

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO CIRCUIT BOARD SOCKETS

(71) We, E.I. DU PONT DE NEMOURS AND COMPANY, a corporation organized and existing under the laws of the State of Delaware located at Wilmington, State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to circuit board sockets, such as the type disclosed in United States Patent No. 3,681,738. Such sockets are intended to be mounted in holes extending through circuit boards and the fluxed and wave soldered to form permanent electrical connections between the exterior of the socket body and printed circuitry on the circuit board. The socket may include interior spring arms for forming a connection with a lead inserted through an opening in the socket and into engagement with the arms.

According to the invention, there is provided a circuit board socket of the type adapted to be positioned within a circuit board hole and subsequently soldered to printed circuitry on the board, said socket including a hollow body, contact means within the body to engage and form electrical contact with a lead inserted through a lead-receiving opening, and a lead-penetratable seal in said opening to prevent solder or flux contaminating said contact means during soldering of said socket to a circuit board.

In a circuit board socket according to the invention the seal forms an improved barrier to the flow of molten solder into the interior of the socket body compared with that provided in conventional sockets using solder resists.

The seal may be of resilient material, such as silicone rubber, so as to be easily penetrated by a lead inserted into the interior of the body. Such a seal has the ad-

ditional advantage of tightly surrounding a lead inserted into the socket and thus preventing the entry of contaminants after insertion of the lead. When the lead is withdrawn, the resilient seal closes the opening formed by the lead and continues to seal the opening in the socket.

In a preferred embodiment, the seal is formed by introducing viscous room temperature curing silicone rubber into the opening so that the material, while still viscous, completely seals the opening and then cures or vulcanizes sufficiently to retain its position in the opening, thus positively sealing the opening. An advantage of this method is that the seal may close the opening without there being substantial stresses normal to the interior surface of the body.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of a circuit board socket according to the invention;

Figure 2 is a partial sectional view taken along line 2—2 of Figure 1;

Figure 3 is a top view of the socket of Figures 1 and 2;

Figure 4 is a sectional view taken along line 4—4 of Figure 1; and

Figure 5 is a partial sectional view of the socket shown in Figure 1, soldered in a circuit board hole with a lead inserted into the socket and in electrical connection with the interior spring arms.

Referring to the drawings, a circuit board socket 10 comprises an elongate metal cup or body 12 closed at end 14 and open at lead-receiving end or mouth 16. The mouth at end 16 is outwardly flared to facilitate reception of a lead inserted into the interior of the body 12. The circuit board socket 10 also includes a generally M-shaped spring member 18 having a pair of opposed spring arms 20 confined within body 12 and interconnected by bight portion 22 adjacent

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closed end 14 of the body. Spring curls 24 connect the ends of the spring arms 20 adjacent mouth 16 with exterior circuit board hole-engaging spring arms 26 extending along opposite exterior walls of the body 12. The spring 18 is formed of relatively high yield strength material and is held within the body 12 by a pair of inwardly directed opposed dimples 28 which extend into the interior of body 12 within the bight portion 22 of spring 18. As illustrated in Figures 1 and 4, portions 30 of the spring 18 extend through flared opening 16 of body 12. Body 12 and spring 18 are essentially identical to corresponding members disclosed in United States Patent No. 3,681,738.

After the spring 18 has been positioned in body 12 as shown in Figure 1, an amount of viscous room temperature curing silicone rubber is applied to the flared open end 16 between the portions 30. The silicone rubber liquid flows completely around the portions 30 and up to the interior walls 32 of mouth 16 to form a seal extending across the entire interior opening of the mouth. The rubber also flows down between the interior facing surfaces 34 of spring arms 20 to form a sealing plug 36. As illustrated in Figure 2, the plug 36 extends to body side walls 38 adjacent flared mouth 16 and may narrow to a tip 40 separated from the side walls at a distance further away from the mouth 16. After application of the silicone rubber to the mouth of circuit board socket 10, the rubber is allowed to cure to solidify the plug in position in the socket as illustrated. The interior walls of body 12 are dry while the surface of spring arms 20 are coated with a material non-adherent to silicone rubber. When the viscous silicone rubber plug sets or cures, it adheres tightly to the dry interior surfaces of body 12 and forms an intimate non-adherent contact with the surface of the spring 18. The contact formed between the plug and both the body and spring tightly closes mouth 16 and prevents flux, molten solder, or other impurities from entering the interior contact area of the circuit board socket 10. See Figure 4.

Following curing of plug 36, the socket 10 may be inserted within a circuit board hole 42 of circuit board 44 and wave soldered to form a soldered electrical connection 46 between the body 10, and arms 26, and printed circuitry 48 on circuit board 44. Prior to wave soldering, the circuit board with the socket mounted therein is conventionally moved through a fluxing bath to improve soldering. The plug 36 prevents any flux or molten solder which could possibly flow into the open end of mouth 16 from flowing into the interior of the body 10. In this way, flux and solder, together with other impurities, are prevented from entering the

contact area between arms 20. Silicone rubber plug 36 is not damaged by the flux or molten solder.

After completion of the soldering operation, a lead 50 may be inserted into the socket through mouth 16 and plug 36 as illustrated in Figure 5. The silicone rubber is easily ruptured by the lead end. The rubber does not adhere to the surfaces of the contact spring arms 20. During insertion, the end of the lead removes any rubber from the area of contact with spring arms 20. As illustrated in Figure 5, the lead 50 may break tip 40 into two portions.

The rubber plug 36 surrounds and forms an impurity resistant seal against the lead 50 inserted into the socket. In this way socket failure is reduced because impurities are sealed away from the contacts between the lead and the socket. When the lead is withdrawn the resiliency of the plug closes the opening formed by the lead and maintains an effective seal.

The exact shape of the plug 36 formed in opening 16 depends upon the amount of liquid rubber applied to the opening. Thus, in a case that a greater amount of rubber is applied, it is possible that the plug would overflow the opening and engage curls 24 and the exterior surfaces of body 12. Such variations in shape of the plug do not affect the desired seal.

While the invention has been described in connection with a specific form of circuit board socket, it is not intended to be limited to circuit board sockets of the specific type disclosed herein.

Obviously, lead penetrable sealing plugs may be applied to openings in other types of circuit board sockets, whether or not leads are actually to be inserted through such openings.

While a preferred embodiment of the invention has been described it is to be understood that variations and modifications are possible without departing from the scope of the appended claims.

WHAT WE CLAIM IS:—

1. A circuit board socket of the type adapted to be positioned within a circuit board hole and subsequently soldered to printed circuitry on the board, said socket including a hollow body, contact means within the body to engage and form electrical contact with a lead inserted through a lead-receiving opening, and a lead-penetrable seal in said opening to prevent solder or flux contaminating said contact means during soldering of said socket to a circuit board.

2. A socket as claimed in claim 1, wherein said seal comprises material which has been introduced into the opening whilst viscous, and subsequently cured to form a sealing plug.



closed end 14 of the body. Spring curls 24 connect the ends of the spring arms 20 adjacent mouth 16 with exterior circuit board hole-engaging spring arms 26 extending along opposite exterior walls of the body 12. The spring 18 is formed of relatively high yield strength material and is held within the body 12 by a pair of inwardly directed opposed dimples 28 which extend into the interior of body 12 within the bight portion 22 of spring 18. As illustrated in Figures 1 and 4, portions 30 of the spring 18 extend through flared opening 16 of body 12. Body 12 and spring 18 are essentially identical to corresponding members disclosed in United States Patent No. 3,681 738.

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Following curing of plug 36, the socket 10 may be inserted within a circuit board hole 42 of circuit board 44 and wave soldered to form a soldered electrical connection 46 between the body 10, and arms 26, and printed circuitry 48 on circuit board 44. Prior to wave soldering, the circuit board with the socket mounted therein is conventionally moved through a fluxing bath to improve soldering. The plug 36 prevents any flux or molten solder which could possibly flow into the open end of mouth 16 from flowing into the interior of the body 10. In this way, flux and solder, together with other impurities, are prevented from entering the

contact area between arms 20. Silicone rubber plug 36 is not damaged by the flux or molten solder.

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The exact shape of the plug 36 formed in opening 16 depends upon the amount of liquid rubber applied to the opening. Thus, in a case that a greater amount of rubber is applied, it is possible that the plug would overflow the opening and engage curls 24 and the exterior surfaces of body 12. Such variations in shape of the plug do not affect the desired seal.

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2. A socket as claimed in claim 1, wherein said seal comprises material which has been introduced into the opening whilst viscous, and subsequently cured to form a sealing plug.



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3. A socket as claimed in claim 1. or 2,
wherein said seal is resilient.
4. A socket as claimed in claim 3, wherein
said seal comprises a plug of silicone rubber.
5. A socket as claimed in any preceding
claim wherein said contact means comprises
a spring member extending from the
interior of the body outwardly through said
opening.
6. A socket as claimed in any preceding
claim wherein said seal is in contact with
part of said contact means, said seal forming
an adherent connection with said body but a
non-adherent connection with said contact
means.
7. A socket substantially as described with
reference to the accompanying drawings.
8. A circuit board having a hole there-
through and with a socket as claimed in any
preceding claim mounted in said hole so as
to be in electrical connection with circuitry
on said board.
9. A circuit board as claimed in claim 8,
substantially as described with reference to
Fig. 5 of the accompanying drawings.

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