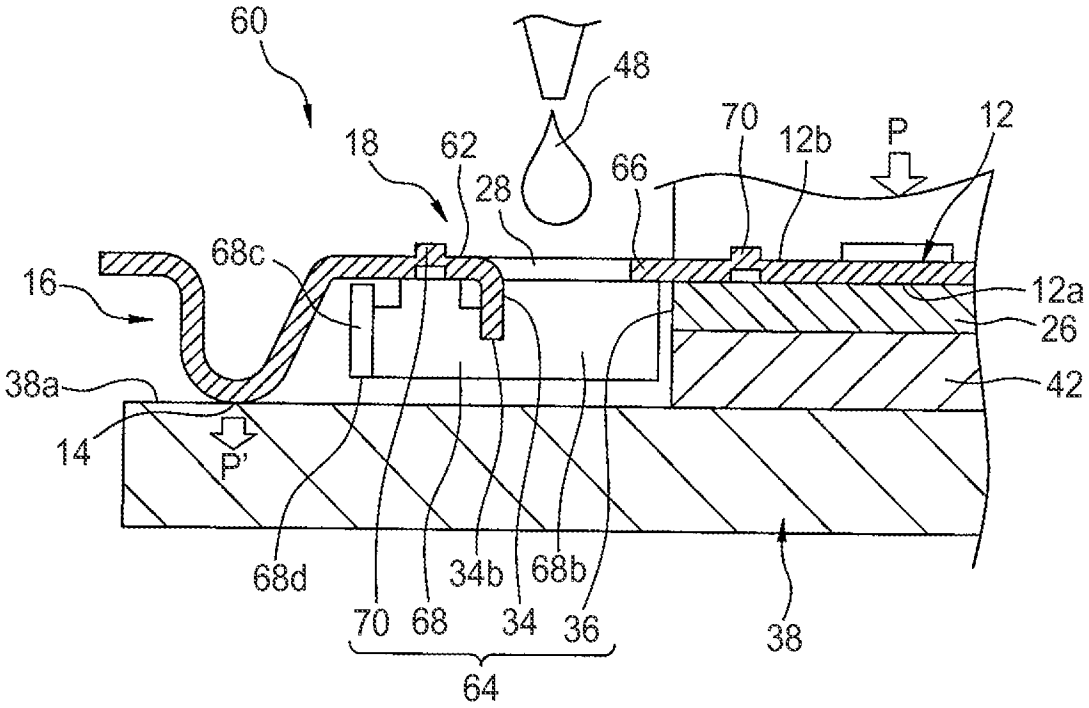
60
48
18
62
28
66
70
12b
P
12
68c
16
12a
26
38a
42
14
P'
68d
34b
68b
70
68
34
36
38
64

FIG. 6a

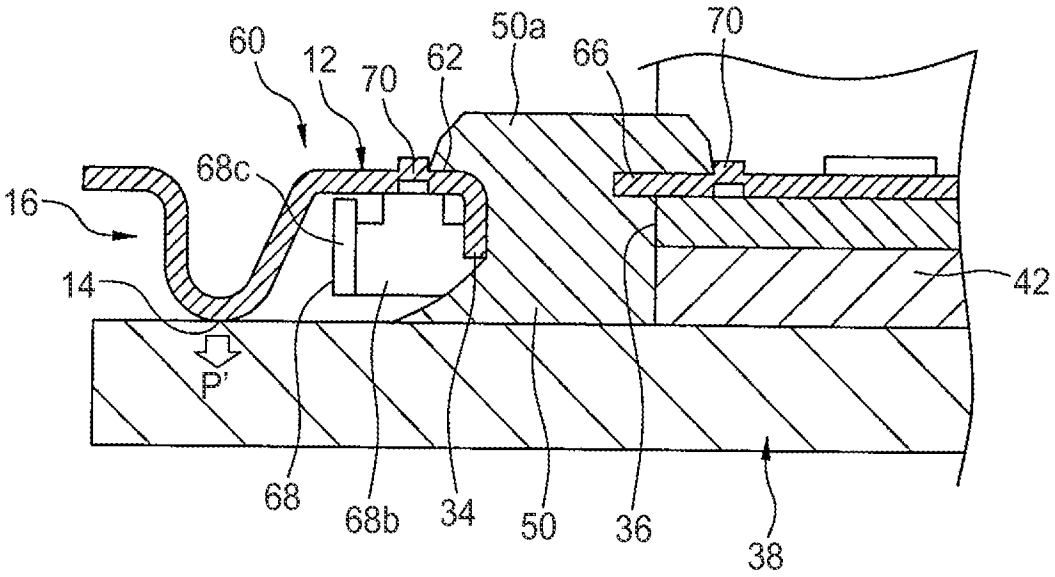
60
12
70
62
50a
66
70
68c
16
42
14
P'
68
68b
34
50
36
38

FIG. 6b

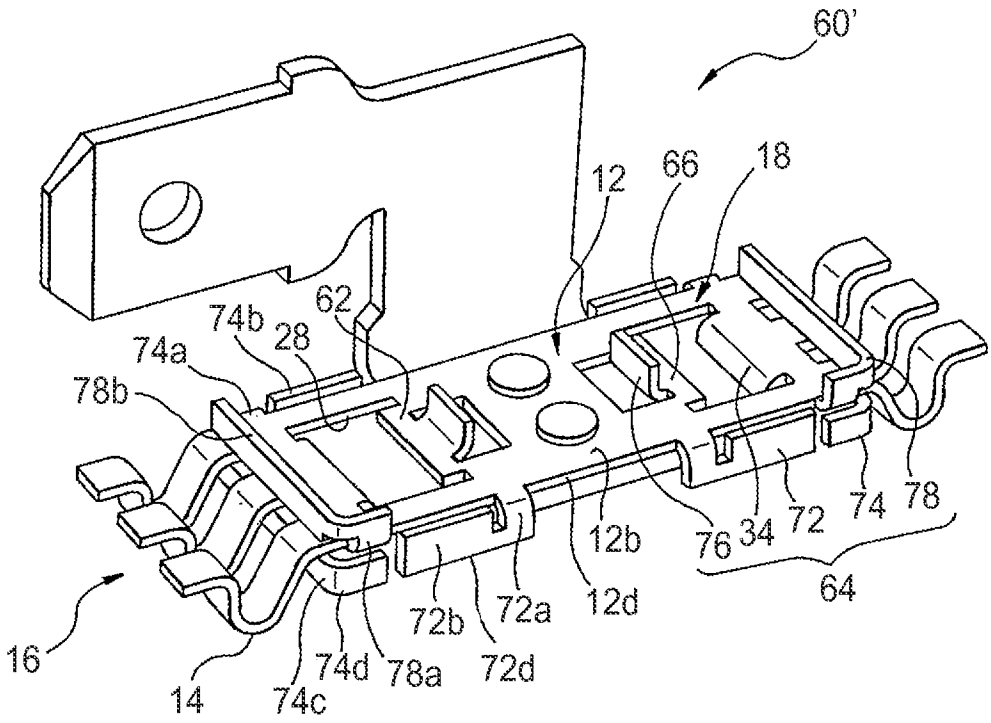
60'
12
66
18
62
74b
28
74a
78b
12b
76
34
72
74
78
64
72b
72a
12d
16
14
74c
74d
78a
72d

FIG. 7

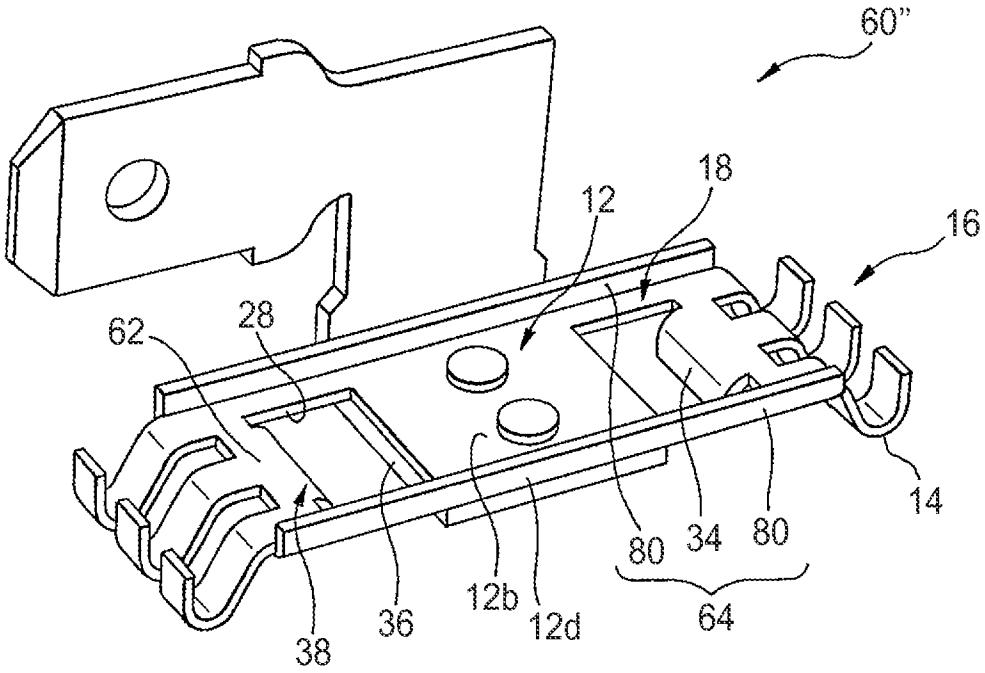
60"
18
12
16
62
28
14
80
34
80
12b
12d
64
36
38

FIG. 8

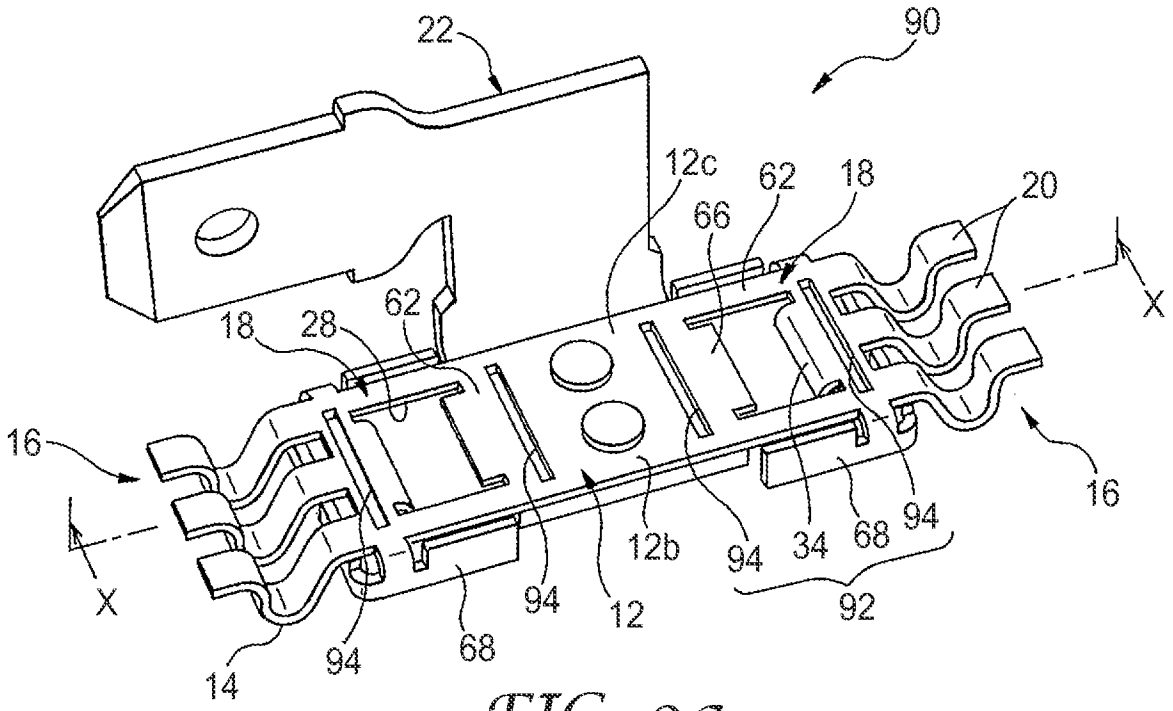
22
90
12c
62
18
66
20
18
28
62
X
16
16
X
94
34
68
94
12b
94
68
94
12
92
14

FIG. 9a

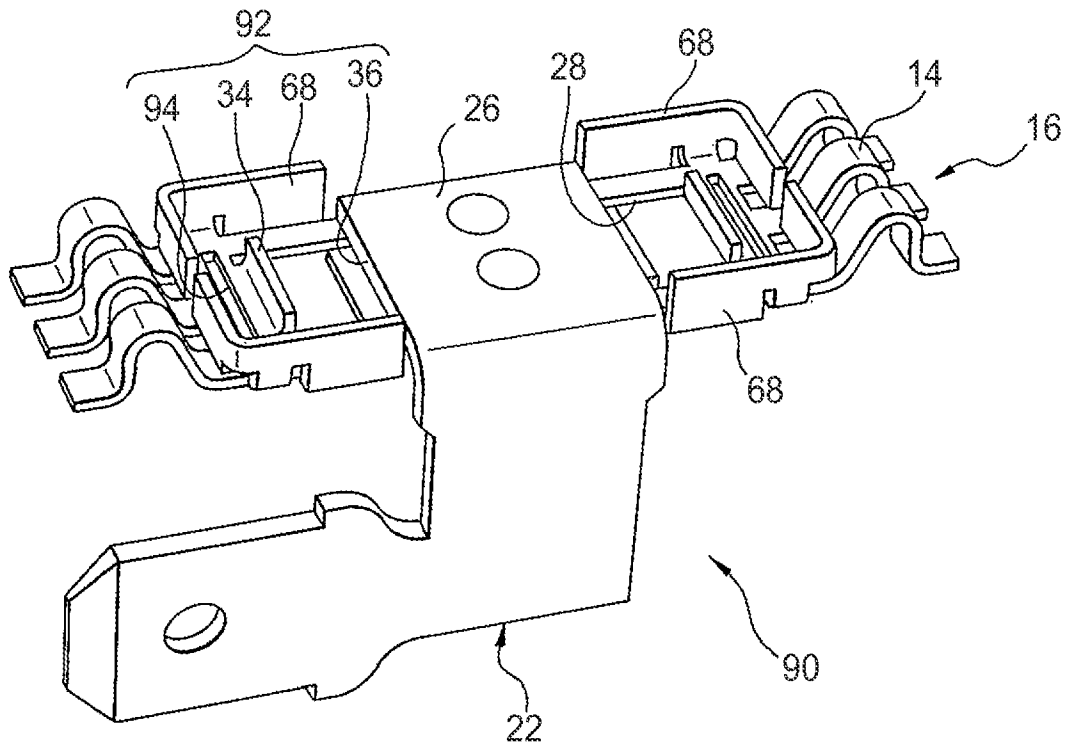
92
94
34
68
36
26
28
68
14
16
68
90
22

FIG. 9b

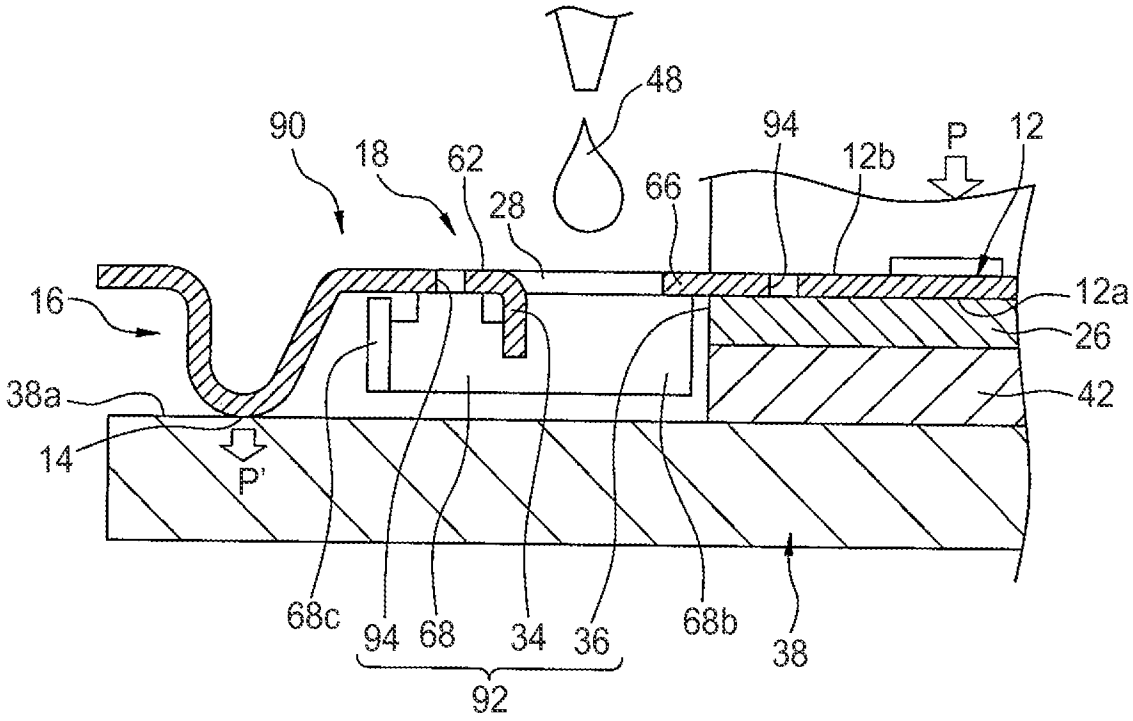

FIG. 10a

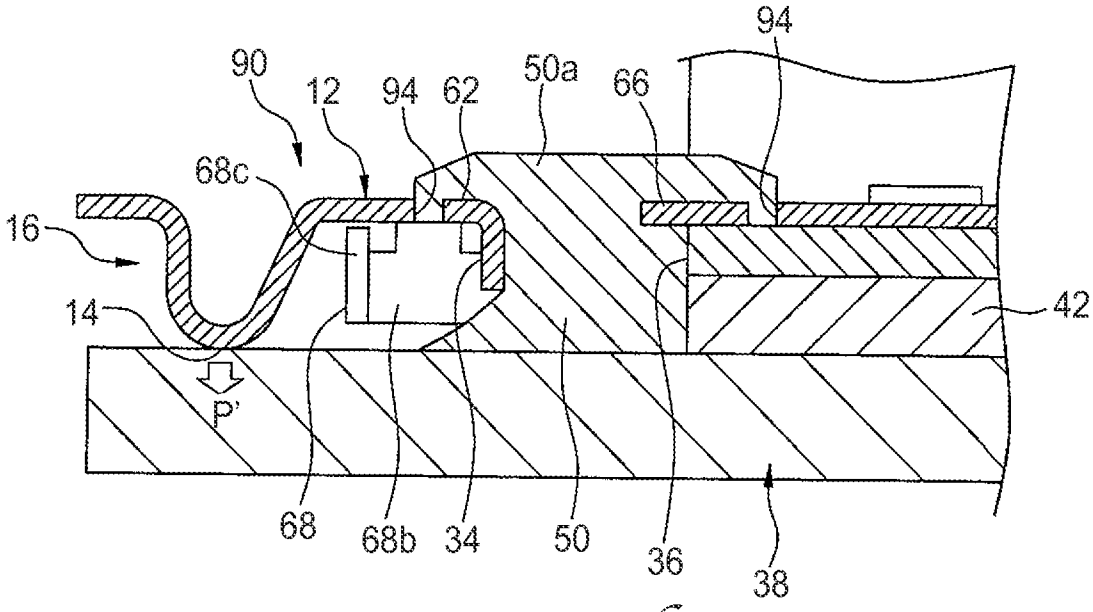

FIG. 10b

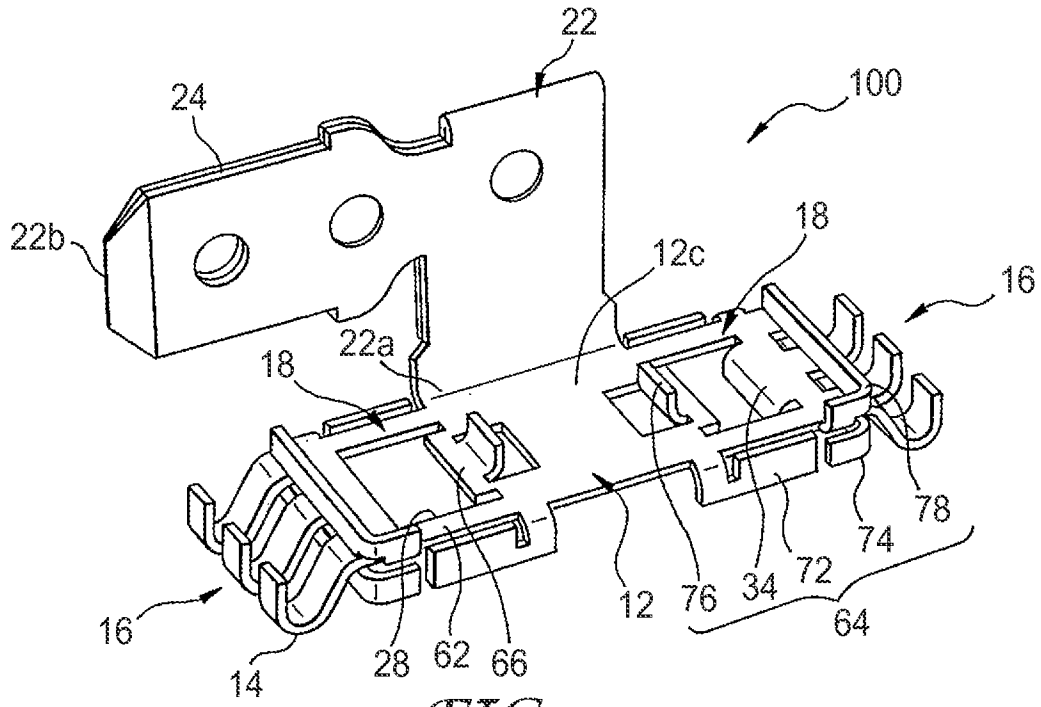
22
24
100
22b
12c
18
16
22a
18
78
74
72
34
76
12
64
16
14
28
62
66

FIG. 11

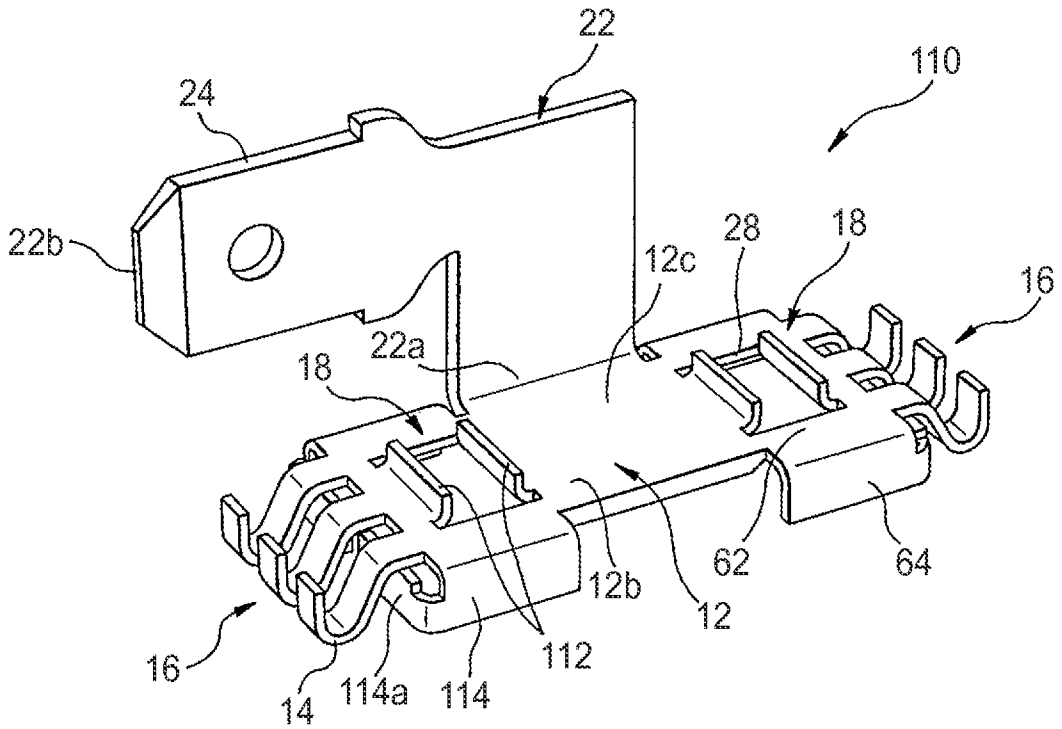
22
110
24
22b
28
18
12c
16
22a
18
62
64
12b
12
16
14
114a
114
112

FIG. 12

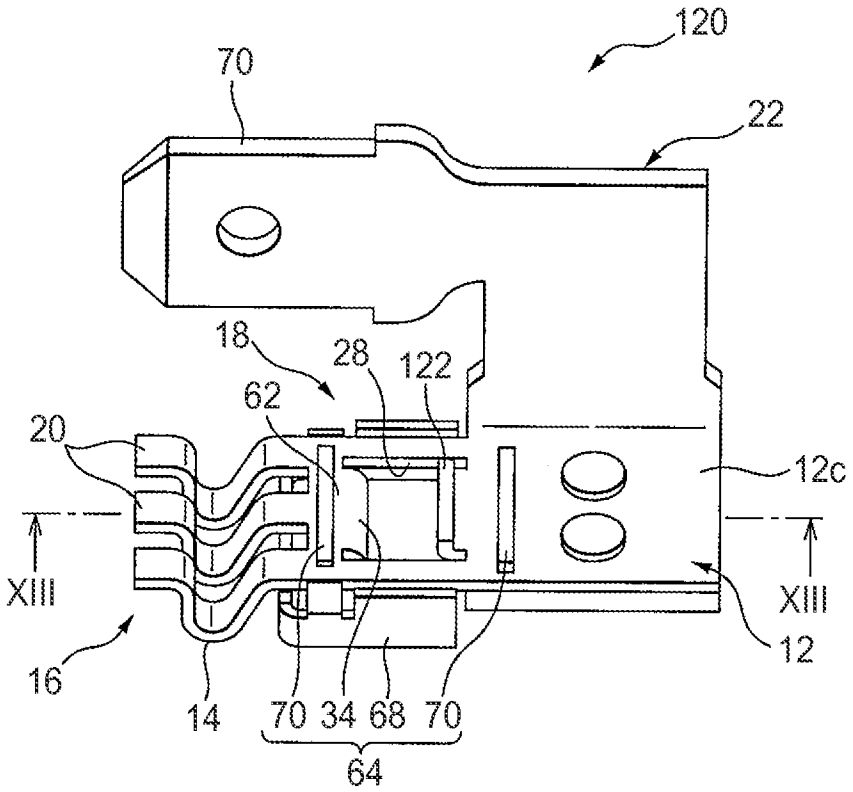

FIG. 13a

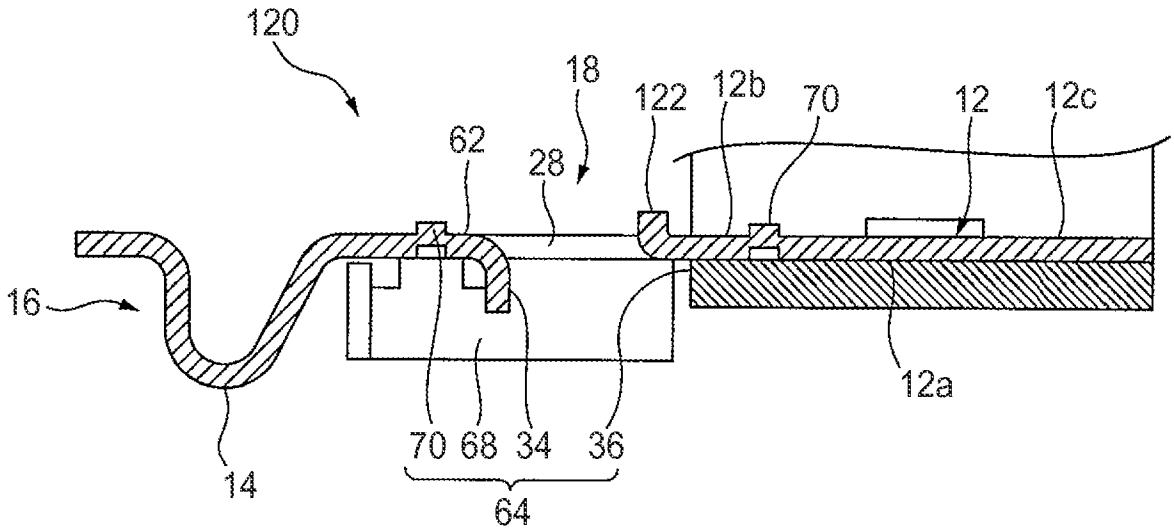

FIG. 13b

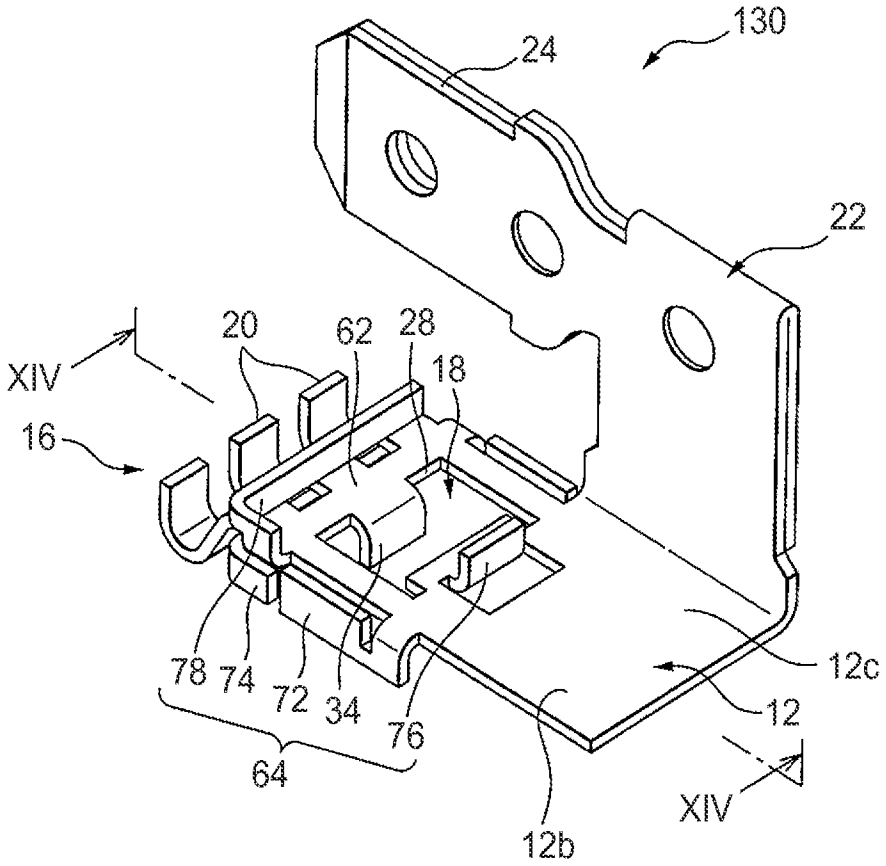

FIG. 14a

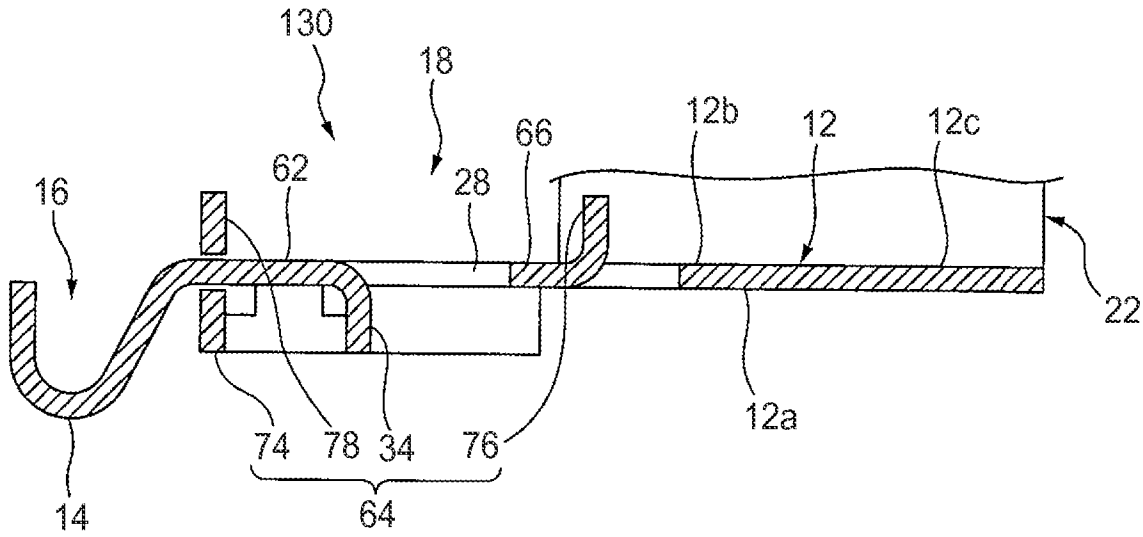

FIG. 14b

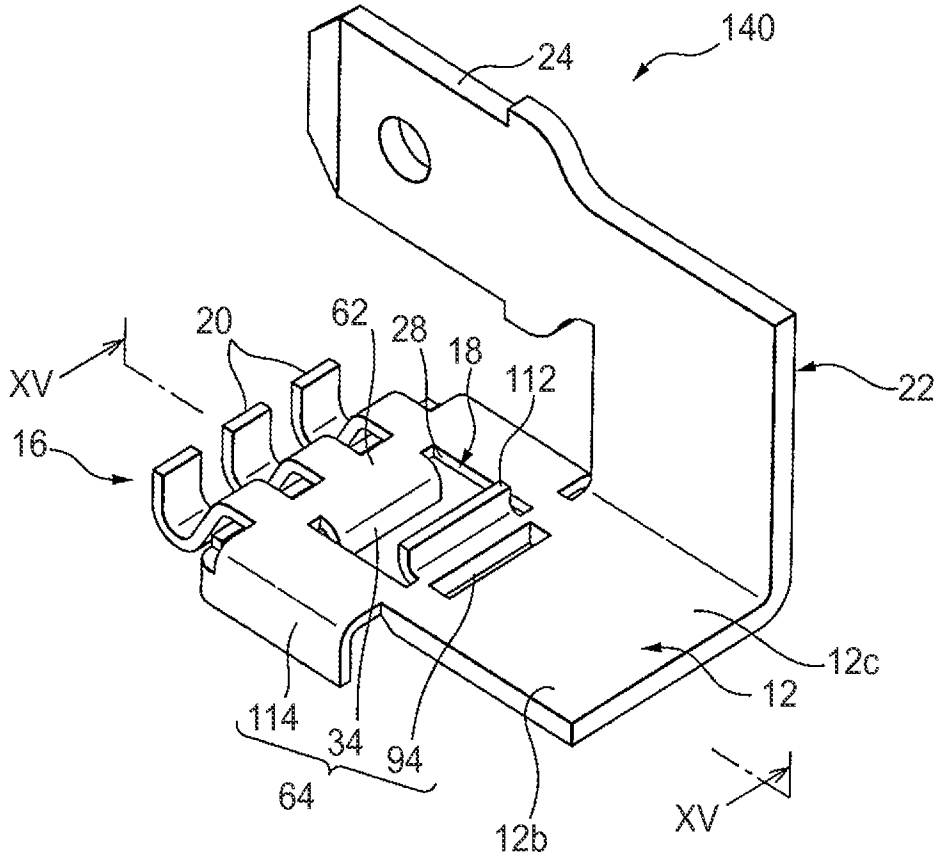

FIG. 15a

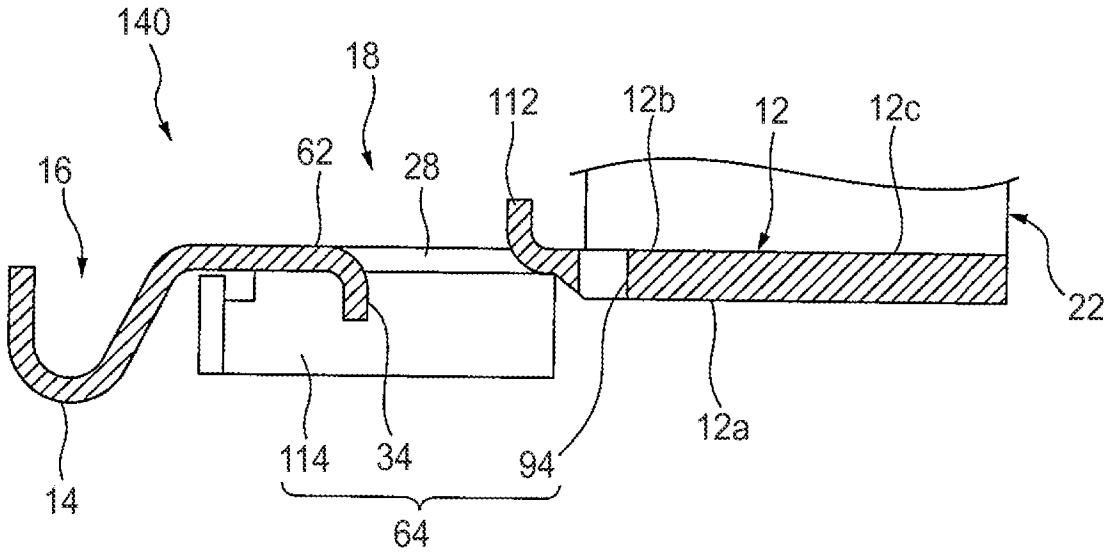

FIG. 15b

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/037871

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01R9/16 H01R12/57 H01Q1/12
ADD. H01R4/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01R H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2010/100961 A1 (NIPPON SHEET GLASS CO LTD [JP]; TOKIWA JUNICHI [JP]) 10 September 2010 (2010-09-10) cited in the application abstract; figure 2	1,2
A	US 2007/029301 A1 (TOKIWA JUNICHI [JP] ET AL) 8 February 2007 (2007-02-08) paragraphs [0028] - [0029]; figures 1-5	1,2
A	GB 1 055 074 A (STANDARD TELEPHONES CABLES LTD) 11 January 1967 (1967-01-11) page 1, line 85 - page 2, line 29; figures 5-6	1,2

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2012	02/08/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Jiménez, Jesús

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/037871

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2009 105036 A (THREE M INNOVATIVE PROPERTIES) 14 May 2009 (2009-05-14) cited in the application abstract; figure 1	1
A	US 2001/041467 A1 (KIKUCHI EIJI [JP] ET AL) 15 November 2001 (2001-11-15) claim 1; figures 4-6	1,2

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/037871

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010100961 A1	10-09-2010	CA 2753517 A1	10-09-2010
		CN 102439794 A	02-05-2012
		EP 2405535 A1	11-01-2012
		JP 2010211924 A	24-09-2010
		US 2012067641 A1	22-03-2012
		WO 2010100961 A1	10-09-2010
US 2007029301 A1	08-02-2007	CN 1897356 A	17-01-2007
		DE 102006032114 A1	22-02-2007
		JP 2007018981 A	25-01-2007
		US 2007029301 A1	08-02-2007
GB 1055074 A	11-01-1967	BE 649646 A	24-12-1964
		GB 1055074 A	11-01-1967
		NL 294503 A	23-07-2012
JP 2009105036 A	14-05-2009	JP 2009105036 A	14-05-2009
		US 2011163569 A1	07-07-2011
US 2001041467 A1	15-11-2001	JP 2001319716 A	16-11-2001
		US 2001041467 A1	15-11-2001