Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [X] To Chairmen
(D) [-] No distribution

Datasheet for the decision of 17 December 2014

Case Number: T 2541/11 - 3.2.04

Application Number: 03255218.4

Publication Number: 1394387

IPC: F02C6/12, F01D5/04, F01D5/02, F04D29/26, F01D25/00, F16D1/08

Language of the proceedings: EN

Title of invention:
Turbochargers

Patent Proprietor:
Napier Turbochargers Limited

Opponent:
Abb Turbo Systems AG

Headword:

Relevant legal provisions:
EPC Art. 114(2), 123(2), 54(3), 56, 113(1), 112a(2)(c)
EPC R. 106

Keyword:
Late-filed document - admitted (no)
Amendments - added subject-matter (no)
Novelty - (yes)
Inventive step - (yes)
Right to be heard - appeal procedure - opportunity to comment (yes)

Decisions cited:
G 0009/91

Catchword:
Reasons 3.2, 3.3, 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 2541/11 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 17 December 2014

Appellant: (Patent Proprietor)	Napier Turbochargers Limited Ruston House Waterside South Lincoln Lincolnshire LN5 7FD (GB)
Representative:	Gill, Stephen Charles Mewburn Ellis LLP 33 Gutter Lane London EC2V 8AS (GB)
Appellant: (Opponent)	Abb Turbo Systems AG Bruggerstrasse 71a, Postfach 5400 Baden (CH)
Representative:	ABB Patent Attorneys c/o ABB Schweiz AG Intellectual Property CH-IP Brown Boveri Strasse 6 5400 Baden (CH)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 13 October 2011 concerning maintenance of the European Patent No. 1394387 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	J. Wright
	T. Bokor

Summary of Facts and Submissions

I. The appellant-opponent lodged an appeal, received 12 December 2011, against the interlocutory decision of the opposition division posted on 13 October 2011 on the amended form in which European patent no. 1394387 could be maintained and paid the appeal fee simultaneously. The statement setting out the grounds of appeal was filed on 23 February 2012.

The appellant-proprietor also lodged an appeal, received 14 December 2011 against the above interlocutory decision and paid the appeal fee simultaneously. The statement setting out the grounds of appeal was filed on 20 February 2012.

II. The opposition was filed against the patent as a whole and based *inter alia* on Article 100(a) together with Articles 52(1) and 54(3) EPC for lack of novelty and Article 56 EPC for lack of inventive step.

The division held, *inter alia*, that the grounds for opposition (novelty and inventive step) mentioned in Article 100(a) EPC did not prejudice maintenance of the patent as amended according to an auxiliary request, having regard to the following documents, amongst others:

E1: WO-A-03/093651
E4: US-A-2002/0001522
E6: US 2441432
E9: Diesel and Gas Turbine Catalog 1998, Volume 63, Page 686; Figure - Small 7 Series Napier 297, 357

III. The appellant-opponent filed the following document with their grounds of appeal:
E12: US 5176497.

IV. Oral proceedings before the Board were duly held on 17 December 2014. During the oral proceedings, the appellant-opponent filed an objection under Rule 106 EPC in writing. It reads as follows:

Objection acc. to Rule 106 EPC; in the name of the opponent.

The decision to not admit reference E12 into the proceedings constitutes a violation against the right to be heard for the following reasons:

It is an aspect of the right to be heard that all parties are allowed to properly respond to the other parties' submissions and amendments. In the present case, the patentee filed amended claims after the opposition period. With the response to the opponent's appeal, he filed further amendments. All amendments concern features not taken from the dependent claims but rather from the specification, if at all, or the figures.

It is part of the opponent's right to be heard to fully react thereto by filing and relying additional prior art which, according to the opponents understanding, show essential features of the subject-matter of the amended claims. Not admitting this prior art for a full discussion rather than for a prima-facie discussion constitutes an unfair proceeding and thus the violation of Article 113 EPC.

If the decision is to not admit E12 into the proceedings, we request to be informed what date would have been the right deadline for filing it and having it admitted into the proceedings and what the respective regulation in the EPC or are the RPBA would be. Evidently, it cannot be the opposition deadline as the amendments undertaken by the patentee were not yet known to the opponent.

V. The appellant-proprietor requests that the decision under appeal be set aside and that the patent be maintained in amended form according to the claims of a main request, filed as the third auxiliary request with letter of 9 July 2012, and promoted to main request after a previous main request was withdrawn during the oral proceedings before the Board. Alternatively, he requests maintenance in amended form according to auxiliary requests 2 to 8 filed with letter of 9 July 2012 and renumbered as in letter of 15 December.

The appellant-opponent requests that the decision under appeal be set aside and that the patent be revoked.

VI. Claim 1 of the main request reads as follows:

"A turbocharger having an impeller (1), the impeller being formed of a first material and being mounted on a turbocharger shaft (2) by means of an insert (3) that is an interference fit in a blind hole of the impeller (1), the insert comprising a second material of greater strength than the first material, wherein a constraining ring (14) comprising a material having greater strength and a lower coefficient of thermal expansion than the first material surrounds at least a part of an axial length of the impeller (1) that overlies the insert (3), thereby to maintain the

interference between the insert and the impeller during use of the turbocharger over its operating speed and temperature range."

VII. The appellant-opponent mainly argued as follows:

Admittance of E12
E12 is filed in response to developments in the proceedings. Figure 6 discloses all features of claim 1 including an impeller insert. Therefore E12 is novelty destroying for claim 1. Figure 4 of E12 is a better starting point for assessing inventive step than E9 since, as well as disclosing an impeller with a blind hole, it also discloses a retaining ring. Therefore E12 should be admitted.

Right to be heard
The party's right to be heard was not respected since the Board only assessed prima facie relevance of E12 and did not allow complete novelty and inventive step arguments to be presented based on E12.

Added subject matter
The term "blind hole" in claim 1 is only shown in the drawings in a particular context. Claiming the feature in isolation is an unallowable intermediate generalisation.

Novelty with respect to E1
E1 discloses a turbocharger impeller with insert in a blind hole. By choosing appropriate materials for the insert and constraining ring as E1 requires, the impeller material implicitly has a greater coefficient of thermal expansion (CTE) than that of the constraining ring. The remaining claim features are also known from E1 so it destroys novelty of claim 1.

Inventive step
E4 discloses an impeller with a blind hole and E6 discloses a similar impeller with insert and restraining ring. Their combined teachings lead to the subject matter of claim 1 in an obvious manner. Alternatively, starting from E9, the document discloses a turbocharger impeller with a blind hole and insert, which is interference fitted as confirmed by E1. The only difference is the restraining ring to prevent the insert walking along the impeller, but this is known from E6. Together with the skilled person's general knowledge of appropriate materials for impeller and constraining ring/insert, the combination obviously leads to claim 1.

VIII. The appellant-proprietor mainly argued as follows:

Admittance of E12
E12 is not prima facie relevant so should not be admitted into the proceedings. In figure 6 the hatched area between blind hole wall and the threaded part of the shaft is too narrow to depict an insert, so the feature is not disclosed. Figure 4 is not a good starting point to assess inventive step since it has no insert, therefore the problem of walking as discussed in the patent cannot occur.

Added subject matter
The term "blind hole of the impeller" in the claim distinguishes the impeller type from a through hole impeller type. The feature is immediately derivable from the drawings independent of other features shown but not claimed.

Novelty with respect to E1

The impeller of E1 figure 1 could be made of titanium and the insert and retaining ring could be made of steel so E1 does not implicitly disclose that the coefficient of thermal expansion (CTE) of the impeller material exceeds that of the retaining ring material as the claim requires.

Inventive step
E4 and E6 both disclose through-hole type impellers, so the combination of their teachings cannot lead to claim 1 in an obvious manner. Starting from E9, the skilled person would not combine its teaching with that of E6 since E6 offers a solution to the problem of walking which only works for through-hole type impellers. Therefore their combined teaching does not obviously lead to the subject matter of claim 1.

Reasons for the Decision

1. The appeals are admissible.

2. Background

The patent concerns turbochargers and their impellers, specification paragraph [0001]. Impellers are typically made of aluminium alloys and provided with a steel insert for threading to the shaft, the joint between the insert and the impeller being achieved with an interference fit, paragraphs [0002] and [0004]. In use the joint is subjected to cyclic centrifugal and thermal stresses. This results in the insert "walking" along the impeller, specification paragraph [0005]. The invention aims to prevent this, paragraph [0006].

3. Admittance of E12

3.1 Document E12, the admission of which is contested, was filed with the grounds of appeal and thus outside the opposition period. It is therefore late filed and subject to the discretion afforded by Article 114(2) EPC. This fact is not changed by filing new evidence with a statement of grounds of appeal that meets the requirements of Article 12(2) RPBA. Such evidence remains late filed and thus subject to the discretion of Article 114(2) as may be inferred from Article 12(4) RPBA. In exercising their discretion the Boards consider, among other factors, relevance and whether or not late filing is justified by developments in the procedure, see Case Law of the Boards of Appeal, 7th edition, 2013 (CLBA) IV.C.1.4.5 b) and the decisions cited therein.

3.2 Firstly, no justification was originally provided for E12 which was cited in the grounds of appeal as one among other citations against claim 1 as granted and as held allowable by the opposition division (now both abandoned). It was first cited, again as one amongst other citations, against the set of claims of what is now the main request more than two years after its submission but again with no justification for this late submission. Only in the oral proceedings before the Board, over three years after the interlocutory decision and two and a half years after this set of claims was submitted, was it argued that the filing of E12 should be seen as a response to the decision's reading of the term "socket" in claim 1 as blind hole and the corresponding amendment made in claim 1 of the main request. This argument also fails to convince as two other documents, E1 and E9, already on file and on which the appellant-opponent also bases his case, show the contested feature of a blind hole in an impeller with an insert. For these reasons these late submission

can carry but little weight for the Board in exercising its discretion.

3.3 Nor is the special significance of this document such that it outweighs the lack of justification for its late filing. In particular its significance over and above what is already on file is not immediately apparent to the Board. E1 and E9, already on file, both show inserts in blind holes (see below) nor is this contested. In E12 however it is not unequivocally clear to the Board from cursory inspection of the parts cited that it discloses an insert, which is a central feature of the claimed invention. Figure 6 might show part of annular spacer ring 94 (see column 7) inserting into the bore hole between the bore wall and the threads of the shaft. However, the otherwise detailed figure 6 shows the spacing to be so slender as to raise serious doubts as to whether it was indeed intended as a practicable feature, or is merely a drawing artefact. Column 7, lines 25 to 26, cited by the appellant-opponent furthermore has the spacer ring interference fitted *onto* the sleeve, and not inside it or the bore as required by claim 1.

As the feature of an insert is critical to novelty and inventive step and it is debatable whether that feature is indeed present in E12 that document whereas it is indisputably present in E1 and E9 together with the feature of a blind hole, it is unlikely to change the outcome of the proceedings.

3.4 For the above reasons the Board at the oral proceedings exercised its discretion in accordance with Article 114(2) EPC not to admit E12 into the procedure.

4. Objection under Rule 106

4.1 In reaction to the Board's announcement not to admit document E12 into the appeal proceedings, the appellant-opponent submitted that non-admission of E12 without a full discussion as to its relevance violated their right to be heard (Article 113(1) EPC) as that right entitled them to a full reaction to the late filed amendments.

4.2 The appellant-opponent does not contest that the E12 was filed outside the opposition period, or that the issue of its admissibility was raised (cf. the annex to the summons, point 2) and discussed by the parties (see minutes). In that he demands under Article 113(1) a "full reaction ... by filing and relying on additional prior art "and a "full discussion" thereof, he rather appears to question whether admissibility of evidence filed in response to unforeseeable amendments should be discussed at all. Thus, a right to present all arguments *as if* the document had been admitted, instead of arguments as to *why* it should be admitted, amounts to a de facto admittance of the document, implying, contrary to Article 114(2) EPC, that the Board had no discretion to disregard a late filed document. Indeed, the appellant-opponent's argument in this respect appears to pit the right to be heard under Article 113(1) EPC against the discretionary power of Article 114(2) EPC.

4.3 In adversarial proceedings the right to be heard is closely related to the principle of equality of arms which means that a party should be able to present its case without being unfairly disadvantaged vis-a-vis the other party, see e.g. Singer-Stauder: Europäisches Patentübereinkommen, 6th edition 2013, p 934, 44. Any right to respond arises from this principle. However,

in the Board's view that right is not absolute but must be balanced inter alia by the same need for procedural economy and due diligence that underpins Article 114(2) EPC and in a similar manner as this requirement sets limits on the power of ex officio examination of Article 114(1) EPC, which are particularly strict for opposition appeal proceedings before the EPO due to their nature and purpose as judicial review proceedings, cf. G9/91 (OJ EPO 1993, 408), reasons 18. Thus, in this case also, where new evidence is said to be presented in response to unforeseen amendments, Article 114(2) EPC will afford the Board discretionary power in disregarding such evidence. In the Board's view discretion is exercised in a fair and proper manner in accordance with established jurisprudence (CLBA, I.C.1.4.5 b) cited above) by weighing factors such as justification and significance. These factors were duly considered and the parties given an opportunity to comment thereon as noted above.

4.4 For these reasons the Board at the oral proceedings held: "The Rule 106 EPC objection is dismissed as the Board sees no violation of the right to be heard in the non-admission of E12. As indicated, the document is late filed and its admission is at the discretion of the Board, i.e. it sees no absolute right of a party to have late filed evidence considered fully. This is not changed even if the evidence is filed in response to unforeseeable developments in the procedure. The question of timing and time limits is moot."

5. Added subject matter

In deciding the question of allowability of amendments under Article 123(2) EPC, the Board, following well established practice (CLBA - section II.E.1), must

consider whether the amendments in question are directly and unambiguously derivable by the skilled person from the application as filed, using normal reading skills and supplementing by his common general knowledge. Where amendments concern features added from drawings, the structure and function of the feature must be clearly, unmistakably and fully derivable from the drawings, as well as the fact that they can be isolated from the other features shown but not claimed, CLBA, II.E.1.5.

5.1 In its present form, claim 1 adds text to a feature of original claim 1; "...the impeller being...mounted on a turbocharger shaft by means of an insert that is an interference fit in *a blind hole of* the impeller..." (added text emphasised in *italics* by the Board). It is common ground that the feature has no literal basis in the original documents as filed, but the appellant-proprietor argues that basis for the feature can be found in the drawings.

The appellant-opponent argues that the drawings only disclose the "blind hole" feature in a particular arrangement and context, for example the blind hole has a particular depth relative to the remaining features shown, but this has not been claimed, resulting in an unallowable intermediate generalisation.

5.2 A first issue the board must consider before deciding whether information has been added is how the added feature "blind hole of the impeller" is to be interpreted. A *blind hole* as such has a clear meaning in mechanical engineering, namely, unlike a through hole, it defines a hole that does not penetrate all the way through something.

However, the skilled person does not read the term in isolation, he reads it in the context of the whole claim and indeed the rest of the patent. Fundamentally the patent concerns the attachment of an impeller to its shaft, see specification paragraph [0002]. The skilled person, a mechanical engineer involved in the design and manufacture of turbochargers, will therefore focus on this when he reads the patent.

Against this background he knows just two basic impeller-types, as also acknowledged by the appellant-opponent, which differ in how they are mounted to their shafts. The first has a through hole, through which the shaft passes, the impeller being secured with a nut on the protruding shaft. The second has a blind-hole into which the shaft is fitted, leaving most of the impeller hub solid.

5.3 As explained in paragraph [0013] of the published application, figures 1 and 2 show two exemplary embodiments of turbocharger impellers of the invention.

The skilled person, who will be familiar with the different turbocharger impeller design and construction types, will recognize immediately from the figures that these show blind hole type connections of shaft and impeller body. Both structure and function of the blind hole impeller, with its dead-end hole allowing a stub of the shaft to enter the hub whilst leaving most of the hub solid, are immediately evident to the skilled person. Not only will he immediately read from the figures that the impeller type concerned is of the second kind mentioned above, that is the blind hole type, but considered in conjunction with the text it will be immediately clear to him that the patent addresses the problem of walking in that context, i.e. in relation to the particular type of connection shown

in the figures. There is no suggestion in the patent that the inventive concept might apply to any through-hole type connections. In this regard the skilled person will recognize this feature as distinctive of or intrinsic to the claimed inventive concept, and not as just one of various interlinked features that define a particular embodiment. Consequently, he will perceive this feature isolated from any other details shown in the figures.

With this in mind the skilled person reads the term *blind hole*, in its claimed context of "...the impeller being...mounted on a turbocharger shaft ...in *a blind hole of the impeller*..." not as merely stating a detail of a hole but rather as defining the *impeller* as one of just two impeller types he knows, namely the second type explained above, with its characteristic shaft mounting arrangement in a blind hole.

5.4 The Board concludes that claim 1 does not add subject matter extending beyond the application as filed, and therefore meets the requirements of Article 123(2) EPC.

6. Novelty with respect to E1, Article 54(3) EPC

6.1 Document E1 discloses a turbocharger having an impeller 28 mounted on a shaft 14 by means of an insert (bushing 34) that is an interference fit, in a blind hole of the impeller (see abstract and figure 1). Furthermore a constraining ring (compression sleeve 36) overlies the insert. In figure 1, the insert and constraining ring are shown made in one piece as mentioned on page 9, lines 16-17.

6.2 Inter alia, the question of novelty vis-à-vis E1 hinges on whether, as argued by the appellant-opponent, the compression sleeve 36 as constraining ring is made of stronger material than the impeller 28 but that has a lower coefficient of thermal expansion (herein CTE).

6.3 It is undisputed that E1 is silent as to specific materials of the various turbocharger components, let alone specific material CTEs. The Board therefore needs to consider whether the above feature is implicitly disclosed. As with explicit disclosures, the standard applied is the direct and unambiguous disclosure of a feature. In this context "implicit disclosure" means a disclosure which any person skilled in the art would objectively consider as necessarily implied by the explicit content, see e.g. Case Law of the Boards of Appeal, 7th edition, 2013 (CLBA), I.C.3.3, and the decisions cited therein.

6.4 E1 on page 1, lines 20-25, states that a turbocharger impeller is often made of a different material to that of the shaft. Moroever, where the impeller is directly screwed to the shaft, differing CTEs may lead to imbalances and furthermore, the thread of the softer of the two materials may be damaged or the thread may seize up. In a particular prior art it is known to join the impeller to the shaft by means of a threaded insert, (page 2, lines 5-7). In this case E1 suggests that by appropriately choosing the insert's material, the problem of the differing CTEs and seizing up can be avoided (page 2, lines 25-28).

The appellant-opponent has argued that this implies that figure 1 of E1 implicitly discloses that the CTE of the constraining ring material (being made in one piece with the insert which will be of harder material

than the impeller) is less than that of the impeller material.

6.5 Firstly, the above passages all refer to prior art from which E1 departs, not to figure 1, which illustrates the invention of E1. They are thus disclosures of separate instances of prior art. Even if the skilled person might consider that those prior art features may apply *as a matter of course* to the embodiment shown in figure 1 this does not mean that those features are disclosed in combination. Moreover, assuming that the skilled person were to choose *appropriate* materials for the components of figure 1 as suggested by the cited passages, the Board is not convinced that this would *inevitably* mean that the CTE of the constraining ring material would be less than that of the impeller material.

6.5.1 Even if it might be *typical* for the skilled person to choose a softer material for the impeller such as aluminium alloy than for the insert for example made of steel, and that in this example the softer aluminum would have a higher CTE, this does not prove that the skilled person would *inevitably* make such a choice.

By way of example, as both parties agree, it is known to build turbocharger impellers from titanium alloy, and that such an impeller might then conceivably have a steel insert. It is indisputed that titanium alloy has a *lower* CTE than steel. Therefore such an impeller, with a steel insert and built according to E1's figure 1, would not be according to the claim. The fact that such a turbocharger might be expensive or untypical is not sufficient to render such an arrangement necessarily, that is implicitly, excluded from the teaching of E1. The mere fact that such a choice of

materials by the skilled person is conceivable means that it is also encompassed, though unspecified, by E1's general teaching. Thus, far from the material choices of claim 1 being implicitly disclosed by E1, E1 only discloses a more general teaching that cannot destroy the novelty of the specific choice of material that is the subject of claim 1.

6.5.2 In summary, the Board holds that there is no unequivocable disclosure of the coefficient of thermal expansion of the impeller material exceeding that of the constraining ring's material in E1.

Therefore the subject matter of claim 1 differs from E1 at least in respect of this feature and is thus new, Article 54(1) with 54(3) EPC.

7. Inventive step

7.1 The appellant-opponent has challenged inventive step starting from document E4 combined with document E6 and E9 combined the skilled person's general knowledge/E6.

7.1.1 E4 with E6

E4 discloses a turbocharger having an impeller 16, 18, mounted on a shaft 12 by means of an insert 22 (figures 1, 2 and 4 and paragraph [0012]). The appellant-opponent has argued that the impeller of E4 also has a blind hole. In particular, he argued that the nose insert 28 that is threaded onto the shaft is part of the impeller and has a blind hole, therefore E4 discloses an impeller blind hole as claimed.

7.1.2 It is indisputed that the nose insert 28 shown in figures 1, 2 and 4 has a blind hole. However as

explained above in point 5.2, in the claim context, the term *blind hole of the impeller* defines a particular type of impeller having a mainly solid hub. The other type of impeller the skilled person knows has a through hole, the impeller being secured to the shaft by a nut screwed to the end of the shaft that protrudes from the hole of the impeller proper.

7.1.3 Reading E4, the skilled person will first note that the prior art discussed in paragraph [0005] identifies that for through bore compressor wheels, the securing nut does not provide optimum aerodynamic performance of the wheel. Moving on to the detailed description of that invention, he learns from paragraph [0012] that the compressor wheel of figure 2 has a hub 16 with attached blades 18 and that a bore 20 extends through the hub. In other words the compressor wheel, like the prior art on which it is based, is of the through hole type.

Reading to the end of this paragraph in conjunction with figures 1 and 2 he learns that a separate streamlined blind-hole nose insert 28, that incorporates the nut, is threaded onto the shaft. The skilled person immediately sees this part 28 as the nut that is necessary for securing a through-hole type impeller to its shaft, the fact that the nut has a blind hole does not change the impeller type. The same is true for figure 4, which shows a similar nut 28 on a through hole impeller, see paragraph [0013].

The Board thus holds that E4 does not disclose a blind hole type impeller as claimed, nor therefore an insert that is *interference fitted in a blind hole of the impeller*.

7.1.4 Turning now to document E6, it is common ground that all the compressor impellers disclosed therein are of the through-hole type, as is immediately clear from all the figures and column 1, lines 44-46. As is usual with such impellers, a nut 20 secures the impeller to the shaft (figures 1, 4 and 5 and column 4, lines 11-29). Thus, E6 does not disclose an impeller with a blind hole.

7.1.5 As neither E4 or E6 discloses an impeller of the blind-hole type, the combination of their teachings (whether that combination is obvious or not) would not result in a turbocharger with an insert interference fitted in a blind hole of the impeller as claimed.

7.2 The Board is also not convinced that the combination of E9 with E6 or general knowledge would lead the skilled person to the invention in an obvious manner.

7.2.1 It is common ground that E9 discloses a turbocharger having an impeller of the blind hole type. The impeller is mounted on the turbocharger shaft by means of what all parties accept to be an insert in the impeller's blind hole (main figure). In the absence of any detailed description of this turbocharger (page 686, middle column) the Board is unable to identify any information about the materials used, let alone their strengths or CTEs. Furthermore it is not possible to discern whether or not the insert is interference fitted in the impeller's blind hole. Nor can document E1 be relied on to interpret E9. E9 does not refer to E1, which is in any case post-published. The content of E9 is that determined by the skilled person's understanding of E9 when it was made available, cf. CLBA, I.C.1.1. Even if E1 might in some way have provided further information reflecting on E9 the

effective date of that combined information would be that of E1, i.e. after the priority date of the patent and thus not relevant for the purposes of inventive step.

In summary, the subject matter of claim 1 differs from E9 in that the turbocharger shaft is interference fitted, in that the material of the insert is stronger but has smaller CTE than that of the impeller material and in that a constraining ring is provided.

7.2.2 Formulation of the objective technical problem

According to the patent, a turbocharger impeller is typically made of aluminium alloy, and it is known to interference fit such an impeller with a threaded steel insert for mounting the impeller to the turbocharger shaft (specification paragraphs [0002] and [0004]).

As described in specification paragraph [0005] the interaction between varying centrifugal forces during cycling from rest to full load and different thermal coefficients of expansion of insert and impeller may cause the insert to "walk" along or out of the impeller. This may cause the turbocharger to fail, specification paragraph [0006].

The objective technical problem can therefore be formulated as modifying a turbocharger of the blind-hole impeller type, such as that of E9, to prevent walking of the insert along the impeller during cyclic operation.

7.2.3 The Board holds that, starting from E9, neither the skilled person's general knowledge, nor document E6 offers a solution to the objective technical problem.

In particular the skilled person would not, as a matter of obviousness, consider combining the teaching of E9 and E6.

E9 is completely silent as to what materials or material properties the turbocharger components should have, nor how the insert is fitted from the drawing or scant description. While an interference fit and appropriate materials properties of insert, impeller and shaft may well spring to the skilled person's mind from common general knowledge, the Board has no compelling reason to believe that the use of a constraining ring of stronger material with lower CTE than the impeller is a commonly known measure to secure an insert, much less to secure it against walking. The claimed solution is therefore not obvious from E9 with general knowledge.

As explained above, section 7.1.4, E6 discloses a through-hole type impeller held on to a shaft with a nose nut, see for example figure 1. The embodiments shown in figures 1 and 3 also have a bushing 13 between the shaft and impeller (at 14). This bushing has either a radial flange 15 and circumferential part 16 (figure 1) or a separate reinforcing ring 25 (figure 3) that may be press- or shrink-fitted onto the impeller. These advantageously use impeller deformation due to differential centrifugal forces as shown in figure 2 to increase friction transmitted from shaft to impeller with increased speed (column 4 lines 30 to 48). Though the differential centrifugal forces causing the deformation are analogous to those that contribute to the walking phenomenon in an insert such as that of E9 this does not mean that their underlying problems are the same. In E6 axial movement of the bushing vis-a-vis the impeller is effectively prevented by the impeller

nut 20 which "forces the impeller into proper position on the bushing" (column 4, lines 19-29). In other words the nut locks the impeller and bushing together, preventing axial movement of the insert 13 relative to the impeller.

Thus, irrespective of the fact that E6 discloses an annular constraining ring (upper part of flange 15 in figure 1 and ring 25 in figure 3), E6 only discloses a way of preventing axial movement of an impeller relative to an insert for through-hole type impellers. Furthermore it is immediately evident to the skilled person that the particular way in which this is achieved, with a nut screwed to the end of the shaft that protrudes from the impeller's through-hole, only works *because* the impeller is of the through-hole type. In search of a solution to the problem of walking in an turbocharger as in E6 he will thus dismiss this way of preventing axial movement as not relevant for a blind-hole type impeller, which, by definition, has no though-hole for a protruding shaft.

The skilled person would therefore not seek a solution to the above problem of *walking* for a *blind-hole* type impeller in document E6, so he would not combine the teachings of E9 and E6 in an obvious manner. With or without applying the skilled person's general knowledge of suitable materials for impellers and inserts, combining selected aspects of both documents in a further hybrid, in the Board's view, goes well beyond the routine skills of the skilled person.

7.3 For the above reasons, the Board finds that the subject matter of claim 1 is not obvious and that therefore the claim involves an inventive step, Article 56 EPC.

8. Amendments made to the description only serve to align it with the claims as amended in the main request. No objections have been raised under Article 123(2) EPC or are apparent to the Board. It concludes that taking into consideration the amendments made in appeal to the patent according to the main request, the patent and the invention to which it relates meet the requirements of the EPC. Pursuant to Article 101(3)(a) EPC it therefore decides to maintain the patent as amended according to the main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent as amended in the following version:

Claims: 1-8 of the main request, filed as auxiliary request 3 with letter of 9 July 2012 and renumbered with letter of 15 December 2014

Description: page 2 as filed with letter of 9 July 2012, pages 3,4 as in the specification,

Figures: as in the specification.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated