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**Datasheet for the decision  
of 11 September 2024**

**Case Number:** T 1967/22 - 3.3.05

**Application Number:** 15799707.3

**Publication Number:** 3150735

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**Language of the proceedings:** EN

**Title of invention:**  
HOT WORK TOOL MATERIAL AND METHOD FOR MANUFACTURING HOT WORK  
TOOL

**Patent Proprietor:**  
Hitachi Metals, Ltd.

**Opponent:**  
Uddeholms AB

**Headword:**  
Hot work tool/Hitachi

**Relevant legal provisions:**  
EPC Art. 123(2), 56

**Keyword:**

Amendments - allowable (yes)

Inventive step - auxiliary request (yes)

**Decisions cited:**

T 0624/91, T 0594/01, T 0718/02

**Catchword:**



**Beschwerdekammern**  
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Case Number: T 1967/22 - 3.3.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.05**  
**of 11 September 2024**

**Appellant:** Uddeholms AB  
(Opponent) 683 85 Hagfors (SE)

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**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
10 June 2022 concerning maintenance of the  
European Patent No. 3150735 in amended form.**

**Composition of the Board:**

**Chairman** E. Bendl  
**Members:** G. Glod  
S. Fernández de Córdoba

## Summary of Facts and Submissions

- I. The appellant's (opponent's) appeal lies from the opposition division's decision finding that European patent EP 3 150 735 in amended form based on the then auxiliary request 2 met the requirements of the EPC.

Claim 1 of said request (now main request) reads as follows:

*"1. A hot work tool material, having an annealed structure and a composition consisting of, by mass%*  
*C: 0.30% to 0.50%,*  
*Si: not more than 2.00%,*  
*Mn: 0.45 to 1.50%,*  
*P: not more than 0.0500%,*  
*S: not more than 0.0500%,*  
*Cr: 3.00% to 6.00%,*  
*one or both of Mo and W represented by relational expression of  $(Mo + 1/2W)$ : 0.50% to 3.50%,*  
*V: 0.10% to 1.50%,*  
*optionally Ni: not more than 1.00%,*  
*optionally Co: not more than 1.00%,*  
*optionally Nb: not more than 0.30%,*  
*optionally Cu: not more than 0.25%,*  
*optionally Al: not more than 0.040%,*  
*optionally Ca: not more than 0.0100%,*  
*optionally Mg: not more than 0.0100%,*  
*optionally O: not more than 0.0100%,*  
*optionally N: not more than 0.0300%,*  
*and the balance of Fe and impurities,*  
*wherein the annealed structure comprises ferrite grains having a grain diameter distribution such that the grain diameter is not lower than 10  $\mu\text{m}$  and not greater than 25  $\mu\text{m}$  as a circle equivalent diameter when the*

*cumulative cross-sectional area is 90% of the total cross-sectional area."*

Method claims 2 and 3 relate directly or indirectly to claim 1.

II. The following documents cited in the impugned decision are of relevance here:

D4: Uddeholm Dievar®, Leaflet from Uddeholm, Edition 9, 03.2012, <http://www.uddeholm.gr/Storage/Media/Shared/SteelBrochures/Dievar/dievarenglish.pdf>

D9: Excerpt from the QVS for Uddeholm Dievar®

D10: FM-rapport, Investigation of iron BCC grain size in Dievar

D17: Sandberg, N., On the Machinability of High Performance Tool Steels, Dissertation, Uppsala University, Sweden 2012, ISSN 1651-6214

III. With the reply to the appeal, the respondent (patent proprietor) submitted two auxiliary requests.

Claim 1 of auxiliary request 1 contains the following restriction (underlined) concerning Si as compared with claim 1 of the main request:

*"Si: not less than 0.30% and not more than 2.00%".*

IV. In reply to the board's communication pursuant to Article 15(1) RPBA, the appellant submitted the following document:

D25: Roberts G., Krauss G., Kennedy R., Tool Steels, Fifth Edition, ASM International, January 1998, pages 81 and 82

- V. The appellant's arguments, as far as relevant to the present decision, are reflected in the reasoning below for the main request and can be summarised as follows for auxiliary request 1.

The requirements of Article 123(2) EPC were not met in view of the word "during" in paragraph [0043] of the patent.

It was evident from D17 (Figure 9) that the presence of Si improved machinability of the final steel. Si did not have an impact on the ferrite grains, as was confirmed by D25.

- VI. The respondent's arguments, as far as relevant to the present decision, can be summarised as follows for the main request, and are reflected in the reasoning below for auxiliary request 1.

If Si had no effect on the ferrite grains, as alleged by the appellant, then a small change in Mn had to have an effect. This was evident from a comparison of D10 with the composition given in Table 1 of D17 and the average grain size of 30  $\mu\text{m}$  in H13M of D17. Consequently, the problem to be solved was not merely to find an alternative.

- VII. At the end of the oral proceedings of 11 September 2024, the requests were as follows.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed, or alternatively that the patent

be maintained in amended form on the basis of one of auxiliary requests 1 or 2 submitted with the reply to the appeal.

## **Reasons for the Decision**

### Main request (found allowable by the opposition division)

#### 1. Article 123(2) EPC

The board sees no reason to deviate from the opposition division's conclusion.

The appellant's objection with respect to paragraph [0043] is not convincing. It is directly and unambiguously derivable at least from paragraph [0029] of the application as filed that, in order to reduce the prior austenite grain size, new austenite grains are kept fine in the quenching step. This means that during quenching the prior austenite grain size can be reduced. This is reflected in the first sentence of paragraph [0043] of the patent.

The requirements of Article 123(2) EPC are met.

#### 2. Article 56 EPC

##### 2.1 The invention relates to a hot work tool material.

2.2 It is undisputed that the material DIEVAR (charge J14482) of D9 was made available to the public. According to D10, this material has a structure comprising ferrite grains having a grain diameter distribution such that the grain diameter is approximately 12  $\mu\text{m}$  as a circle equivalent diameter

when the cumulative cross-sectional area is 90% of the total cross-sectional area. This material contains 0.43% by mass of Mn, which is below the range claimed of 0.45 to 1.50% by mass.

Although D4 provides general information about the DIEVAR material and discloses a typical analysis containing 0.5% by mass of Mn, it is evident that the specific charge of DIEVAR finally produced will have a composition that may vary slightly around the typical amounts given in the table in D4, as confirmed by D9. The final measured values depend on the process conditions and raw materials. This is also completely in line with the appellant's statement ("*the composition of the final product will deviate somewhat from this target or even be undefined within certain narrow limits*") in the paragraph bridging pages 8 and 9 of the grounds of appeal.

The argument that 0.43 was not different from 0.45 in the view of the case law, in particular T 624/91, T 594/01 and T 718/02, is not convincing. The value referred to in T 624/91 is a nominal value, while in the present case 0.43 is a measured value. T 594/01 dealt with the distinction of a specific measured value from "lower than that value", which is different from the case at hand. T 718/02 relates to a selection invention and does not deal with the difference between a specific measured value and a claimed range.

- 2.3 The problem to be solved by the patent is to provide a hot work tool material having an annealed structure which is effective for producing a fine structure when the material is made into a hot work tool.



- 2.4 It is proposed to solve the problem by a hot work tool material characterised in that it comprises 0.45 to 1.50% by mass Mn.
- 2.5 Based on the information provided in D4, D9 and D10, it is not credible that the small change in Mn (0.43 vs 0.45% by mass) has any effect on the structure.

The respondent argued that a small change in the amount of Mn had an effect on the structure. This was evident when considering Table 1 of D17 (page 23) and the average grain size of 30  $\mu\text{m}$  in H13M (D17: page 22, third paragraph from bottom). This average grain size was much larger than the average grain size of 4.0  $\mu\text{m}$  found in D10. Since Si was alleged by the appellant to have no effect on the grain size, this difference could only be due to the change in the amount of Mn.

This is not convincing. In D17, the microstructure of the steel is tempered martensite. In D10 the sample used was in the soft annealed condition. Therefore the results of D17 and D10 are not comparable. In addition, there is no indication in D17 of the type of grains that were measured. Furthermore, the impact of the heat treatment on the annealed structure is not known exactly. Therefore the board does not accept that there is evidence showing that such a small change in the amount of Mn has an effect on the structure.

Consequently, in agreement with the opposition division, the problem to be solved can be seen as providing an alternative (further) hot work tool material (see impugned decision, page 18, fourth paragraph).

- 2.6 The solution to the posed problem is obvious, since D9 relates to a DIEVAR material and the skilled person would surely also choose a DIEVAR material having the typical composition shown in D4. There is no reason to believe that the very small change from the composition of D9 to the typical composition in D4 would lead to a structure comprising ferrite grains having a grain diameter distribution outside the claimed range.
- 2.7 The subject-matter of claim 1 lacks an inventive step in view of the prior use D9 in combination with D4.
- 2.8 The main request as found allowable by the opposition division fails.

Auxiliary request 1

3. Article 123(2) EPC

In claim 1 of auxiliary request 1 the amount of Si is limited to not less than 0.3% and not more than 2.00% by mass. The change in the lower end point is based on page 6, line 14 of the application as filed.

The requirements of Article 123(2) EPC are met.

4. Article 54 EPC

The requirements of Article 54 EPC are also met.

Neither D4 nor D9 discloses a composition containing not less than 0.3% by mass of Si. Indeed, the compositions disclosed in D4 (table on page 3) and D9 (table on page 2) contain 0.2% by mass Si. This was not contested by the appellant.

5. Article 56 EPC

5.1 Compared with the main request, claim 1 of auxiliary request 1 additionally differs from the disclosure of D9 by the higher amount of Si.

5.2 The problem to be solved by the patent is still as indicated under point 2.3 above.

5.3 It is proposed to solve the problem by a hot work tool material characterised in that it comprises 0.45 to 1.50% by mass Mn and 0.3% and not more than 2.00% by mass Si.

5.4 As indicated above, the problem listed in the patent is already solved by the material of D9. According to the patent, Si is beneficial for the machinability of materials.

The problem can thus be reformulated as providing a material having the microstructure of D9 with improved machinability.

5.5 The proposed solution is not obvious.

D4 does not teach an increase in Si.

Although the skilled person may possibly know from D17 (Figure 9, page 35) that an increase in Si could generally be beneficial to the machinability of steel, there is no teaching in D17 that the increase in Si in the specific case of D9 would not also affect the other properties, such as the structure comprising ferrite grains having a certain grain diameter distribution. It is true that D25 teaches that the undissolved carbides that coexist with the austenite serve as the grain size

control, but not elements that are fully in solution such as Si.

However, the appellant's argument that Si has no effect on the grain size is not completely in line with the teaching of D17. According to D17 (chapter 4.1 on page 33), the presence of Si in steel could increase the carbon activity. Since carbon is relevant to the grain size, Si could possibly have an indirect effect on the grain size.

Therefore there is no reason for the skilled person only to increase the amount of Si without adapting the other ingredients to ensure that the grain size is maintained as in D9. Such a unilateral increase in Si is, rather, based on hindsight.

- 5.6 The subject-matter of claim 1 and of claims 2 and 3, which refer directly or indirectly to claim 1, involves an inventive step.
6. Auxiliary request 1 is allowable.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent with claims 1 to 3 according to the auxiliary request 1 submitted with the reply to the statement of grounds of appeal and a description to be adapted thereto.

The Registrar:

The Chairman:



C. Vodz

E. Bendl

Decision electronically authenticated