United States Patent [19]

Hughes et al.

[11] **3,837,001**

[45] **Sept. 17, 1974**

[54] **SPRING CONTACT FOR SEMI-CONDUCTOR DEVICES**

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[22] Filed: **Mar. 7, 1974**

[21] Appl. No.: **448,879**

Related U.S. Application Data

[63] Continuation of Ser. No. 310,995, Nov. 30, 1972, abandoned.

[30] **Foreign Application Priority Data**

Dec. 9, 1971 Great Britain 57143/71

[52] **U.S. Cl.** **356/65,** 357/68, 357/69, 357/70, 313/269

[51] **Int. Cl.** **H01l 3/00,** H01l 5/00

[58] **Field of Search** 317/234, 1, 4, 5.4, 6; 313/260, 269

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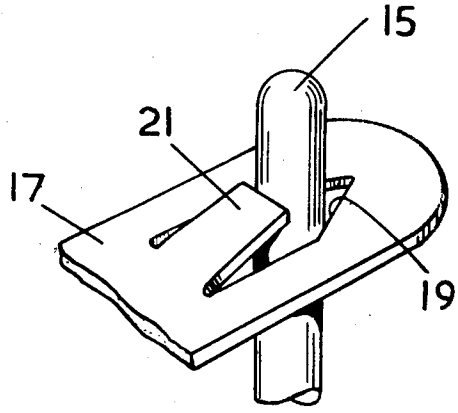
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Primary Examiner—Andrew J. James

[57] **ABSTRACT**

A semi-conductor device includes a conductive header and a semi-conductor chip secured to the header so that a contact area of the chip is electrically and/or thermally connected to the header. A terminal pin is carried by the header and is insulated therefrom and a metal bridging member extends between the terminal pin and the chip with an end portion of the bridging member engaging a further contact area of the chip to electrically connect the further contact area to the terminal pin. The bridging member is formed remote from the end portion with a slot shaped to define an integral resilient tongue. The terminal pin is received between the free end of the tongue and the wall of the slot adjacent the free end of the tongue and is resiliently urged into engagement with the free end of the tongue and the adjacent wall of the slot at three separate positions angularly spaced around the longitudinal axis of the pin.

2 Claims, 2 Drawing Figures



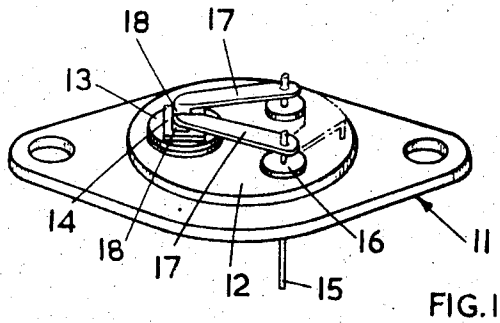


FIG. 1

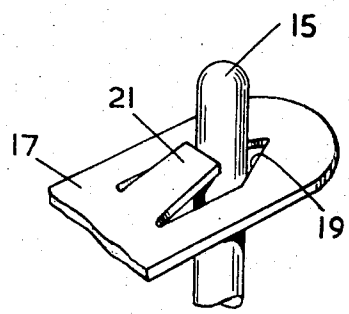


FIG. 2

A SPRING CONTACT FOR SEMI-CONDUCTOR DEVICES

This is a continuation of application Ser. No. 310,995, filed Nov. 30, 1972, now abandoned.

This invention relates to semi-conductor devices of the kind including a conductive header, a semi-conductor chip secured to the header, so that a contact area of the chip is electrically and/or thermally connected to the header, a terminal pin carried by the header and insulated therefrom, and an electrical connector extending between the terminal pin and the chip to electrically connect a further contact area of the chip to said terminal pin.

The invention resides in a semi-conductor device of the kind specified wherein the electrical connector includes a metal bridging member having an end portion engaging said further contact area of the chip, the bridging member being formed remote from said end portion with a slot shaped to define a resilient tongue integral with the bridging member, the terminal pin being received between the free end of said tongue and the wall of the slot adjacent the free end of said tongue, and the arrangement being such that the pin is resiliently urged by said tongue against said wall of the slot and further being such that the free end of said tongue and said wall together engage said pin at three separate positions angularly spaced around the longitudinal axis of the pin so that movement of the bridging member relative to the pin is substantially prevented.

In the accompanying drawings which illustrate one example of the invention.

FIG. 1 is a perspective view of a semi-conductor device, and

FIG. 2 is a perspective view to an enlarged scale of part of the device shown in FIG. 1.

Referring to the drawings, the device includes a mild steel header **11** having an integral, raised plateau **12** of circular cross-section. A circular copper pad **13** is received in a hole in the plateau **12** and one face of a semi-conductor chip **14** is soldered to the pad **13.** In the example shown, the chip **14** defines a transistor having its base and emitter exposed on one face of the chip and its collector exposed on the opposite face of the chip. Said opposite face of the chip is secured by the solder to the pad **13** so that the collector of the transistor is physically and electrically connected to the header **11.**

Extending through the header **11** and the plateau **12** are a pair of spaced terminal pins **15** of circular cross-section. The pins **15** are secured to the header **11** by a glass layer **16** so that the pins are carried by the header **11** but are insulated therefrom. The pins **15** provide electrical connections to the base and emitter areas respectively of the chip **11** which are exposed on the upper surface of the chip and to provide these connections, a bridging member **17** extends between each terminal pin **15** and a respective area of the chip **14.** Each bridging member **17** is in the form of a nickel plated, beryllium/copper alloy strip of thickness 0.25mm and each strip is formed at one end with a projecting foot portion **18** which engages the base of emitter areas of the chip **14.** Adjacent its end remote from the foot portion **18,** each bridging member **17** is formed with a substantially U-shaped slot **19** (FIG. 2) the limbs of the slot **19** extending parallel with the longitudinal axis of the strip and defining therebetween a resilient tongue **21.**

Each pin **15** is received between the free end of the tongue **21** of its respective bridging member **17** and the base wall of the slot **19** in the bridging member. Further the dimensions of each tongue **21** are such that the respective terminal pin **15** flexes the tongue **21** so that the pin **15** is resiliently urged by the tongue **21** against the base wall of the slot **19.** Furthermore, the shape of the free end of each tongue **21** and the base wall of each slot **19** are such that together the free end of the tongue and the base wall of the slot engage their respective terminal pin at three separate positions angularly spaced around the longitudinal axis of the pin **15.** In the example shown, the free end of each tongue **21** is plane and the base of each slot **19** is V-shaped and defines an included angle of 90°. Thus, in this example, each pin **15** is engaged by the plain end of the tongue **21** of the respective bridging member **17** and by each wall of the V-shaped base of the slot **19** in the bridging member so as to provide the required three position engagement of the pin by the bridging member.

In a modification of the above example, the free end of each tongue **21** is again plain whereas the base wall of each slot **19** now defines a V-shape having an included angle of 60°. Again the required three position engagement of each pin by its respective bridging member is obtained. It is, however, to be understood that where the base wall of each slot is arranged to be V-shaped, the value of the included angle preferred depends upon the diameter of the pin and the thickness of the bridging member.

In a further modification (not shown), the required interengagement between each pin and its respective bridging member is produced by arranging that each slot **19** defines part of a circle, the free end of each tongue **21** again being V-shaped. Of course, it will be understood that shapes, other than those described, for the slots **19** and the free ends of the tongue **21** are suitable. It is, however, to be appreciated that in all cases the angular spacing between the three positions of interengagement of each pin **15** and its respective terminal member **17** must be such as to prevent relative movement between the bridging member **17,** and the pin **15.** If the angular spacing is not so arranged or if the bridging member engages its respective pin at two separate positions, then, during assembly of the semi-conductor device, there is a considerable risk that the bridging member will rock on the pin so causing the foot portion **18** to move relative to the chip **14** and possibly to no longer engage the correct area of the chip.

In a further example (not shown), both the free end of each tongue **21** and the base wall of each slot **19** are arranged to be V-shaped so that each pin **15** is engaged at two angularly spaced positions by its respective tongue **21** and at a further two angularly spaced positions by the base wall of its respective slot **19.** This four position engagement of each pin **15** by its respective bridging member **17** is also found to prevent relative movement between the bridging member and the pin and so reduce the tendency for incorrect connections being made during assembly of the device. It is, however, to be appreciated that where the four position engagement between a pin **15** and its respective bridging member **17** is employed, the arrangement must be such that the pin is engaged by the slot **19** and tongue **21** at two positions each and not, for example, be engaged at three positions by the tongue and one position by the

slot. Also it is to be understood that in view of manufacturing difficulaties it is desirable that the bridging members do not engage their respective pins at more than four angularly spaced positions.

Further, it may in some cases be desirable to arrange that each bridging member **19** is provided, during assembly of the device, with a removable extension piece at its end remote from the foot portion **18.** The dimensions of the extension piece will be such that when the bridging member is mounted on its respective pin the free end of the extension piece will only engage the header **12** when the foot portion **18** is engaged with the correct contact area of the chip and the remainder of the bridging member is perpendicular to the axis of the pin. The provision of the extension piece will therefore further facilitate assembly of the device the extension piece being of course removed when assembly is complete.

We claim:

1. A semi-conductor device including a conductive header, a semi-conductor chip secured to the header so that a contact area of the chip is electrically connected to the header, a terminal pin carried by the header and insulated therefrom, a metal bridging member extending between the terminal pin and the chip with an end portion of the bridging member engaging a further contact area of the chip to electrically connect said terminal pin and said further contact area of the chip, the bridging member being formed remote from said end portion with a slot, said slot being wider than the outer diameter of the pin, said slot being V-shaped at one end and shaped at its opposite end to define a resilient tongue integral with the briding member, the terminal pin being received between the free end of said tongue and the wall of the slot adjacent the free end of said tongue, the pin being in contact with and resiliently urged by said tongue against said V-shaped end of the slot at two locations; thereon, whereby the free end of said tongue and said V-shaped end of the slot together engage said pin at three separate positions angularly spaced around the longitudinal axis of the pin so that movement of the bridging member relative to the pin is substantially prevented.

2. A device as claimed in claim **1** wherein the free end of said tongue and said wall together engage said pin at four, angularly spaced positions around the longitudinal axis of the pin, the free end of said tongue and said wall each engaging the pin at two of said four positions.

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