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**D E C I S I O N**  
**of 21 March 2002**

**Case Number:** T 0804/99 - 3.2.6

**Application Number:** 92102979.9

**Publication Number:** 0500135

**IPC:** B23K 1/08

**Language of the proceedings:** EN

**Title of invention:**

Wave soldering in a protective atmosphere enclosure over a solder pot

**Patentee:**

PRAXAIR TECHNOLOGY, INC.

**Opponent:**

L'AIR LIQUIDE, S.A. pour l'étude et l'exploitation des procédés Georges Claude

**Headword:**

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**Relevant legal provisions:**

EPC Art. 52(1), 54(1), 56, 83, 114(2)

**Keyword:**

"Admissibility of late filed documents - introduction agreed by Patentee"

"Sufficiency of disclosure - yes"

"Novelty and inventive step - yes"

**Decisions cited:**

G 0009/91

**Catchword:**

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Case Number: T 0804/99 - 3.2.6

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.6**  
**of 21 March 2002**

**Appellant:** L'AIR LIQUIDE, S.A.  
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**Representative:** Vesin, Jacques  
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**Decision under appeal:** Interlocutory decision of the Opposition Division  
of the European Patent Office posted 8 June 1999  
concerning maintenance of European patent  
No. 0 500 135 in amended form.

**Composition of the Board:**

**Chairman:** P. Alting van Geusau  
**Members:** G. C. Kadner  
M.-B. Tardo-Dino

## Summary of Facts and Submissions

- I. The mention of the grant of European patent No. 0 500 135 in respect of European patent application No. 92102979.9 filed on 21 February 1992 and claiming a US-priority of 22 February 1991 was published on 10 April 1996.
- II. Notice of opposition was filed against this patent on the grounds of Article 100(a) (lack of novelty and inventive step), (b) and (c) EPC by the Appellant.
- III. By decision announced during the oral proceedings on 19 May 1999 and posted on 8 June 1999 the Opposition Division maintained the patent in amended form. Amended claim 1 reads as follows:

"A wave soldering apparatus comprising a solder pot (19) and enclosure means (26, 30) for containing a protective atmosphere during contacting of circuit boards with a solder wave (12) in the pot, said enclosure means having an entrance (40) for circuit boards on an entrance side (34) and an exit (42) for circuit boards on an exit side (36), a supply of non-oxidizing gas having an oxygen content not greater than 5% by volume, and means (52, 54, 56) for admitting said gas into the enclosure means;

wherein said enclosure means (26, 30) comprises a bulkhead (26) and a hood (30);

wherein the bulkhead (26) is attached to the solder pot (10), the lower extremity of the bulkhead (26) is immersed in the solder (12) contained in the solder pot (10);

wherein the hood (30) is located at the upper extremity of the solder pot (10), the hood (30) forms an enclosure over not more than the solder pot and defines said entrance and exit sides (34, 36), and the lower extremities of a front side (32), of the entrance side (34) and of the exit side (36) of the hood (30) are shaped to fit around the outside upper extremity of the solder pot (10);

wherein means (44, 46) for sealing the hood (30) to the solder pot (10) are provided, said sealing means (44, 46) comprising a first elastomeric seal (44) on the inside surfaces of the lower extremities of the front, entrance and exit sides (32, 34, 36) of the hood (30), said first elastomeric seal (44) for contacting the upper outside surfaces of the solder pot (10), and a second elastomeric seal (46) on the outside surface of a rear side (38) of the hood (30) for contacting the bulkhead (26);

wherein the solder pot (10) with the bulkhead (26) is adapted to be withdrawn laterally from under the hood (30); and

wherein the solder pot (10) with the bulkhead (26) is adapted to move vertically without breaking the seals obtained by the sealing means (44, 46)."

The Opposition Division was of the opinion that the patent as amended did not extend beyond the content of the application as filed and met the requirements of clarity, and also those of novelty and inventive step having due regard in particular to the state of the art disclosed in:

D1: JP-U-63-189 469

D2: English translation of D1

D3: JP-A-61-82 965

D4: English translation of D3

D14: US-A-4 921 156

IV. On 16 August 1999 notice of appeal was lodged against this decision together with payment of the appeal fee.

The statement of grounds of appeal was filed on 27 October 1999. On appeal the Appellant (Opponent) additionally relied on the following documents:

R2: JP-A-57-173 999

R3: WPIL abstract of D3

R4: Brochure: Lötssystem Typ E 071/L-C/400, Streckfuss

R5: Brochure: NU/ERA MP Computer Controlled Wave Soldering System, Technical Devices

R6: Brochure: "Gemini" Dual Wave Soldering System LG, Nihon Den-Netsu Keiki Co., Ltd.

R7: Brochure: Minipak 300 Lambda and Omega Wavesoldering System, Electrovert, 1988

R8: Brochure: Europak I SMT Europak II SMT, Electrovert, 1988

R9: Electronic Materials Handbook, Vol. 1, Packaging,  
by ASM International, 1989

V. In a communication dated 16 October 2001 the Board pointed out that documents R4 to R6 did not appear to be suitable as prior art evidence since they did not carry a publication date, and the other newly filed documents did not appear relevant because they did not deal with solder pot hood and sealing constructions. In the oral proceedings discussion would focus on the matter of inventive step.

VI. Oral proceedings were held on 21 March 2002.

The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 500 135 be revoked.

The Respondent (Patentee) requested that the appeal be dismissed and that the patent be maintained on the basis of the amended claims and description as maintained by the Opposition Division.

VII. In support of its request the Appellant essentially relied upon the following submissions:

At least the newly filed pre-published documents R7, R8 and R9 should be admitted into the appeal proceedings since they indicated that the solder pots in wave soldering system were movable in vertical and horizontal direction. In that respect R7, R8 and R9 would come closer to the subject-matter claimed than the other prior art documents.

The teaching of claim 1 was not sufficiently clear

enough to enable a skilled person to carry out the invention. Particularly it was not comprehensible how an airtight seal between the bulkhead and the hood could be established so that in case of movement between these parts the seal was not broken.

Documents D1/D2 showed closure means covering only the surface of a solder pot. A skilled person studying the device shown in D3/D4 and reading the description (page 4, top of the right column) would draw the conclusion that a seal should exist between the solder pot and the hood since the hood was installed in an airtight manner. Reference was also made to seals made from rubber in connection with the delivery shutter.

The common general knowledge of the skilled person included also the availability of elastomeric seals which were suitable for use in hot environments. Therefore the features concerning the use of elastomeric seals in connection with the vertical and horizontal movement were obvious to the skilled person.

Figure 2 of D14 showed a hood in the form of a tunnel which covered not more than the solder pot. The part of the solder pot comprising the pumps was outside the enclosure.

A bulkhead attached to the solder pot and immersed in the solder was disclosed in R2. If a cover should be provided in that arrangement the skilled person was free to lengthen the bulkhead to a higher level and to combine it with a hood which was known from the other documents. Therefore, having regard to the relevant prior art, the features of claim 1 were readily available to the skilled person and because no



extraordinary or surprising result was provided by the sum of the known features disclosed in the prior art the subject-matter of claim 1 lacked an inventive step.

VIII. The submissions of the Respondent are summarised as follows:

None of the documents R7, R8 and R9 disclosed a combined movement in a horizontal and a vertical direction. Height adjustment required a movement only of a small distance, and normally the height adjustment of the solder wave was performed by vertical movement of the solder pump. Horizontal movement according to R7 and R8 was not necessary by reason of accessibility of the solder pot because the hood was lifted. However, no objections were raised against the introduction of those three further documents into the proceedings.

The hood shown in D1/D2 covered not only the solder pot but also the pump device. The hood according to D3/D4 was still larger than that of D1/D2. No seals and particularly no elastomeric seals were disclosed in any of these documents.

According to D14 the seal between the soldering tunnel 3 and the solder bath 20 was achieved by the provision of an immersed seal by means of a sealing skirt. Neither D1/D2, D3/D4 nor D14 disclosed a bulkhead, and therefore no combination of a bulkhead with a hood was derivable from that prior art.

Since the soldering apparatus of R2 did not contain a hood no indication was given to combine a hood with a bulkhead, particularly because R2 showed only a wall which did not extend over the surface of the solder

pot.

Even considering elastomeric seals to be well known in the art the combination of the features of claim 1 led to a novel and efficient soldering apparatus towards which no indication could be derived from any of the cited prior art documents.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Admissibility of late filed documents*

According to the case law of the Boards of Appeal late-filed evidence can only be taken into consideration by the Board if it is prima facie more relevant with respect to the subject-matter claimed than the prior art documents already present in the proceedings unless the Patentee agrees to the introduction of the new evidence (see G 9/91, OJ 1993, 408). In the present case the features of horizontal and vertical movement of the solder pot in relation to the soldering apparatus were not explicitly disclosed in the documents up to R6 as being prior art. Since that additional feature is of relevance, and also because the Patentee agreed with the introduction, the Board admitted R7, R8 and R9 into the proceedings.

3. *Sufficiency of disclosure and extension of subject-matter*

With regard to the Appellant's objection of insufficiency of the disclosure of the wave soldering

apparatus of claim 1 (Article 83 EPC), it is to be noted that claim 1 defines in detail the shape of the sides of the hood contacting three sides of the solder pot and the bulkhead (see claim 1, second to fifth paragraph). To a skilled person it is clear from this claim in conjunction with Figure 2 that the general L-form (in cross section) of the hood allows vertical and horizontal movement of the solder pot. The desired gas-tightness of the enclosure means in conjunction with elastomeric seals being attached to the hood indicates clearly that these seals slide along the contact surfaces of solder pot and bulkhead during vertical movement thereby preventing them breaking. In so far the skilled person does not have any difficulty in carrying out the subject-matter of claim 1.

The objections raised under Articles 123(2) and (3) EPC have not been maintained on appeal. The Board does not see any reason to deviate from the decision of the Opposition Division in this respect.

4. *Novelty*

Novelty of the apparatus according to claim 1 was not contested by the Appellant. The Board is satisfied that none of the prior art documents discloses a wave soldering apparatus comprising all features of claim 1 of the patent in suit. Particularly the features of the hood and the bulkhead in their specific relation with one another and with the solder pot and the provision of elastomeric seals in the form as defined in claim 1 are not disclosed in any of the cited documents (Article 54(1) EPC).

5. *Inventive step*

5.1 The Appellant started from a combination of D1/D2 with D3/D4, added features of D14 and R2, and combined that subject matter with the teachings of R9 and common general knowledge in order to provide evidence for lack of inventive step involved in the subject-matter of claim 1.

In the Board's opinion the closest prior art is represented by D3/D4. This document discloses a wave soldering apparatus including the features of the first paragraph of claim 1.

5.2 The problem addressed in the patent in suit is to provide an apparatus whereby existing wave soldering machines originally designed to operate in air are retrofitted to obtain the benefits of soldering machines designed to operate under a protective atmosphere and to provide an economical design for new wave soldering machines initially intended to operate under a protective atmosphere (see page 4, lines 50 to 54 of the description according to the auxiliary request filed 19 May 1999).

5.3 This problem is solved by an apparatus according to claim 1, particularly comprising enclosure means of a specific form, combining a bulkhead and a hood, the bulkhead being sealed against the solder bath by an immersed seal and the hood being sealed against the solder pot and against the bulkhead by elastomeric seals, wherein the solder pot with the bulkhead is adapted to be withdrawn laterally from under the hood and to move vertically without breaking the seals obtained by the sealing means.

5.4 Regarding the hood containing the protective atmosphere

according to D3/D4 it is apparent that it covers the solder pot including the solder pump and impeller 3. No bulkhead is present in that device or derivable from the description. The text (top of page 4, right column of D4) describes that the hood is installed in an airtight manner on the top of the outside wall of the solder bath defining in which manner the airtight connection is performed. The following mention of elastic rubber material relates to the closure of the delivery shutter, not to the seal of the hood against the solder pot. Obviously the solder pot cannot be withdrawn laterally from the hood before it is moved under the hood. Therefore the device of D3/D4 does not give any indication towards the construction of the wave soldering apparatus with the features as claimed.

5.5 The apparatus disclosed in D1/D2 does not come closer to the subject matter of claim 1 of the patent in suit because any indication is lacking as to how the hood is connected to the solder pot. Consequently that prior art neither alone nor in combination with D3/D4 leads to the claimed solution.

5.6 The wave soldering arrangement shown in D14 (Figures 1 to 3) has a construction fundamentally different from those of D3/D4 and D1/D2 since the protective atmosphere is contained in a tunnel 3. The airtightness against the solder pot is achieved by interconnected vertical walls 18, the lower ends 22 of them forming a skirt edge being immersed in solder bath thus providing an immersed seal. Due to the technical difference it is not apparent why the skilled person would try to combine the teachings of D1/D2 or D3/D4 with that of D14. Even in the case of a combination of both known apparatus the skilled person would not be led to the

subject-matter of claim 1 but would at best arrive at a soldering arrangement with a hood containing the protective atmosphere covering the solder bath and being sealed against it by vertical walls being fixed to the hood and being immersed in the solder in the form of a skirt edge. No bulkhead extending over the surface of the solder bath and sealed against the hood is shown, no elastomeric seals are present in that combination, and no horizontal movement of the solder pot relative to the hood is possible.

5.7 The prior art disclosed in R7, R8 and R9 teaches that the solder pot is horizontally movable and adjustable in height, however no indication is present showing by which means the protective atmosphere is sealed in such known arrangement. Moreover, an adjustment in height generally means only a small vertical movement, which is also possible with the solder pot shown in D14. In contrast to that adjustment the vertical movement according to the patent is not limited and in its length only dependent of the vertical extension of the contact area between the hood with the bulkhead and the solder pot. Therefore R7, R8 and R9 do not give any indication towards the claimed solution in its specific working combination of features.

5.8 Document R2 discloses a soldering apparatus which has no enclosure means for containing a protective atmosphere. For this reason the skilled person would not combine that apparatus with one of the other arrangements having enclosure means. The further documents cited in opposition and on appeal are still more distant from the subject-matter claimed than the documents discussed above.

It is to be noted that the Appellant mainly insisted on the obviousness of the features of claim 1 taken in isolation, and because a functional interrelation was denied, no inventive activity could be attributed to the claimed working combination of features.

The Board draws attention to the fact that clearly there is a functional relationship amongst the features of claim 1 wherein in particular the combination of bulkhead, L-shaped hood and elastomeric seal leads to a simple arrangement in which vertical adjustment of the solder pot can be achieved without breaking the seals and nevertheless allows lateral withdrawal at any vertical position of the solder pot. Such functional combination is neither disclosed nor hinted at in any of the cited documents. No way was shown by the Appellant or is apparent to the Board in which the claimed solution could be arrived at without inventive step (Article 56 EPC).

6. Summarising, for the above reasons the Board arrives at the conclusion that the subject-matter of claim 1 complies with the requirements of patentability according to Article 52(1) EPC. The same conclusion applies to the subject-matter of claims 2 to 9 which cover particular embodiments of the wave soldering apparatus according to claim 1. Therefore the patent can be maintained in the form as amended during the proceedings before the Opposition Division.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau