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**Datasheet for the decision  
of 10 January 2013**

**Case Number:** T 1061/09 - 3.2.07

**Application Number:** 99937026.5

**Publication Number:** 1134034

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A21C 3/04, B27G 11/00

**Language of the proceedings:** EN

**Title of invention:**  
Method of forming paste

**Patentee:**  
Musashi Engineering, Inc.

**Opponent:**  
Esec AG

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56  
RPBA Art. 13(1)

**Keyword:**  
"Second effect of distinguishing feature - not disclosed  
(point 5.2.4)"  
"Problem - alternative method (point 7.2)"  
"Disclosure of closest prior art, values given for embodiments  
- to be considered (point 3.2.3, 3.2.4)"  
"Auxiliary request filed during oral proceedings - not  
admitted (point 8.4)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 1061/09 - 3.2.07

**DECISION**  
of the Technical Board of Appeal 3.2.07  
of 10 January 2013

**Appellant:** Musashi Engineering, Inc.  
(Patent Proprietor) 8-7-4, Shimorenjaku  
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Tokyo 181-0013 (JP)

**Representative:** TBK  
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**Respondent:** Esec AG  
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**Representative:** Troesch Scheidegger Werner AG  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 12 March 2009  
revoking European patent No. 1134034 pursuant  
to Article 101(3) (b) EPC.

**Composition of the Board:**

**Chairman:** H. Meinders  
**Members:** H.-P. Felgenhauer  
I. Beckedorf

## **Summary of Facts and Submissions**

I. The patent proprietor (appellant) has filed an appeal against the decision of the opposition division revoking European patent No. 1 134 034.

It requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the set of claims, an amended description and amended figures filed as auxiliary request 2 with letter of 10 December 2012 or, alternatively, on the basis of claim 1 of the (new) auxiliary request filed during the oral proceedings.

The respondent (opponent) requested that the appeal be dismissed.

II. Claim 1 according to auxiliary request 2 reads as follows:

"A paste pattern forming method, wherein a drawing pattern is formed on a paste-applied body by drawing linearly drawn paste lines, and wherein said paste-applied body is a lead frame and said paste is an adhesive for die bonding, characterized in that at least one segment line of said drawing pattern is formed by drawing two drawn lines formed by drawing a line to go and return over a certain stroke, and the start point and the end point of the drawn lines are positioned other than at the ends of said drawing pattern".

Claim 1 according to the new auxiliary request reads as follows:

"A paste pattern forming method, wherein a drawing pattern is formed on a paste-applied body by drawing linearly drawn paste lines, and wherein said paste-applied body is a lead frame and said paste is an adhesive for die bonding, characterized in that said drawing pattern is obtained by forming a plurality of segment lines of said drawing pattern formed by drawing two drawn lines formed by drawing a line to go and return over a certain stroke, and the start point and the end point of the drawn lines are positioned other than at the ends of said drawing pattern".

III. The following prior art will be considered:

The public prior use discussed in the decision under appeal, as supported by the following documents

- O1a            Coversheet and Table of Contents of MEPPE, Packaging & Assembly Seminar Proceedings, June 21 1995, Boston
  
- O1b            Part of the Seminar Proceedings: René J. Ulrich "Epoxy Die Attach: The Challenge of Big Chips" printed version of Power Point<sup>®</sup> presentation (Folien / slides 1 - 26)

and the affidavits considered in the decision under appeal

D13 by E. Lin with cover page and pages 1-2, 1-4, 1-5, 1-7, 2-28, 4-3, 4-4, 4-9 and 4-10 of the operating and maintenance manual "Programmable Dispenser (PD)" issue 05 / 98

D14 by E. Lin with cover page and pages 1-2, 1-3, 1-4, 1-5, 1-7, 2-28, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-21, 4-22 and 4-23 of the operating and maintenance manual "Programmable Dispenser (PD)" issue 01 / 97.

IV. Impugned decision

According to the impugned decision the feature of claim 1 of auxiliary request 2 defining that the two drawn lines are formed by drawing a line to go and return over a certain stroke can be understood in two ways. According to one way it defines that the two lines are arranged in an overlapping manner. According to the other way it defines that the two lines are arranged to lie side by side. Since a side by side arrangement of corresponding drawn lines is known from 01b (slides 10, 11) the subject-matter of this claim lacks novelty.

V. The arguments of the appellant can be summarized as follows:

- (a) The feature distinguishing the method according to claim 1 of auxiliary request 2 from the method of 01a, 01b defines that at least one segment line of said drawing pattern is formed by drawing two drawn lines formed by drawing a line to go and

return over a certain stroke. This means that the two drawn lines are arranged such that they completely overlap.

- (b) The effect resulting from this arrangement is that no air pockets exist between the two lines. Thus the expansion of such air during bonding is prevented.
- (c) Furthermore, since the two lines concerned completely overlap even the formation of micro bubbles can be prevented. Such micro bubbles could arise in case the two lines do not completely overlap; this would leave minute "valleys" filled with air.
- (d) The closest prior art method, namely the one derivable from Olb, slides 10, 11 shows that segment lines of the pattern are formed by drawing two parallel lines which are connected via a curved connection line, for which a radius  $r$  is defined. If the radius is such that they do not overlap relatively large bubbles can occur. If the arrangement is such that the two lines partially overlap, still micro bubbles can occur. Thus neither arrangement prevents the creation of micro bubbles. As indicated in the description of the patent in suit and as generally known in the technical field concerned, bubbles expand thermally when a semiconductor chip is fixed to the lead frame while the paste is heated and dried. This can lead to the destruction of the semiconductor chip due to stresses originating from the thermal expansion of the bubble.

- (e) It is true that in the event that only micro bubbles are created the bubbles to be avoided are minute ones. Nevertheless, the avoidance of also such micro bubbles improves the bonding quality. This is referred to in paragraph [0009] of the patent in suit stating that with the desired drawing pattern a bubble can be completely prevented from being entrapped in a step of bonding a bonded member, e.g. a semiconductor chip, to a paste applied body, e.g. a lead frame.
  
- (f) The objective technical problem derivable from the effect of the distinguishing feature can, without involving elements of the solution according to claim 1, be formulated as to improve the paste pattern forming method according to the closest prior art such that a paste pattern forming method results which leads a to better bonding quality.
  
- (g) This problem is evidently solved by the avoidance of the mentioned valleys between two partially overlapping lines, resulting from forming the segment line of said drawing pattern by two drawn lines drawing a line to go and return over a certain stroke.
  
- (h) Starting from the method according to the acknowledged closest prior art the skilled person finds no incentive in the prior art to modify the paste pattern forming method such that instead of two lines arranged side by side which are connected via a curved connection line these two



lines are drawn in a completely overlapping relationship.

- (i) This holds true even if it is considered that the arrangement of the two completely overlapping lines does not lead to an effect which is different from the effect obtained by the arrangement derivable from 01a, 01b, in which the two lines are drawn such that they partially overlap. In this case a less ambitious problem can be considered, namely to devise an alternative method to the one according to that closest prior art. In an attempt to find such an alternative method the skilled person is neither prompted by 01a, 01b nor any other available prior art to completely disregard that the paste pattern of the closest prior art always requires a curved connection line between the two drawn lines of a pattern segment line. Quite on the contrary, considering e.g. D13 it is apparent that a curved connection line between the two drawn lines is indispensable. This applies also in case the radius of the curved connection line is considered to be very small.
  
- (j) According to the method of claim 1 of the new auxiliary request the advantage of the arrangement defined by claim 1 of auxiliary request 2 is further increased. The reason is that the effects obtained with respect to at least one segment line according to claim 1 of auxiliary request 2 are now obtained for a plurality of segment lines of the pattern. The amendment of claim 1 thus clearly

leads to subject-matter involving an inventive step. It should therefore be admitted.

VI. The arguments of the respondent can be summarized as follows:

- (a) The paste pattern forming method according to the closest prior art given by 01a, 01b, slides 10, 11 comprises, compared to the method according to claim 1 of auxiliary request 2, the step that at least one segment line of the pattern is drawn such that two lines are arranged side by side, partially overlapping. The curved connection line between the two drawn lines has a specified radius. The radius given in 01a, slide 11 of 0.1 mm leads, together with the values given for the length of the two drawn lines and the amount of paste distributed, to the result that the two side-by-side drawn lines overlap substantially.
- (b) Concerning the effect which can be attributed to the feature distinguishing the method according to claim 1 from the one according to the closest prior art it has to be considered that with the latter paste pattern forming method the same effect is obtained since the two drawn lines are for both methods in an overlapping relationship. Irrespective of whether the overlapping of these two lines is complete or partial the formation of an air space which leads to the creation of bubbles during bonding is prevented. This fact is e.g. corroborated by a statement in 01a that such voids (empty spaces) are already eliminated by an arrangement in which the lines touch each other.

- (c) It is not apparent that beyond this effect a further effect is to be attributed to the complete overlapping as defined by claim 1 as opposed to the partial one according to the closest prior art. The prevention of micro bubbles referred to by the appellant does not find any mention in the patent in suit. Such an effect is also not apparent considering that degrees of overlap between the two lines produced by the method of claim 1 and the two lines according to the closest prior art differ, if at all, only marginally.
  
- (d) Even if it is considered that micro bubbles may occur and that they actually play a role when the degree of overlap is less than complete, further parameters need to be considered in this context. Such parameters like e.g. the viscosity of the paste and the speed by which it is applied can influence the capacity of the paste to entrain air during its application. Since neither in claim 1 nor in the patent in suit such parameters are identified an effect of prevention of micro bubbles cannot be considered.
  
- (e) Thus the distinguishing feature does not lead to the method of claim 1 having an effect differing from the one obtained by the closest prior art method.
  
- (f) The problem to be solved starting from the method according to the closest prior art can thus only be seen in providing an alternative method.

- (g) In an attempt to solve this problem the skilled person would certainly consider the size of the radius of the curved connection line between the two drawn lines. Since according to O1b these two lines should anyway overlap the only sensible modification is reducing the radius such that the degree of overlap between the two drawn lines increases. In the limit such an undertaking would lead to a radius approaching a zero value and thus to a complete overlapping of these two drawn lines.
  
- (h) In this respect it also needs to be taken into account that the choice of the degree of overlap depends on many factors such as the wettability of the body to which the paste is applied, the viscosity of the paste, the extent of the area to which paste is to be applied and the thickness of each drawn line. Whether "valleys" actually remain depends in any case on the time passing between the application of the paste pattern and the application of the element to be connected to the body.
  
- (i) In any case, if particular circumstances require a complete overlap: starting from the method according to the closest prior art the skilled person arrives within regular design practice at the complete overlapping of drawn lines as defined by claim 1.  
The subject-matter of claim 1 thus does not involve an inventive step.
  
- (j) Claim 1 according to the new auxiliary request should not be admitted since the additional

feature leads to the effect that more than one segment of the pattern is formed with two drawn lines. Since the effect to be obtained according to claim 1 of the new auxiliary request equals the sum of the effects which can be obtained by straightforward repetition of the method according to claim 1 of auxiliary request 2 to another segment of the pattern, the subject-matter of this claim 1 cannot be considered as clearly overcoming the objection of lack of inventive step raised with respect to the method according to claim 1 of auxiliary request 2.

VII. In the annex to the summons to oral proceedings the Board gave its preliminary opinion i.a. with respect to the understanding of claim 1 of auxiliary request 2 and concerning the distinguishing feature over the prior art 01a, 01b, all to be considered in the examination of inventive step (points 6.3.3, 6.3.6).

VIII. Oral proceedings before the Board were held 10 January 2013.

### **Reasons for the Decision**

#### 1. *Procedural aspect*

1.1 The appellant withdrew at the beginning of the oral proceedings auxiliary requests 1 and 3.

1.2 Following the examination of the subject-matter of claim 1 of auxiliary request 2 concerning inventive step and after the Board had announced its conclusion

in this respect, claim 1 of a new auxiliary request was filed.

- 1.3 The admittance of this request has been objected to by the respondent. As indicated during the oral proceedings a criterion for the admittance of this request, namely that the subject-matter of claim 1 of the new request clearly overcomes the lack of inventive step objection raised with respect to claim 1 of the previous request, has not been met (cf. points 6.1 - 6.3 below).

*Claim 1 of auxiliary request 2*

2. *Subject-matter of claim 1*

Claim 1 of this request differs from claim 1 as granted in that the feature defining that

- (a) at least one segment line of the drawing pattern is formed by drawing two drawn lines

has been further defined in that the two drawn lines are

- (b) formed by drawing a line to go and return over a certain stroke.

- 2.2 Claim 1 is directed to a paste pattern forming method, wherein a drawing pattern is formed on a paste-applied body by drawing linearly drawn paste lines.

The paste-applied body is a lead frame and the paste is an adhesive for bonding.

2.3 According to features (a) and (b), at least one segment of the paste pattern is formed by drawing two drawn lines (feature (a)). The two drawn lines are formed by drawing a line to go and return over a certain stroke (feature (b)).

2.4 According to a further feature of the characterising portion the start point and the end point of these drawn lines are positioned other than at the ends of said drawing pattern.

2.5 Features (a) and (b) are, as agreed upon by the parties during the oral proceedings and as indicated in the annex to the summons to oral proceedings (point 6.3), of particular relevance.

Feature (b) is, as can be derived from the following and as consented to by the parties during the oral proceedings, the one distinguishing the method of claim 1 over the method according to the closest prior art given by O1a, O1b. It is thus, as stated in the annex (point 6.3.6) and as agreed upon by the parties during the oral proceedings, essential for the examination of inventive step.

2.6 According to the understanding given to this feature in the annex (point 6.3.3) it implies that the **two drawn lines are exactly overlapping.**

This understanding, on which the appellant based its argumentation in favour of inventive step has been accepted by the respondent as being possibly derivable from claim 1 and the disclosure of the patent in suit.

3. *Method according to O1a, O1b*

3.1 It is common ground that the method of O1a, O1b, which according to the impugned decision is novelty destroying if feature (b) is understood differently, namely that the two lines of a segment are arranged side by side (cf. reasons, point 8.3), represents the closest prior art.

3.2 It is undisputed that O1a, O1b, which by their very nature as printed version of a Power Point<sup>®</sup> presentation (O1b) and as an introductory portion to this printed version (O1a) have to be read together.

3.2.1 The **disclosure of O1a, O1b** comprises a **statement** in the section "ABSTRACT" of O1a giving guidance concerning the distance between the two drawn lines of a segment line.

It reads: "The continuous path dispensing is the best method to reduce the variance in material volume. The **pattern writing technique allows void free bonding**. Because the pattern is written such that the lines of the pattern **touch each other, all the air is flushed out** prior to attaching the die and **voids are eliminated right from the beginning**." (highlighting in bold added).

From this statement it is apparent that

- the known paste pattern forming method aims for the drawn lines of the pattern to be such that void free bonding - in the terminology of the patent in suit: bonding by which bubbles are prevented from being



entrapped (paragraph [0009]) - results and that for that purpose

- lines of the pattern touch each other such that voids (in which air could otherwise be entrapped resulting in bubbles during bonding) are eliminated right from the beginning.

3.2.2 The disclosure of 01a, 01b encompasses furthermore **two embodiments** given by slides 10 and 11 of 01b.

It remained undisputed that the paste patterns according to these embodiments each comprise, corresponding to feature (a), a pattern with four segment lines each formed by drawing two parallel drawn lines.

It remained also undisputed that the two drawn lines of each set are connected at their outer ends, which form part of the outer contour of the pattern, via a curved connection line of radius  $r$ . According to slide 11 the radius has a value of  $r = 0.10$  mm.

Based on the value for the radius and the further dimensions given in slide 11 for the paste patterns shown in slide 10 and the assumption that each drawn line has a semi-circular cross-section when applied to a body, the width of the drawn lines has been calculated by the respondent. This assumption does not take into account that the paste lines in any case have a tendency to spread out over their width due to their viscous nature. It thus leads, to the advantage of the appellant, to a smaller value for the width of the lines than is to be expected for actually drawn lines.

According to the result given for this calculation (letter of the respondent of 20 November 2009, cf. the paragraph bridging pages 2 and 3) each of the two parallel drawn lines has a width of 0.36 mm, which with a radius of the connection line of 0.10 mm and a resulting distance between the center-lines of the two drawn lines of 0.20 mm results in the two drawn lines overlapping considerably.

- 3.2.3 The validity of this result, which has been cited in the impugned decision (reasons, point 8.3), has not been objected to by the appellant.

The appellant, however, argued that the result of this calculation should not be considered as forming part of the method disclosed by O1a, O1b since it merely reflects a calculation based on numerical values given for two specific embodiments. In its view the overlap derivable from this calculation is not representative for the overall teaching of O1a, O1b.

This argument is not convincing.

The calculation relied upon by the respondent can be immediately carried out based on the numerical values given in slide 11 with respect to the two embodiments of paste patterns shown in slide 10.

No convincing reason has been given to not consider the two embodiments as incorporating the teaching of O1a, O1b.

That this is indeed the case is corroborated by the fact that the overlap of the two drawn lines of a line segment derivable for these embodiments is perfectly in line with the guidance given for the shape of the paste pattern by the statement in the "ABSTRACT" of O1a as referred to above (point 3.2.1).

- 3.2.4 Thus the **disclosure of O1a, O1b** which is to be considered in the following concerns a paste pattern forming method in which at least one segment line is formed by drawing two drawn lines as defined by feature (b).

These lines are formed by drawing a first line in a given direction which is connected via a curved connection line of radius  $r$  to a second line extending in the opposite direction, parallel to the first line.

Furthermore, the radius has a value chosen such that the first and the second line are arranged in a partially overlapping manner such that voids between the two lines are eliminated.

4. *Feature distinguishing the method of claim 1 from the one according to O1a and O1b / effects / problem*

- 4.1 A comparison of the method of claim 1 with the one disclosed in O1a, O1b reveals that, as indicated in the annex (cf. point 6.3.6), the only **distinguishing feature** to be considered is **feature (b)** according to which the two drawn lines of the at least one segment line are formed by drawing a line to go and return over a certain stroke.

4.2 Distinguishing feature (b) is defined in claim 1 in terms of the manner in which the two drawn lines are formed; **drawing a line to go and return**. The distinguishing feature has in these proceedings also been expressed by different parameters or terms.

No objection has been raised by the appellant against the following terms under which the distinguishing feature has been addressed.

4.2.1 The resulting arrangement of the two lines has been referred to as **completely overlapping**. This implies a particular distribution of the paste, namely that the amount of paste normally distributed for one line is doubled while the area onto which the paste is applied remains essentially the same as for one line.

4.2.2 The distance between the centres of the two lines has been referred to as the **radius r having a value of zero**. This implies also that in the method of claim 1 a curved connection line as known from O1a, O1b does not exist.

5. *Effects of the distinguishing feature*

The following **effects attributed to the distinguishing feature** have been discussed during the oral proceedings.

5.1 According to the appellant the arrangement of the two lines, such that they completely overlap each other, leads to the **first effect** that in the area covered by the paste of these two lines there is no empty space giving rise to the creation of bubbles during bonding.

The appellant referred to this effect also as **prevention of bubbles during bonding.**

5.2 In the view of the appellant this arrangement also causes a **second effect**, namely that even the formation of minute empty spaces is prevented, as they can be formed if the overlap is only partial. The appellant referred to this effect also as **prevention of micro bubbles during bonding.**

5.2.1 The respondent has not objected to the first effect being taken into account.

5.2.2 It has, however, objected to the consideration of the second effect, the prevention of micro bubbles. In its view neither micro bubbles nor their prevention is referred to in the patent in suit and furthermore the meaning of the term micro bubbles is not clear. Moreover, if the prevention of micro bubbles is understood to be due to the overlap of the two lines being complete as compared to a partial overlap, then further parameters contributing to such an effect need to be taken into account as well. Such parameters which contribute on a similar scale to an effect caused by a minute difference in the extent of overlap are e.g. the viscosity of the paste, the relative speed (between a nozzle applying the paste and the area of the body to which it is applied) and the wettability of the surface to which the paste is applied. This applies correspondingly if micro bubbles are understood as being minute pockets of air entrapped in the paste in the course of its application. Since none of these further parameters has received mention in the patent

in suit, nor are they defined in claim 1, the second effect cannot be acknowledged.

- 5.2.3 The Board considers the opinion of the respondent to be correct. The arrangement of the two lines such that they completely overlap each other, thus leads to the **first effect** that in the area covered by these two lines there is no empty space giving rise to the creation of bubbles during bonding. The formation of bubbles during bonding is thus prevented.

The **second effect** cannot be considered, as such an effect is not disclosed in the patent in suit. The statement in the description that the object of the invention is to provide "a drawing pattern ... which can completely prevent a bubble from being entrapped in a step of bonding a bonded member ... to a paste applied body ..." referred to by the appellant can, as indicated during the oral proceedings, only be seen in relation to the general prevention of bubbles as referred to in the description (cf. e.g. paragraphs [0017], [0030], [0043] to [0045]), but not in relation to any other type of bubbles like micro bubbles which are not at all referred to in the patent in suit.

- 5.3 The Board agrees with the argument of the respondent that a third and a fourth effect is caused due to feature (b). These effects relate to how the distinguishing feature (b) has been addressed (cf. points 4.2, 4.2.1 and 4.2.2 above).

- 5.3.1 The **third effect** results from the fact that two completely overlapping lines make it possible to apply a larger amount of paste on substantially the same area

as a single line. The third effect thus concerns the extent to which the body is covered by the paste.

- 5.3.2 The **fourth effect** is linked to the third effect and results from the drawing of the line to go and return over a certain stroke. This leads automatically to the situation that the line "to go" has an end point which is simultaneously the start point for the line "to return". This has the effect referred to in the patent in suit, namely that an extra amount of paste is applied at such points (see e.g. paragraph [0042]). This effect thus concerns the distribution of the paste.

6. *Problem*

- 6.1 The problem solved by the subject-matter of claim 1 starting from the method of O1a, O1b has been formulated based on the first effect. This reflects the discussion during the oral proceedings, resulting in that the second effect has not been considered (cf. point 5.2.4 above). The third and fourth effects have been considered in the examination of inventive step as design options or the result of design choices.

- 6.2 The **problem** which can be formulated **based on the first effect** can be seen, in line with the problem mentioned in the patent in suit (paragraph [0009]), to modify the known method such that formation of bubbles can effectively be prevented.

- 6.3 It is common ground that the formation of at least one segment line according to features (a) and (b) contributes to the solution of this problem.

6.4 According to the appellant a more general problem should be considered since the above formulated problem would contain already a pointer to the solution.

As indicated during the oral proceedings the Board does not, in line with the arguments of the respondent, find this argument to be convincing.

One reason is that the problem formulated above does not comprise a pointer to the solution, which is the formation of two lines according to feature (b), but merely identifies the aim to be achieved, namely to prevent the formation of bubbles.

A second reason is that the more general problem as suggested by the appellant (improvement of the quality of the bonding) cannot be considered solved by the subject-matter of claim 1. This is because such an improvement requires that account is taken of a variety of parameters like the viscosity of the paste, the wettability of the body surface to which the paste is applied, the relative speed between the nozzle through which the paste is applied and the body to which the paste is applied etc., which determine the quality of the bonding. None of these parameters is addressed in claim 1, nor in the patent in suit. The subject-matter of this claim cannot therefore be considered as solving this general problem.

6.5 This issue needs no further consideration since, as can be derived from the following, the problem formulated above based on the first effect need not further be considered since it is already solved by the paste



pattern forming method according to the closest prior art given by 01a, 01b (cf. point 3.2.4).

7. *Obviousness*

7.1 The Board agrees with the respondent that starting from the closest prior art according to 01a, 01b as indicated above (point 3.2.1) the problem formulated above (point 6.2) based on the first effect of distinguishing feature (b) can no longer be considered since such a problem is already solved by the known method. The reason is that the first effect is already obtained by the known method due to the considerable overlap of the two lines of the segment line and that the second effect based on the complete overlapping according to claim 1 cannot be considered as indicated above (cf. point 5.2.3).

7.2 As discussed during the oral proceedings and accepted by the appellant at least as an alternative problem a **less ambitious problem** needs to be formulated, namely to adapt the line arrangement of the method of 01a, 01b to external requirements.

7.3 According to the appellant starting from the method according to 01a, 01b the skilled person would not consider changing the arrangement of the two drawn lines such that these, instead of overlapping partially, overlap completely. One reason is that 01a, 01b does not give any incentive in this direction and another is that the skilled person would not completely change the method in which the paste pattern is formed, by omitting an important parameter, namely the provision of a curved connection line between the two parallel

drawn lines having a radius  $r$  clearly identified in 01b. Reducing the radius of the curved line to  $r = 0$  would be out of reach for the skilled person.

7.4 For the Board the arguments of the respondent are more convincing.

First, the reasons to modify the known method of 01a, 01b such that the two lines of a line segment no longer overlap partially but completely are manifold.

In this connection it needs to be considered that the distinguishing feature can, as indicated in point 4.2 above, also be expressed by different parameters or terms. These lead to the third and fourth effect referred to in points 5.3.1 and 5.3.2 above.

To obtain - depending on circumstances like the requirements imposed on the shape of the paste pattern, the paste parameters and the body to which the paste is applied - each one of these effects can be seen as a reason for the skilled person to modify the known method.

As a consequence, drawing lines such that corresponding to the third effect a larger amount of paste is applied on an area of the body having substantially the same width as for one line is the result of an obvious modification of the known method, with the result that the two lines are formed as completely overlapping.

It is evident that then the lines have to be drawn as a line to go and return over a certain stroke as defined by feature (b) which leads automatically to the end

point of the line "to go" being simultaneously the start point for the line "to return". This corresponds to the fourth effect. In that case, the extra amount of paste applied at the location of these points (cf. e.g. paragraph [0042]) has to be taken into account.

It is therefore a matter of requirements given by the bonding to be performed or, correspondingly the shape of the paste pattern to be obtained, whether or not partial overlapping in the manner known from O1a, O1b suffices, which has the advantage that no end points and starting points result at the extremes of the pattern, or whether a complete overlap having the disadvantage of such start and end points is aimed for.

Whether the method known from O1a, O1b (partial overlap) is used or the method of claim 1 (complete overlap) is thus the result of a design choice according to requirements, well weighing the advantages and disadvantages of both methods. This is within the reach of the skilled person. It has not been put into question that the known method can be modified without technical difficulties such that the method according to claim 1 results.

Consequently the paste pattern forming method of claim 1 cannot be considered as involving an inventive step (Article 56 EPC).

7.5 The above result holds true considering the following arguments of the appellant.

7.5.1 According to one argument the solution given by the method of claim 1 cannot be considered as an obvious

modification of the method of O1a, O1b. Even if the value for the radius of the curved connection line is considered as being small in this method, it has to be taken into account that nevertheless the existence of such a curved connection line remains mandatory. The omission of such a connection line would mean a shift away from the method of O1a, O1b for which, leaving inadmissible hindsight aside, no reason is given by O1a, O1b.

The respondent did not object to the view that a shift from a segment line formed by drawing two lines which are connected via a curved connection line having a small radius to a segment line formed by drawing two completely overlapping lines with a radius being zero, changes the manner in which the two lines are connected.

However, a change in this respect is foreseeable and not based on inventive activity. In this connection it referred also to D14, figure 4-18, from which it can be derived that the quality of the outer ends of a segment line is in any case of concern: in this respect the curved connection line and in particular its radius are of importance. The radius  $r$  as an important parameter is therefore subject to change if it is to comply with given requirements.

- 7.5.2 The Board considers the opinion of the respondent as being more convincing. As can be derived from the above (point 7.4) the following needs to be taken into account. It is due to given requirements that the skilled person considers it necessary to draw two lines of a line segment in complete overlap. In that case there is no reason to maintain a curved connection line

if the problem which can arise from the start and end point of the two lines being formed at the extremities of the pattern as indicated above is of no concern.

- 7.5.3 According to a further line of argument the disclosure of the closest prior art method according to O1a, O1b needs to be considered in context with modifications suggested by further known paste pattern forming methods. This is necessary for dealing with the question which modification(s) can be considered as obvious starting from this closest prior art.

D13 to be considered in this respect discloses (cf. paragraph 3.5.1) under the heading "Teach: New Material - Leadframe - Dispense Pattern Class Optimization Parameters" in the section "Overlap Distance" that this parameter is only available for a certain setting. Furthermore, in section "Wetting correction" it is stated "This parameter simultaneously increases all pattern radii within the pattern. To allow the highest pattern speed it is recommended that the greatest possible correction values are used. The upper limit is reached when two adjacent adhesive lines become visibly **separated**. This correction is necessary because of the different wetting behaviour of different leadframe pad surfaces."

According to the appellant D13 thus teaches the skilled person away from the method of claim 1 in that a visible separation of the two lines is required.

- 7.5.4 The Board finds the argument of the respondent more convincing that this statement concerns a particular condition, namely a wetting correction, and does,

permitting that the wetting condition allows or requires it, not distract from the fact that according to 01a, 01b the pattern is to be such that lines **touch** each other such that voids are eliminated right from the beginning (cf. point 3.2.1 above).

Consideration of D13 thus does not lead to the skilled person being limited with respect to the direction in which the partial overlap according to 01a, 01b can be modified. Considering D13 the degree of overlap still depends, as indicated above, on the circumstances to be considered, namely requirements to be fulfilled, e.g. concerning the manner in which the paste is to be distributed according to a given paste pattern, and conditions like the wettability referred to above.

*Claim 1 according to the new auxiliary request*

8. *Subject-matter of claim 1*

8.1 Claim 1 according to the new auxiliary request differs from claim 1 according to auxiliary request 2 in that in feature (a) instead of "at least one segment line" "a plurality of such segment lines" is referred to.

8.2 It is true that, as argued by the appellant, the first effect obtained for the at least one segment line according to claim 1 of auxiliary request 2 (cf. point 5.2.3 above) is now obtained for "a plurality" of line segments, as referred to in claim 1.

It has, however, neither been argued nor shown by the appellant that a further effect is obtained which goes beyond the sum of the individual effects obtainable for

each individual segment line formed by drawing two drawn lines as defined by feature (b). Such a further (synergistic) effect is also, as indicated during the oral proceedings, not apparent.

- 8.3 Thus the objection concerning lack of inventive step raised with respect to the subject-matter of claim 1 according to auxiliary request 2 is clearly not overcome with the subject-matter of the claim 1 of the new auxiliary request since the amendment does not introduce any additional fact (feature or effect) to be considered in the examination of inventive step.

As it is clearly not allowable, the new request has not been admitted (Article 13(1) RPBA).

9. Since the only admissible request is not allowable the appeal has to be dismissed.

## **Order**

### **For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders