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SOLDER FOR CONNECTING SEMICONDUCTOR SYSTEMS WITH A METAL BASE

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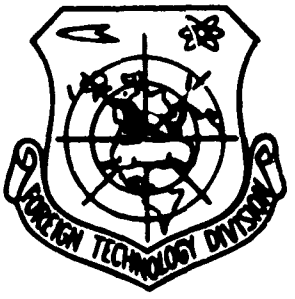

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13. ABSTRACT

This invention concerns solder for connecting semiconductor systems with a metal base having a different thermal expansibility, distinguished by the fact that it is composed of 45-90% lead, 1-10% gold and the rest indium.

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EDITED TRANSLATION

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By: Ivan Soska

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SOLDER FOR CONNECTING SEMICONDUCTOR SYSTEMS WITH A METAL BASE

Ivan Soska

The invention concerns solder for connecting metal sections of semiconductor parts whose components do not operate in a semiconductor system of undesirable diffusion.

It is required of solders connecting semiconductor systems with the housing base, especially in output semiconductors, that on the one hand the forces appearing from various dilatation of the connected sections be entrapped by their plastic deformation and further that the electrical and thermal resistances of the base-collector junction increase substantially. The types of solder used for this purpose at the present time ordinarily contain either silver, cadmium, tin or zinc as their second component in addition to lead.

However, their use in soldering semiconductors to a base brings in the substantial disadvantage that the solder's components which are already decreased are diffused into the semiconductor during the soldering process, which substantially reduces the electrical properties of the semiconductor part.

This difficulty can be prevented by using the solder from the invention, which, in addition, also counters thermal stress by its own plastic deformation.

The object of the invention is solder for connecting a semiconductor system with a metal base having a different thermal expansibility, which is distinguished by the fact that it is composed of from 45 to 90% lead, 1 to 10% gold, and the rest indium.

According to the invention the solder in its molten state adheres to the soldered surfaces of both the semiconductor and the base, and after it hardens, by plastic deformation it takes on the stress forces arising from the various thermal dilatation of the connected parts. With respect to the low tension of the gold vapors it is possible to use the colder in cases, for example, in which with a cadmium or zinc content it would act unfavorably on the electrical parameters of the system. The solder's melting point in relationship to is components can be selected with the range of 150-325°C.

The practical use of the solder, as will be described in the next example, concerns a case in which the vapors of the solder's metal components may not exert an unfavorable change in the electrical properites of the semiconductor system as a result of the unfavorable condensation of these metals on the semiconductor surface. A solder applicable to this purpose has a melting point of 300°C and is composed of 80% lead, 2% gold, and 18% indium. Sections of the required size are cut out of the foil of this solder, approximately 50 µm thick and are laid between the base and the semiconductor system. The built-up unit is heated to 309°C and is then left to cool. After cooling, a mechanically stable and dilationally well resistant bounding of the semiconductor with the base is formed

without the semiconductor's electrical and thermal resistances being unfavorably modified by soldering.

OBJECT OF THE PATENT

Solder for connecting semiconductor systems with a metal base having a different thermal expansibility, distinguished by the fact that it is composed of 45-90% lead, 1-10% gold, and the rest indium.