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D E C I S I O N
of 7 June 2005

Case Number: T 0386/02 - 3.5.1
Application Number: 91911016.3
Publication Number: 0531428
IPC: H04N 7/00, G01R 15/12,
G01R 1/067

Language of the proceedings: EN

Title of invention:

Test fixture alignment apparatus and method

Patentee:

EVERETT/CHARLES CONTACT PRODUCTS INC.

Opponents:

MANIA GmbH & Co.
atg test systems GmbH

Headword:

PCB Alignment/EVERETT/CHARLES CONTACT PRODUCTS INC.

Relevant legal provisions:

EPC Art. 56, 123(2)

Keyword:

"Added subject-matter of amended claims (no)"
"Inventive step (yes)"

Decisions cited:

T 0284/94

Catchword:

-



Case Number: T 0386/02 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 7 June 2005

Appellant:
(Opponent 01)

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D-61276 Weilrod (DE)

Representative:

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Respondent:
(Proprietor of the patent)

EVERETT/CHARLES CONTACT PRODUCTS INC.
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Representative:

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Decision under appeal:

Interlocutory decision of the Opposition
Division of the European Patent Office posted
4 February 2002 concerning maintenance of the
European patent No. 0531428 in amended form.

Composition of the Board:

Chairman: S. V. Steinbrener

Members: W. E. Chandler

G. E. Weiss

Summary of Facts and Submissions

I. This appeal is against the interlocutory decision of the opposition division concerning maintenance of European patent No. 0 531 428 in amended form.

Two oppositions were filed against the patent as a whole covering Articles 100(a), (b), and (c) EPC. Opponent 02 subsequently withdrew its opposition during opposition proceedings.

The opposition division held that the grounds for opposition mentioned in Articles 100(a), (b), and (c) EPC did not prejudice the maintenance of the patent, based on the auxiliary request filed during the oral proceedings, having regard inter alia to following documents:

D1: US-A-4 820 975

D18: DE-A-34 05 567

D22: JP-A-63 124 969 and English translation thereof

II. Opponent 01 (appellant) lodged an appeal and requested that the decision be set aside and that the patent be revoked. The appellant also made an auxiliary request for oral proceedings.

III. Following a communication from the Board accompanying the summons to oral proceedings, the proprietor (respondent) filed claims of first to third auxiliary requests. The appellant declared that he would not be attending the oral proceedings, but maintained his requests.

IV. Oral proceedings were held on 7 June 2005, which the appellant did not attend. The respondent requested that the decision under appeal be set aside and that the patent be maintained on the basis of:

Claims 1, 7, 9, and 12 as filed at the oral proceedings;
Claims 2 to 6, 8, 10, 11 and 13 to 15 as granted;
Description pages 2 to 4 and 10 as filed at the oral proceedings;
Description pages 5 to 9 of the patent specification;
Drawing Figures 1 to 14 of the patent specification (Figure 15 deleted).

V. Claim 1 reads as follows:

"A test fixture for testing a printed circuit board (20) in which the test fixture (10) comprises a base (25), an array of test probes (18) on the base (25) to be aligned with a pattern of test points in a circuit array (22) on the board (20); the circuit array being positioned on the board (20) with reference to one or more indexing marks (28) on the board: said indexing marks comprising a fiducial mark (28): and board mounting means (24) on the base for holding the board in a fixed position relative to the array of test probes (18) on the base: sensing means (30) for sensing the position of the fiducial mark (28) on the board as the board is held on the base by the board mounting means (24), to produce a measurement of the alignment or misalignment of the array of test probes (18) relative to the pattern of test points in the circuit array (22) on the board characterized in that said sensing means is mounted in a fixed position on the base (25) for sensing the position of the fiducial mark

(28) on the board; in that the board mounting means (24) comprises tooling pins (24) on the fixture (10) for respectively engaging an alignment device (26) of the board (20) and in alignment with the circuit array (22), to hold the board and its circuit array in a fixed position relative to the array of test probes (18) on the fixture (10) and means (44) for rigidly securing the tooling pins in a first position for holding the board in a fixed position to produce said sensing means measurement; the tooling pins being individually moveable relative to the fixed position of the sensing means to move the board relative to the array of test probes (18) to a second adjusted position to correct any misalignment of the circuit array (22) relative to the array of test probes and to produce a corresponding change in said sensing means measurement; said sensing means producing said output to indicate the precise movement of the board to the second adjusted position on the fixture necessary to align the sensing means with the fiducial mark (28), to thereby indicate precise alignment of the test probes with corresponding test points in the circuit array of the board."

Method claim 12 corresponds to apparatus claim 1.

VI. The appellant argued in writing as follows:

Claim 1 as amended before the opposition division was not allowable under Article 123(2) EPC.

Firstly, the change from tooling "pin" to tooling "pins" was a generalisation that was not supported by the originally filed description, which only disclosed a "pair" of pins, i.e. two pins. Secondly, in the originally filed application there was a one-to-one

correspondence between the number of tooling pins and the number of sensors; for example, one tooling pin and one sensing means in the claims and two tooling pins and two sensors in Figure 1. Amended claim 1 specified tooling pins in the plural and sensing means in the singular, i.e. an unsupported two-to-one correspondence. Thirdly, the original disclosure disclosed a specific extent of movability of the tooling pins, but not a general movability of the pins relative to each other as now claimed by the introduction of the term "individually" moveable. Fourthly, it was not possible to adjust the board if the number of sensors did not correspond to the number of individually moveable pins, so that the amended claim did not provide an unambiguously recognizable complete solution to a problem as required by T 284/94. Finally, there was no support for the feature of "rigidly securing the tooling pin[s] in a first position" prior to adjustment. In particular, the support alleged by the opposition division in the decision under appeal only described how the pins could be slackened off when required, but not specifically prior to adjustment. In fact, the pins had to be loose when the board was placed on them otherwise it would not locate in the vertical direction.

The amendment made to claim 1 during the opposition proceedings of specifying a plurality of individually adjustable pins added a second difference with respect to the arrangement of D22. This gave rise to the additional objective problem of adjusting for tolerances in the distance between the alignment holes on the board. This was obvious in the light of D18, which disclosed solving this problem by making one of two tooling pins moveable.

VII. The respondent argued as follows:

Although the embodiment showed two tooling pins, the original disclosure supported the expression of tooling pins in the plural, at page 12, lines 5 to 7 of the corresponding WO-A-publication, for example. The number of tooling pins was not linked to the number of sensors so that there was no originally disclosed limitation to a one-to-one correspondence. The fact that there was only one type of tooling pin implied that they were "individually" movable. The number of sensors was a function of the number of fiducial marks and had nothing to do with the number of tooling pins. The skilled person would be able to choose the appropriate sensors and tooling pins to solve the problem of adjusting the board. The opposition division had correctly decided that the feature of rigidly securing the tooling pins in a first position was supported in the original disclosure (page 15, lines 7 to 19).

The invention resulted in more accurate alignment of the board on the test fixture. In particular, the use of individually moveable pins engaging directly into the board avoided the additional tolerances introduced by the fixed plate in D22.

If the skilled person were to consider using sensing means to improve the alignment of the board, he would have used the whole teaching of D1, including the idea of clamping the board and moving the sensors and test probes relative to it. This would teach away from the invention, especially the idea of using individually moveable pins.

Moreover, none of the documents disclosed locating the board on individually moveable pins. D18 only disclosed one moveable pin, which solved the different problem of reducing mechanical tolerance of the reference holes in the board and not aligning the board on the test fixture.

Reasons for the Decision

1. The appeal complies with the requirements referred to in Rule 65(1) EPC and is, therefore, admissible.

2. The patent (see in particular Figures 1 and 9) essentially concerns testing printed circuit boards (PCBs) using a test fixture having a pattern of test probes that make contact with test points on the board. The board to be tested is aligned on the test fixture by placing it on tooling pins that pass through holes drilled on the board. The patent overcomes the problem of alignment error caused by mechanical tolerances in the position of these holes relative to the test points on the PCB. It does this by sensing and indicating the position of indexing means, having a fixed position relative to the test points on the board, and providing movable tooling pins that allow the board to be moved so that the sensed indexing means coincide with a reference position known to be correct.

Added subject-matter

3. Concerning the amendment to tooling pins in the plural, although the embodiment uses a pair of tooling pins, the description states, at page 2, lines 7 to 10 of the

WO-A-publication, that this is the *usual* arrangement, and refers several times to tooling pins in the plural. Moreover, the passage on page 12, at lines 8 to 10 states that "[A]lternatively, tooling pins on the fixture can be engaged with other alignment devices on the board ...", albeit in relation to the alternative alignment devices on the board. The Board judges that by referring to "tooling pins" in general and not specifically to the tooling pins of the embodiment the description is clearly not limited to two pins and therefore unambiguously supports tooling pins in the plural, as claimed.

4. The application makes no specific statements about one-to-one correspondence between the number of tooling pins and the number of sensors, and the appellant has derived it from the example of one tooling pin and one sensing means in the originally filed claims and two tooling pins and two sensors in Figure 1. The Board judges that this is effectively an intermediate generalisation from the examples, which if the proprietor had filed as an amendment, would not be allowable. There is thus no support of such a disclosure, and therefore no limitation to it. In any case, the Board judges that original claim 1 is not restricted to only sensing means in the singular as stated by the appellant since the means in original claim 1 is not used with a singular verb, such as the "is" used at line 20 of the granted claim 1.

5. Since there is no disclosure of a one-to-one correspondence, the Board judges that the part of decision T 284/94 (OJ EPO, 1999, 464) cited by the appellant, which deals with the case of isolating

- disclosed* features from the description, does not apply. In any case, the Board also judges that it is possible to adjust the board without the alleged one-to-one correspondence, which also implies that the latter is not necessary. In particular, the Board agrees with the respondent that the number of sensors is influenced by the number and nature of the fiducial marks and is not determined solely by the number of tooling pins. For example, a single sensor detecting a cross-shaped fiducial mark could operate with several tooling pins to register the board in two dimensions.
6. The appellant admits that the description discloses a specific extent of movability of the tooling pins, but not that they are "individually" movable. However, in the absence of any disclosure of connected movement of the pins, the Board cannot see how the pins can be anything other than "individually" movable. In particular, the original description describes at page 19, lines 14 to 21, adjusting the position of one tooling pin and then the other tooling pin without any suggestion that they are connected and hence implying that the adjustment is in both cases the same as the single adjustment possibility mentioned on pages 14 and 15.
 7. Concerning the feature of "rigidly securing the tooling pin[s] in a first position", the description states that in the embodiment of the alignment method using the "gold board", after registering the cross-hairs with the gold pins at page 17, lines 4 to 16 and placing the circuit board on the tooling pins at page 17, lines 16 to 21, the "moveable tooling pins are then loosened ..." at page 17, line 26. The Board judges

that this can only imply that the pins were tight previously and thus rigidly secured in a first position, as claimed.

State of the art

8. In the statement of grounds of appeal, the appellant specifically refers to documents D22, D1 and D18.
9. D22 concerns the problem of overcoming the effect of manufacturing errors or tolerances on the alignment of a printed circuit board on inspection equipment having test pins. Figures 1 and 2 show that the board 2 to be tested is held on a fine adjustment plate 6 by means of guide pins 23. The plate can be moved in the X and Y directions relative to the test probes 11 by means of two fine adjustment mechanisms 5, which themselves have guide pins 21 as can be seen from Figure 3. After fine adjustment, screws 26 are used to fix the fine adjustment plate (see page 4, paragraph 5 of the English translation). If no fine adjustment is required, additional pins called reference pins 28 are used to lock the fine adjustment plate (see page 5, paragraph 3).
10. D1 also concerns the problem of improving the accuracy in positioning a PCB on a test bed. In Figure 1, the board 42 is clamped in a test jig with test probes 17 on test heads 15 that move relative to it on both sides. Each test head has optical sensing means 48-50 for sensing the position of alignment marks 47 on the board in order to align the probes with the test points on the board under test.

11. D18 concerns the problem of avoiding jamming of a PCB to be tested in the test jig caused by the tight tolerances between the tooling pins and the alignment holes on the board. This is solved by making one of the pins movable.

Inventive step

12. The Board judges that D22 is the closest prior art because it is the only document discussed by the appellant in which the circuit board to be tested is held by tooling pins and moved relative to the test probes as in the patent.
13. Starting from D22, it is common ground that claim 1 differs in that there are means for sensing the position of the fiducial marks and in that the tooling pins are individually movable.
14. In respect of the second difference, Figure 5 of D22 shows the guide pins 23a and 23b, but apart from explaining at page 4, fourth paragraph, that the shafts 25a and 25b of the guide pins fit into apertures 30 on the board, D22 does not disclose exactly how the guide pins operate. Although the pin 23b is referred to as a "guide plate" and has an elongated shape, D22 does not disclose that either of these pins is movable. The Board has also considered whether the moveable guide pins 21 on the fine adjustment mechanisms 5 in D22 can be equated with the claimed "tooling pins". However, the Board judges that this is not the case. Firstly, the Board agrees with the respondent that the notion of a "tooling pin" seems to require a direct engagement with the workpiece to be "tooled" and not

some intermediate mechanism. Furthermore, the claim specifies that the tooling pins engage in an alignment device of the board, whereas the pins on the adjustment mechanism in D22 engage in the fine adjustment plate, which is not an alignment device of the board but a separate device.

15. The Board also agrees with the respondent that the above mentioned differences can be considered to solve the problem of improving the accuracy of the alignment of the board on the test fixture. Clearly the use of the sensing means and the fiducial mark solve this problem. Although at first sight the use of movable tooling pins to align the board appears to be a backward step from the fine adjusting plate in D22, the Board judges that in fact when the pins are locked in place, a very stable and accurate positioning of the board is possible. In D22, although the adjustment itself might be easier, there are as stated by the respondent additional tolerances, namely movement of the board, which is not disclosed as being rigidly fixed, on the guide pins 23, and movement of the fine adjustment plate on the guide pins 21 until fixed by screws 26.

16. The Board first assumes that the skilled person would solve the problem identified above by providing and sensing fiducial marks on the board as disclosed in D1. If the entire teaching of D1 were to be used, it would lead to a situation where the board were clamped, and thus there would be no need for tooling pins at all, let alone movable ones. If, on the other hand, the teaching of the sensing means were isolated from D1 and incorporated into the apparatus of D22, the Board also

sees no reason to make both tooling pins 23 moveable. Firstly, the purpose of the tooling pins in D22 is to locate the board on the plate and not to allow alignment of the board as in the invention. Even if it is obvious to make one of the pins movable to assist mounting the board on the plate in the manner of D18, there is no reason to make the second pin movable. Secondly, no other document has been produced that shows two movable tooling pins. In particular, D18 only shows one movable pin, which is sufficient to solve the problem of avoiding jamming of the board on the pins. The only disclosure of two movable pins is the movable pins on the fine adjustment mechanism in D22. However, the Board sees no incentive to remove the fine adjustment plate in D22 and to move the board directly using these pins, which would require a major constructional change to the apparatus.

17. The Board accordingly judges that the subject-matter of claim 1 involves an inventive step (Article 56 EPC). The remaining claims and the description have been adapted at the oral proceedings and also meet the requirements of the Convention.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent as amended in the following version:

Claims 1, 7, 9, and 12 as filed at the oral proceedings;
Claims 2 to 6, 8, 10, 11 and 13 to 15 as granted;
Description pages 2 to 4 and 10 as filed at the oral proceedings;
Description pages 5 to 9 of the patent specification;
Drawing Figures 1 to 14 of the patent specification.

The Registrar:

The Chairman:

M. Kiehl

S. Steinbrener