(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 518 568 A2**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **92305175.9**

(51) Int. Cl.5: **H01R 13/115**

(22) Date of filing: **05.06.92**

(30) Priority: **12.06.91 JP 167643/91**

(43) Date of publication of application:
16.12.92 Bulletin 92/51

(84) Designated Contracting States:
DE FR GB IT

(71) Applicant: **YAMAICHI ELECTRIC CO., LTD.**
28-7, Nakamagome 3-chome
Ohta-ku, Tokyo(JP)

(72) Inventor: **Takayanagi, Shigeyuki**
1565-1, Koyagi-cho
Takasaki-shi, Gumma-ken(JP)

(74) Representative: **Ben-Nathan, Laurence Albert**
Urquhart-Dykes & Lord 91 Wimpole Street
London W1M 8AH(GB)

(54) **Sleeve contact.**

(57) An inner contact 2 is accommodated in a sleeve-like outer shell 1. Both ends of a plurality of lead clamping elastic contact elements 5 of the inner contact 2 are connected to a closed end side ring portion 4 and to an open end side ring portion 3, respectively. Central portions of the lead clamping elastic contact elements 5 are bent in the circumferential direction of the two ring portions, and twisted, and further bent into an inner area of the two ring portions. The central portions are served as a pressure contact portion 8 for clamping an IC lead 7.

EP 0 518 568 A2

BACKGROUND OF THE INVENTION

This invention relates to a sleeve contact comprising a sleeve-like outer shell for receiving or accommodating an IC lead, and an inner contact for clamping the IC lead.

A conventional sleeve contact of the type mentioned above comprises a sleeve-like outer shell having a closed end and an open end, and an inner contact accommodated in the outer shell. The inner contact has a ring portion tightly fitted to an inner peripheral wall surface of the outer shell, and a plurality of lead clamping elastic contact elements extending from this ring portion. Free end portions of the lead clamping elastic contact elements form a contact portion for catching the IC lead accommodated in the outer shell.

However, because of the structural limitation in that the lead clamping elastic contact elements of the inner contact are accommodated and supported in the sleeve-like outer shell in a cantilevered fashion, and the IC lead is caught by the free ends of the contact elements which are supported in a cantilevered fashion, in order to establish a contact relation, this prior art device has the shortcomings in that if the sleeve contact is made small and the inner contact is miniaturized, it is practically impossible to provide, in this cantilevered spring structure, a sufficient amount of elastic pressure for clamping the IC lead accommodated in the sleeve-like outer shell. As a result, desirable reduction in diameter of the sleeve-like outer shell and miniaturization of the sleeve contact are restricted.

Furthermore, since the cantilevered spring forming the lead clamping contact elements merely extends in the axial direction of the outer shell, its length in the axial direction of the outer shell is long, which, in turn, increases the length of the inner contact. If the length of this inner contact is made short in an attempt to miniaturize the overall structure of the device, a required length of the spring is unobtainable, thus resulting in decrease of reliability of contact with the IC lead.

Moreover, in the conventional structure of the contact element, in which the lead clamping contact elements are formed of a cantilevered spring extending in the axial direction of the outer shell, an oxide skin or film on the surface of the IC lead is difficult to be removed to a fully satisfactory extent, and the above-mentioned decrease in reliability is further advanced.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide, in order to solve the above problems, a sleeve contact, in which an inner contact for catching an IC lead can be reduced in diameter, and therefore the sleeve contact itself can be made small , and the IC lead can be clamped properly.

To achieve the above object, according to the present invention, the inner contact is provided with a closed end side ring portion, an open end side ring portion, and a plurality of lead clamping elastic contact elements extending between the two ring portions, both ends of the elastic contact elements being connected to the two ring portions so as to contact an IC lead.

From another aspect of the present invention, central portions of lead clamping elastic contact elements are bent towards the circumferential direction of an outer shell, the central portions being twisted relative to an axis of the outer shell and bent into an inner area of the two ring portions.

From a further aspect of the present invention, those portions of contact elements connected to a closed end side ring portion and an open end side ring portion of the lead clamping elastic contact elements, respectively, are allowed to extend inclining in opposite ways relative to an axis of the sleeve-like outer shell, an area of connection between both the contact element portions being bent into an inner area of both the ring portions and twisted to form a pressure contact portion for clamping a lead.

According to the present invention, the lead clamping elastic contact elements extend between the closed end side ring portion and the open end side ring portion with both the ends of the contact elements connected to the two ring portions (that is, the contact elements are supported by both the ends thereof). Therefore, even if the inner contact is miniaturized, a sufficient amount of contact pressure can still be obtained owing to the elastic contact elements, and a proper contact relation can be realized by providing a pressure contact portion for clamping the IC lead, at the central portions of the elastic contact elements, which are supported by both the ends.

Furthermore, by twisting the elastic contact elements which are bent or inclined in the circumferential direction, the edge portion is allowed to contact the surface of the IC lead to remove any oxide film. By virtue of the foregoing construction, a contact pressure can be increased so as to realize a highly reliable contact relation between the sleeve contact and the IC lead. Moreover, the diameter of the inner contact can be reduced, and the sleeve contact can be made small. At the same time, a sufficient amount of contact pressure can be obtained with respect to the IC lead inserted, thus enabling to realize a highly reliable contact relation.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a sleeve contact according to one embodiment of the present invention;
Fig. 2 is a sectional view of the above;
Fig. 3 is a sectional view taken on line A-A of Fig. 2;
Fig. 4 is a plan view for explaining a twisted state of a pressure contact portion in an inner contact;
Fig. 5 is an expanded view showing a punched-out state of the inner contact;
Fig. 6 is a side view of the above.

DETAILED DESCRIPTION OF THE EMBODIMENT

One embodiment of the present invention will now be described in detail with reference to Figs. 1 through 6 inclusive. As is shown in Fig. 2, a sleeve contact comprises a sleeve-like outer shell 1, and an inner contact 2 received or accommodated in the sleeve-like outer shell 1. This sleeve-like outer shell 1 has an open end 1a, and a closed end 1b. An inner peripheral wall surface of the opening end 1a is enlarged as it goes outwardly of the sleeve-like outer shell 1 thereby to form a tapered portion 1c, so that insertion of the inner contact 2 would be facilitated. A flange 1d is formed on the opening end 1a side in order to set an implanting depth into a contact implanting hole formed in a contact board, and a press-fit claw 1e is formed on the outer peripheral surface of the flange 1d so as to be press-fitted to the inner wall of the cavity.

Fig. 5 is an expanded view of the inner contact 2, showing a punched-out state thereof. The inner contact 2 is punched out in parallel relation such that the length of an opening end side ring portion 3 is longer than the length of a closed end side ring portion 4, and at the same time, elongated narrow lead clamping elastic contact elements 5 having equal widths are disposed at equal spaces, extending between the two ring portions 3 and 4, with both ends 5a and 5b of the contact elements 5 connected to the inner edges of the ring portions 3 and 4.

Also, the inner contact 2 is punched out such that the central portions of the elastic contact elements 5 are bent at an angle of α 1 in the same direction, and those portions 5c of the contact elements connected with the open end side ring portion 3 and those portions 5d of the contact elements connected with the closed end side ring portion 4 are inclined in the opposite direction with each other and linearly extended. The elastic contact elements 5 are connected together at their central portions which are generally equidistant from the two ring portions 3 and 4, thereby forming a generally V-shaped configuration as a whole.

At this time, the bending angle α 1 at the central portions is set to an obtuse angle of 90° or more, and preferably in a range of from 110° to 140° .

After punched out, the inner contact 2 is bent into a cylindrical shape so that both the opening end side ring portion 3 having a large diameter and closed end side ring portion 4 having a small diameter are formed in concentric ring shapes, respectively. Split spaces 3a and 4a are formed between the end portions of the respective ring portions 3 and 4, so that the ring portion 3 is press fitted into the cylindrical inner cavity of the sleeve-like outer shell in its reduced diameter owing to the provision of the split space 3a in the ring portion 3 and tightly fitted to the surface of the inner peripheral wall of the cylindrical inner cavity.

The two ring portions 3 and 4 are formed with tapered annular portions 3c and 4c which are enlarged as it goes outwardly. At this time, the closed end side ring portion 3 is brought into contact with the inner peripheral wall surface of the outer shell 1 under a weak contact pressure, or loosely inserted in such a manner as to be slightly spaced away from the inner peripheral wall surface of the outer shell 1.

The plurality of generally V-shaped lead clamping elastic contact elements 5 extending between the two ring portions 3 and 4 are bent in the circumferential direction (that is, in the circumferential direction of the open end side ring portion 3 and the closed end side ring portion 4), and the central portions of the lead clamping elastic contact elements 5 are bent into an inner area 6 of the two ring portions 3 and 4. By virtue of the central portions (bent portions) of the elastic contact elements 5 bent into the inner area 6, the central portions are twisted relative to an axis Y of the outer shell 1, thereby forming a pressure contact portion 8 for catching the lead 7 inserted.

As shown in Figs. 3 and 4, the pressure contact portion 8 is given a twisting angle α 3, so that the outer shell 1 is brought into a position as indicated by the solid lines wherein its angle α 2 relative to the diameter line L of the outer shell 1 is an obtuse angle (for example, about 110° to 130°), from a position as indicated by the imaginary lines wherein its angle relative to the diameter line L is a right angle, and its edge portion 9 is brought into contact with the peripheral surface of the lead 7.

More specifically, as is shown in Fig. 3, the pressure contact portion 8 is bent as as to be given a twisting angle α , wherein either one of the two edge portions 9 on the inner surface side of the pressure contact portion 8 having a rectangular shape in section, of the lead clamping contact element 5 of the inner contact 2 is located in an inner area of an internal circle portion of the ring portions 3 and 4. The pressure contact portion 8 is

set to form an angle α 2 with respect to the diameter line L by the twisting angle α 3, and the angle α 3 is preferably set in the range from about 20° to 40° . For twisting the elastic contact elements 5, for example, after the two ring portions 3 and 4 are rolled into cylindrical shapes, respectively, one of the ring portions 3 and 4 is twisted with respect to the axis, or the two ring portions 3 and 4 are twisted in the opposite directions with respect to each other.

When the IC lead 7 is inserted into the inner contact 2, the lead clamping elastic contact elements 5 are bent or inclined in the same direction in order to receive or accommodate the lead 7 with a spring having a long enough length. The pressure contact portions 8 at central portions of the contact elements 5 are pushed outwardly with the peripheral surface of the lead. By this pushing, the contact portions 8 are favorably elastically displaced outwardly from the connected portions of both ends of the elastic contact elements 5 about the connected portions, at a place away to the circumferential direction, so as to contact the peripheral surface of the IC lead with a proper contact pressure. At this time, the edge portion 9 of the pressure contact portion 8 of each lead clamping elastic contact element 5 is inclined towards the surface of the IC lead so as to contact it, thereby removing the oxide film on the contacting surface of the IC lead. As a result, a wholesome contact relation can be obtained.

According to the present invention, the lead clamping elastic contact elements are connected at both ends thereof to two the ring portions, while being allowed to extend between the closed end side ling portion and the open end side ring portion, so as to contact the lead. Therefore, even if the inner contact is miniaturized, a contact pressure caused by the elastic contact elements can be obtained. A proper contact relation can be established by forming a pressure contact portion for clamping the lead at the central portions of the elastic contact elements which are supported by both the ends.

Furthermore, since the plurality of lead clamping elastic contact elements connected between the closed end side ring portion and the open end side ring portion are bent in the circumferential direction, the elastic contact element portions extending from the ring portions, respectively, are inclined in the opposite ways with respect to each other, and therefore a long enough spring length can be obtained in the lead clamping elastic contact elements.

Moreover, by bending the elastic contact elements which are already bent or inclined in the circumferential direction, into the inner area of the two ring portions and twisting them, the edge portion of the pressure contact portion is caused to contact the surface of the IC lead. At a result, any oxide film on the surface of the IC lead can be removed to increase reliability of the contract relation. According to the present invention, the diameter of the inner contact can be reduced, and therefore the sleeve contact can be made small, while maintaining the reliability of a contact relation between the inner contact and the IC lead.

Claims

1. A sleeve contact comprising a sleeve-like outer shell having a closed end and an open end, and an inner contact accommodated in said outer shell, a lead inserted from said opening end being caught by said inner contact for realizing a contact relation therebetween, wherein said inner contact is provided with a closed end side ring portion, an open end side ring portion, and a plurality of lead clamping elastic contact elements extending between said two ring portions, both ends of said elastic contact elements being in connection with to said two ring portions.

2. A sleeve contact comprising a sleeve-like outer shell having a closed end and an open end, and an inner contact accommodated in said outer shell, a lead inserted from said opening end being caught by said inner contact for realizing a contact relation therebetween, wherein said inner contact is provided with a closed end side ring portion, an open end side ring portion, and a plurality of lead clamping elastic contact elements extending between said two ring portions, both ends of said elastic contact elements being in connection with said two ring portions, central portions of said lead clamping elastic contact elements being bent in the circumferential direction of said sleeve-like outer shell and twisted relative to an axis of said outer shell and further bent into an inner area of said two ring portions.

3. A sleeve contact comprising a sleeve-like outer shell having a closed end and an open end, and an inner contact accommodated in said outer shell, a lead inserted from said opening end being caught by said inner contact for realizing a contact relation therebetween, wherein said inner contact is provided with a closed end side ring portion, an open end side ring portion, and a plurality of lead clamping elastic contact elements extending between said two rings, both ends of said elastic contact elements being in connection with said two ring portions, those portions of said con-

tact elements connected to the closed end side ring portion and the open end side ring portion of said lead clamping elastic contact elements, respectively, are allowed to extend inclining in opposite ways relative to an axis of said sleeve-like outer shell, an area of connection between both said contact element portions being bent into an inner area of both said ring portions and twisted to form a pressure contact portion for clamping a lead.

FIG.1

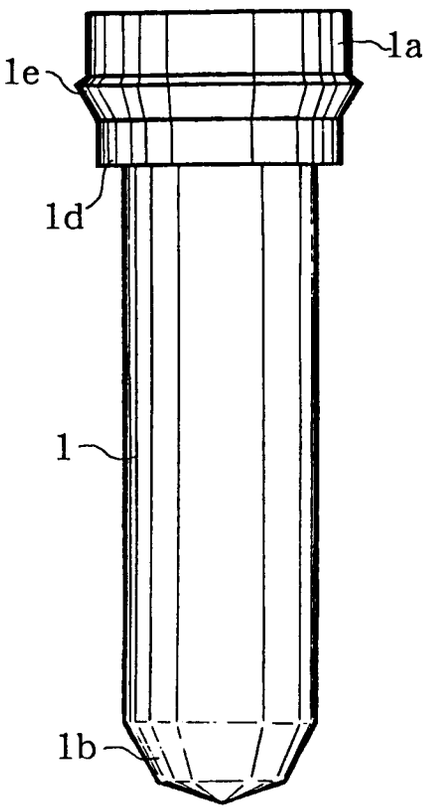

FIG.2

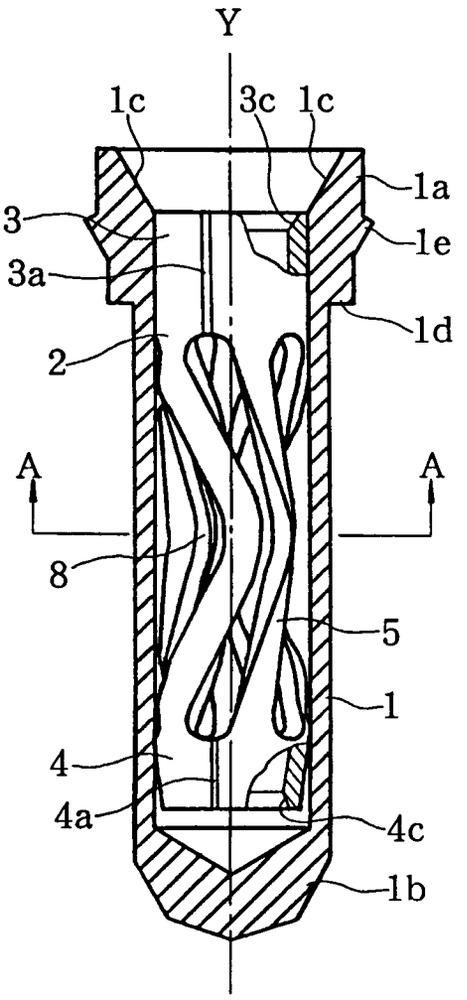

FIG.3

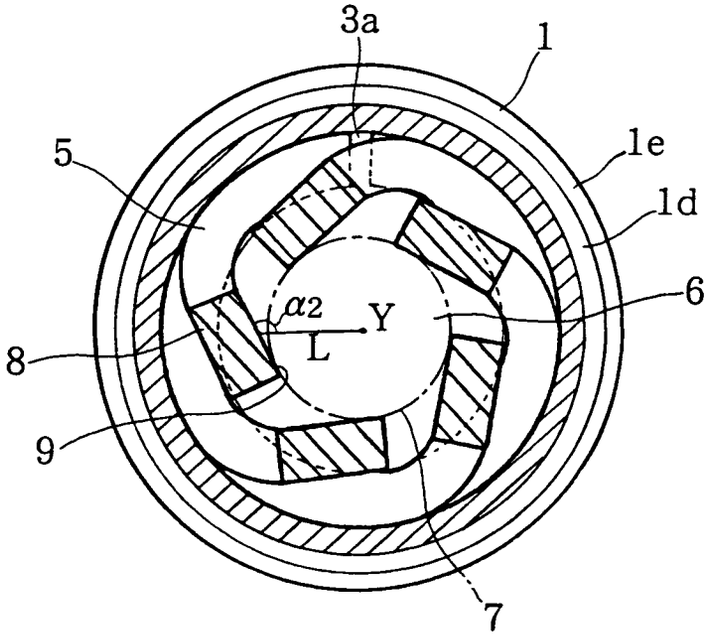

FIG.4

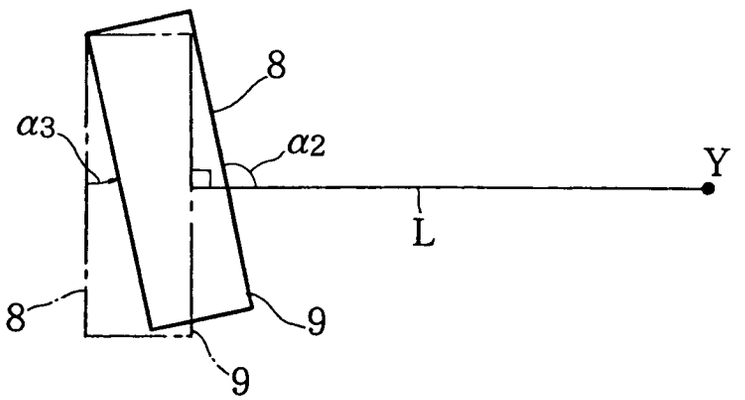

FIG.5

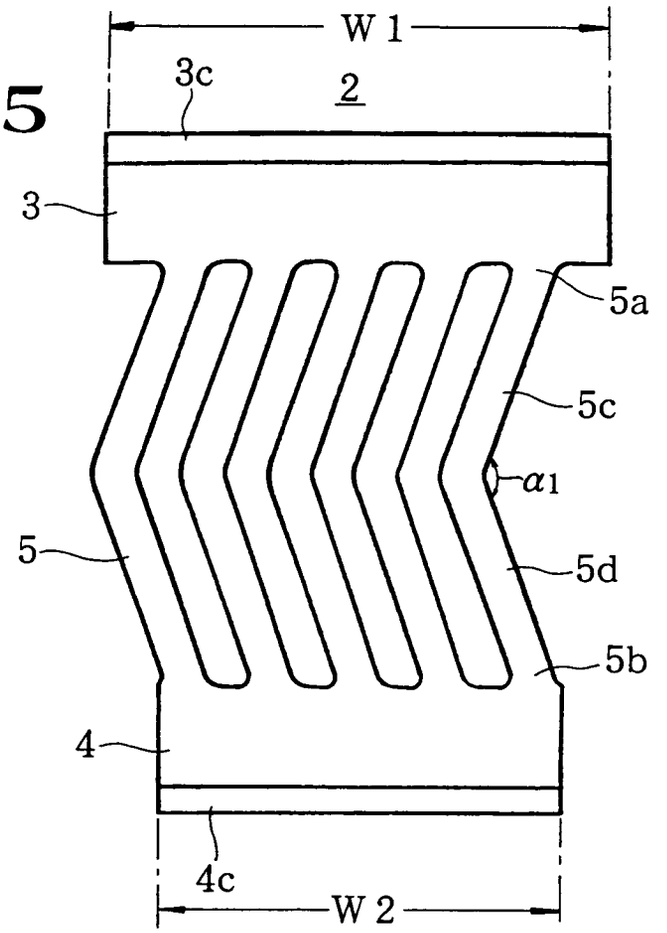

FIG.6