

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 35

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TONGBI JIANG

Appeal No. 2002-0981
Application 09/005,895

ON BRIEF

Before OWENS, KRATZ and TIMM, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal is from the final rejection of claims 1-3, 5, 12, 13, 16-21, 25, 30 and 35-42, which are all of the claims pending in the application.

THE INVENTION

The appellants claim a method and a screen printing system for screening onto an electronic device support structure a thermally curable material including a conductive adhesive.

Claims 1 and 25 are illustrative:

1. A method of forming a thermally curable material on a support structure in an electronic device, the method comprising:

placing the electronic device support structure on a heatable structure in a process chamber;

depositing through a screen to form thermally curable material including a conductive adhesive on a surface of the support structure while it is in the process chamber; and

heating the heatable surface to heat the support structure to a temperature sufficient to cure the deposited material while the support structure is still in the process chamber to bond the thermally curable material to the support structure.

25. A screen-printing system, comprising:

a heatable surface adapted to hold a support structure of an electronic device; and

a screen through which a thermally curable material including a conductive adhesive can be deposited onto portions of the support structure while the support structure is placed on the heatable surface;

the system adapted to heat the heatable surface to cure thermally curable material that may be deposited on the support structure.

THE REFERENCES

Dery et al. (Dery)	4,659,872	Apr. 21, 1987
Pennisi et al. (Pennisi)	5,128,746	Jul. 7, 1992
Zhou et al. (Zhou)	5,985,043	Nov. 16, 1999
		(filed Jul. 21, 1997)
MacKay et al. (MacKay)	5,988,487	Nov. 23, 1999
		(filed May 27, 1997)
Wood et al. (Wood)	6,107,122	Aug. 22, 2000
		(filed Aug. 4, 1997)

THE REJECTIONS

The claims stand rejected under 35 U.S.C. § 103 as follows: claims 1, 3, 5, 12, 13, 16-20, 25 and 30 over MacKay in view of Zhou and Wood; claims 2 and 21 over MacKay in view of Zhou, Wood and Pennisi; and claims 35-42 over MacKay in view of Zhou, Wood and Dery.

OPINION

We reverse the rejections of claims 1-3, 5, 12, 13, 16-21 and 35-40, and affirm the rejections of claims 25, 30, 41 and 42.

The appellant states that the claims stand or fall in the following groups: 1) claims 1-3, 5, 35 and 36; 2) claims 12, 13, 16, 17, 37 and 38; 3) claims 18-21, 39 and 40; and 4) claims 25, 30, 41 and 42 (brief, pages 3-4). Although an additional reference is applied to claims 41 and 42, the appellants do not argue the rejection of these claims separately from the rejection of independent claim 25 from which they depend. We therefore limit our discussion of the affirmed rejection to claim 25. See *In re Ochiai*, 71 F.3d 1565, 1566 n.2, 37 USPQ2d 1127, 1129 n.2 (Fed. Cir. 1995); 37 CFR § 1.192(c)(7) (1997). As for the reversed rejections, we need to address only the independent claims to which these rejections apply, i.e., claims 1, 12 and 18.

Claims 1, 12 and 18

Each of the appellant's claims 1, 12 and 18 requires a thermally curable material that includes a conductive adhesive.

MacKay discloses a method for forming a thermally curable material on a support structure in an electronic device, comprising placing the electronic device support structure (substrate 5) on a heatable structure (heater stage 20), depositing through a screen (stencil 40) a thermally curable material (solder paste 70) onto a surface of the support structure, and heating the heatable surface to heat the support structure to a temperature sufficient to cure the thermally curable material to bond the thermally curable material to the support structure (col. 3, lines 52-60; col. 5, lines 4-8).^{1,2} MacKay does not disclose a thermally curable material including a conductive adhesive.

¹ The appellants state that "[a]s used in this application, thermal curing includes both chemical or physical alteration of the curable material, including altering the chemical characteristics of an adhesive material or reflowing solder" (specification, page 7, lines 27-30).

² It is undisputed that MacKay's process steps take place in a process chamber.

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Zhou discloses a mixture of solder powder and a thermally curable adhesive composition including a fluxing agent that also acts as an adhesive (col. 2, lines 43-45), and teaches that "instead of solder bumps, a solder paste comprising a solder powder and the thermally curable adhesive composition can be employed" (col. 10, lines 41-43) and that "[d]uring the reflow step, the fluxing agent promotes wetting of the solder to the metallization patterns and, simultaneously, the fluxing agent itself crosslinks to mechanically bond and encapsulate the surfaces and their metallizations" (col. 2, lines 59-65).

The portion of Wood relied upon by the examiner is the abstract which discloses using conductive adhesive bumps, rather than solder bumps, on dies to provide compliant connections with electrical connectors.

The examiner argues:

Zhou teaches that it is obvious to use a thermally curable adhesive compound instead of solder bumps. Wood discloses in the abstract that it is obvious to use conductive adhesive as the thermally curable material. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify MacKay by inventions of Zhou and Wood in order to make use of thermally curable material including conductive adhesive. [answer, page 5]

* * *

Zhou and Wood are relied on as a [sic] secondary references only to teach that solder paste can be

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substituted by a thermally curable adhesive material (Zhou) and conductive adhesive (Wood). [answer, page 8]

For a *prima facie* case of obviousness to be established, the applied prior art must be such that it would have provided one of ordinary skill in the art with both a motivation to carry out the claimed invention and a reasonable expectation of success in doing so. See *In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991); *In re O'Farrell*, 853 F.2d 894, 902, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988).

MacKay teaches that "with the stencil and plate remaining in place on top of the substrate, the substrate is heated to a temperature sufficient to reflow the solder paste material. In this manner, the solder paste is pulled away (i.e., detached) from the stencil side walls and anchored to the substrate pad before the stencil is removed" (col. 2, lines 34-39). Zhou, however, teaches that during reflow the fluxing agent, which acts as an adhesive, "crosslinks to mechanically bond and encapsulate the surfaces and their metallizations" (col. 2, lines 63-65), "hardens quickly and soon after the solder bump melts" (col. 11, line 61), and "forms strong adhesion of the cured composition to the chip, substrate and solder joints" (col. 11, lines 66-67).

The examiner has not explained why, if Zhou's solder powder/fluxing agent, which bonds surfaces together during reflow, were substituted for MacKay's solder paste, one of ordinary skill in the art would have had a reasonable expectation that the solder material would be pulled away from the stencil side walls and anchored to the substrate pad as desired by MacKay. Also, the examiner has not explained why one of ordinary skill in the art would have had a reasonable expectation that the use in MacKay's method of Zhou's solder powder/fluxing agent, which bonds surfaces together during reflow, would permit the stencil to remain in place during reflow and then be removed as required by MacKay. The examiner further has not explained why, in view of these considerations, one of ordinary skill in the art would have had a reasonable expectation of success in using Wood's conductive adhesive in MacKay's method.³

Accordingly, we conclude that the examiner has not carried the burden of establishing a *prima facie* case of obviousness of the method claimed in the appellant's claims 1-3, 5, 12, 13, 16-21 and 35-40.

³ The examiner does not rely upon Pennisi or Dery for any disclosure that remedies the above-discussed deficiency in MacKay, Zhou and Wood as to the independent claims.

Claim 25

MacKay discloses a screen-printing system (col. 4, lines 48-52) comprising a heatable surface (20) adapted to hold a support structure (5) of an electronic device (col. 3, lines 54-63), a screen (40) through which thermally curable material (70) can be deposited onto portions of the support structure while the support structure is placed on the heating surface (col. 4, lines 23-64), and a system adapted to heat the heatable surface to cure the thermally curable material on the support structure (col. 5, lines 4-10).

MacKay does not disclose a thermally curable material including a conductive adhesive. The system claimed in the appellant's claim 25, however, does not include such a thermally curable material. The claim merely requires that the system is capable of screening and curing a thermally curable material including a conductive adhesive. Because Wood's conductive adhesive (col. 7, lines 25-27), like MacKay's solder (col. 3, lines 59-60), can form bumps on bond pads, it reasonably appears that MacKay's system is capable of screening solder containing at least a trace amount of conductive adhesive.⁴ Also, because

⁴ The appellant's claim 25 does not specify the amount of conductive adhesive in the thermally curable material.

Wood's conductive adhesive cures at a temperature as low as 100°C (col. 7, lines 18-19), which is below MacKay's exemplified 183°C solder melting temperature (col. 5, line 47), it reasonably appears that MacKay's system is capable of curing solder containing at least a trace amount of conductive adhesive.

The appellant argues with respect to claim 25 that "MacKay does not disclose a conductive adhesive as the thermally curable material" (brief, page 8). What claim 25 recites is "a thermally curable material including a conductive adhesive". The claim does not require a conductive adhesive as the thermally curable material. Regardless, as discussed above, the system claimed in claim 25 does not include the thermally curable material.

Accordingly, we affirm the rejections of claim 25 and claims 30, 41 and 42 that stand or fall therewith.

DECISION

The rejections under 35 U.S.C. § 103 of claims 1, 3, 5, 12, 13 and 16-20 over MacKay in view of Zhou and Wood, claims 2 and 21 over MacKay in view of Zhou, Wood and Pennisi, and claims 35-40 over MacKay in view of Zhou, Wood and Dery, are reversed. The rejections under 35 U.S.C. § 103 of claims 25 and 30 over MacKay in view of Zhou and Wood, and claims 41 and 42 over MacKay in view of Zhou, Wood and Dery, are affirmed.

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No time period for taking any subsequent action in
connection with this appeal may be extended under 37 CFR
§ 1.136(a). *AFFIRMED-IN-PART*

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TERRY J. OWENS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
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Administrative Patent Judge)	APPEALS AND
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