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**Datasheet for the decision
of 25 August 2006**

Case Number: T 0070/04 - 3.2.07

Application Number: 96927908.2

Publication Number: 0815268

IPC: C21D 9/573

Language of the proceedings: EN

Title of invention:

Primary cooling method in continuously annealing steel strip

Patent Proprietor:

NIPPON STEEL CORPORATION

Opponent:

Drever International S.A.

Headword:

-

Relevant legal provisions:

EPC Art. 56
RPBA Art. 10b

Keyword:

"Inventive step (no)"
"Auxiliary request filed at the end of the oral proceedings
(not admitted)"

Decisions cited:

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Catchword:

An auxiliary request for maintenance of the patent in a further amended form was not admitted, with reference inter alia to Article 10b(3) of the Rule of Procedure of the Boards of Appeal, see point 3 of the reasons.



Case Number: T 0070/04 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 25 August 2006

Appellant: Drever International S.A.
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
19 November 2003 concerning maintenance of
European patent No. 0815268 in amended form.

Composition of the Board:

Chairman: C. Holtz
Members: H. Hahn
P. O'Reilly

Summary of Facts and Submissions

- I. The Opponent lodged an appeal against the decision of the Opposition Division to maintain European patent No. 0 815 268 in amended form on the basis on the claims 1 to 4 according to the auxiliary request filed on 16 June 2003 with letter of 13 June 2003.
- II. An opposition had been filed against the patent as a whole and was based on Article 100(a) EPC (i.e. lack of novelty and lack of inventive step).

The Opposition Division held that D5 did not form part of the prior art available to the public within the meaning of Article 54(2) or (3) EPC. Furthermore, the subject-matter of claim 1 as granted was considered to be novel, particularly with respect to documents D1 and D5. Claim 1 of the main request was considered to lack an inventive step over the combined teaching of the closest prior art D3 with D6. Claim 1 of the first auxiliary request was considered to meet the requirements of Articles 123(2) and (3) EPC. The Opposition Division further held that claim 1 of the auxiliary request involves an inventive step taking account of the calculations according to Annex B and considering that the technical effect of less heat buckles of the cooled strip due to the combination of features appeared plausible and not hinted to by the prior art.

- III. With a communication dated 10 March 2006 and annexed to the summons to oral proceedings the Board presented its preliminary opinion based on claims 1-4 according to the auxiliary request filed on 16 June 2003 with letter

of 13 June 2003. The Board stated that documents D3 and D6 seemed to form the closest prior art documents which also formed the most promising springboards towards the invention. Inventive step should be discussed in the oral proceedings on the basis of the technical problems resulting from the distinguishing features between claim 1 and the processes of either D3 or D6 to see whether or not the solutions thereto are rendered obvious. It was also intended to be discussed whether the alleged advantage of avoiding of "cooling buckles" can be considered or not in view of the Case Law. The Board further stated that the documents D2, D4 and D7/D7a may also be considered. Finally, the parties were advised to take note of the amended Rules of Procedure of the Boards of Appeal, in force as of 1 May 2003 and particularly of Article 10b.

- IV. With letter of 22 May 2006 the appellant submitted further arguments with respect to inventive step together with a Table and Graphs 1 to 8 containing results of virtual experiments which are based on the equations and data of the patent in suit and the values of Annex B, respectively.
- V. With letter dated 25 July 2006 the respondent submitted further arguments as a response to the summons and to the appellant's submissions of 22 May 2006 in combination with the document "High Speed Technologies in Continuous Annealing", Nishiyama Memorial Technical Lecture, The Iron and Steel Institute of Japan, Feb. 16 and Mar. 1, 1983 and its English translation - which erroneously was designated as "Annex C" since an Annex C was already submitted with letter of 13 June

2003 together with Annexes A and B - to show that the formation of cooling buckles belongs to the prior art.

VI. Oral proceedings before the Board were held on 25 August 2006.

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

(b) The respondent (patent proprietor) requested that the appeal be dismissed, alternatively, to set aside the decision under appeal and to maintain the patent on the basis of claims 1 and 2 of the patent as maintained by the Opposition Division.

(c) The following documents and pieces of evidence were discussed or cited:

D1 = US-A-5 137 586

D2 = EP-A-0 182 050

D3 = JP-B-55-1969 (Japanese original and English translation)

D4 = "Progress of Strip Continuous Annealing Technologies" (English translation)

D6 = JP-A-6-346156 (Japanese original and English translation)

D7 = JP-B-2-16375 (Japanese original and English translation)

Annex A = "The following formula is used to calculate the blowoff speed", as submitted by the respondent with letter dated 13 June 2003 during the opposition procedure

Annex B = "Calculation of Temperature at Strip Edge" and "Calculation of Stress $\Delta\sigma$ ", as submitted by the respondent with letter dated 13 June 2003 during the opposition procedure

Annex E = "Influence of cooling gas temperature on cooling efficiency" including Graphs 1 to 8, as submitted by the appellant with letter dated 22 May 2006

VII. Claim 1 according to the single request reads as follows (subdivision into features **[a]** to **[b3]** based on the appellant's analysis added by the Board):

"1. A primary cooling method in continuously annealing steel strip comprising **[a]** a heating step, a soaking step, **[b]** a primary cooling step said primary cooling step including a rapid cooling step at least in a second half thereof, **[c]** an overaging step, and a final cooling step, being characterized in that **[b1]** inert atmosphere gas containing H₂ gas in the concentration of 30-60 % vol. is employed as cooling gas for use in said rapid cooling step, **[b2]** the blowoff temperature of said cooling gas is 80-150°C, and **[b3]** the blowoff speed of said cooling gas is 100-150 m/sec."

VIII. The appellant argued essentially as follows:

The objective problem (see patent, paragraph [0006]) is to increase efficiency and to reduce costs of the cooling process. The first instance correctly decided that the temperature range of the cooling gas of from 30-150°C lacked an inventive step. Now a temperature range of from 80-150°C is claimed which should solve this problem. It is evident from the virtual experiments that the efficiency is lowered by increasing the cooling gas temperature or by increasing the kinetic energy (see Annex E, Table and Graphs 1, 2, 5 and 6). From the patent, however, it is known that from an economical point a range of 80-100°C is preferred while a temperature of from 30-80°C cools more efficiently (see patent, paragraph [0045]). These two ranges exclude each other so that the original objective technical problem has not been solved. For this reason the problem was amended by introducing the "cooling buckles" as additional problem to be solved. These "cooling buckles" are, however, only mentioned in the context of the slow cooling step and not with the rapid cooling step which is defined in claim 1 (see patent, paragraphs [0003] and [0029]). According to T 0037/82 features which do not aid to solve the problem need not be considered.

Even if one assumes that the problem has been solved claim 1 lacks an inventive step since it is rendered obvious by either D3 and/or D6, or D2 or D7 in combination with D4. Taking account of the formula of Annex A the pressures of D3 can be converted into blowoff speeds of the cooling gas. The first comparative example of D3 used a cooling gas of 8%

hydrogen and 92% nitrogen while according to the second experiment the cooling comprised at the beginning 30% hydrogen which concentration was then increased to 50% hydrogen whereby the desired cooling rates and the desired target temperature of the strip could be achieved without "fluttering" (see English translation, page 6, first paragraph to page 7, first paragraph). Thus only the temperature of the cooling gas according to feature b2) is missing. The blowoff speed of D3 is not limited to that of the example. Furthermore, the patent itself cites document D7 (see paragraph [0040]) which discloses a cooling gas comprised of 5% hydrogen and 95% nitrogen which is used at a temperature of 100°C (see D7, English translation, page 10, line 7). In this context it should be noted that figures 3 and 4 of D7 show the same blowing apparatus as the patent in suit. According to figures 4a and 6 of D7 a homogenous temperature distribution of the strip across the width of the strip is achieved by selecting specific distance ratios between the cooling box, the strip S and the nozzles 18 (see D7, English translation page 8, lines 11 to 17; figures 4a and 6). If the nozzle height is equal to the blowing distance as shown by the dashed line, i.e. if there are only holes and no nozzles, then the distribution over the width is not homogenous (see D7, figure 6). It is believed that the results according to Annex B correspond to those of the dashed line of figure 6 of D7. The patent in suit uses the same data as D7. Furthermore, if the same blowing box is used as according to D7 then - since the problem has already been solved - the problem cannot be the provision of a homogenous temperature distribution over the width of the strip. Therefore the skilled person would arrive at the claimed process without inventive

merit. D3 also teaches that with a low hydrogen concentration "fluttering" occurs. Thus if the skilled person cannot go in one direction he has to go into the other direction. Furthermore, the skilled person knows that cooling water is particularly cheap (see patent, paragraph [0045]) and produces a cooling gas temperature of not more than 55°C which motivates him to choose this solution instead of a refrigerator which requires additional energy. The avoidance of "fluttering" cannot be considered with respect to efficiency since no link between the cooling gas temperature and the "fluttering" can be seen. Furthermore, only the operational costs of hydrogen and energy have been considered so far; the apparatus costs increase due to the need of a longer cooling section (compare Annex B). Additionally, the ventilator costs, electricity costs, etc. need to be considered.

D6 does not mention features b1) and b2) of claim 1 but D6 shows in its figure 3 the relationship between the heat transfer coefficient and the hydrogen concentration in the cooling gas which preferably has normal temperature and is blown onto the strip with a flow rate of 120 m/sec and although mentioning a range of 70-90% hydrogen teaches to take only as much hydrogen as necessary since too much hydrogen increases the costs (see D6, English translation, page 3, third paragraph; page 4, second paragraph; figure 3). Hence the skilled person would select a corresponding hydrogen concentration according to the desired heat transfer coefficient and, not being aware of any prejudice, would also choose a cooling gas temperature of 100°C which is known from e.g. D2 or D7. The overaging step results in the precipitation of carbides

from solid-solution state carbon and depends upon the steel quality (compare patent, paragraph [0027]); it is only necessary for specific steel qualities. The overaging step is mentioned in D3 (see claim 1), D2 (see figure 2) and D7 (see figure 1).

Although D2 mentions air as the cooling gas it is clear to the skilled person that actually it cannot be air since the oxygen content of the air would oxidize the steel strip surface. Presumably this is a translation error. Furthermore, an additional pickling step (to remove the produced oxide layer) would increase the process costs. From the data disclosed in D2 (see page 14) taking account of the formula of Annex A a blowoff speed of about 140 m/sec can be calculated. Hence only feature b1) of claim 1 is actually missing. The skilled person in order to increase the efficiency of the cooling process would increase the hydrogen concentration as this is suggested by the text book D4 (see page 1, point 3). Therefore claim 1 as maintained lacks an inventive step.

A further auxiliary request should not be admitted, since no new documents were introduced and no new arguments arose. Thus the factual framework had not changed. The respondent had sufficient time to submit such a request to defend the patent in a reasonable manner. It was also not an issue of fairness but a procedural one. Before the Opposition Division the patent proprietor submitted auxiliary requests as a precaution which he did not do before the Board of Appeal.

IX. The respondent argued essentially as follows:

The skilled person has no motivation to modify the processes of D3 and D6 or D2/D7 in the claimed manner. The drawbacks mentioned in the patent (see paragraph [0005]) do not belong to the prior art and were found by the patent proprietor. D3 and D6 are cited in paragraph [0004] of the patent in suit which is the starting point of the invention. The state of the art such as D3 and D6 used the lowest possible temperature of the cooling gas, i.e. room temperature, which requires the use of a refrigerator. Water is a less expensive cooling medium for the cooling gas and allows reaching a temperature in the range of 80-100°C (see patent, page 7, lines 54 to 57). "Efficiently" in the context of the passage dealing with the two temperature ranges quoted by the appellant means that all other parameters remain unchanged. As can be derived from the patent in suit the "fluttering" needs to be avoided and a cooling rate of at least 60°C/sec is required from a metallurgical point of view (see page 2, lines 31 to 33; page 6, lines 1 and 2; page 7, lines 33 to 45). "Efficient" thus includes a sufficient cooling rate while considering the costs of the process. An overaging step is not absolutely normal (see D1) and the combination of all features a) to c) and b1) to b3) makes the invention according to which the three parameters b1) to B3) are adjusted and optimized.

D3 was published in 1974 and teaches that hydrogen has a high heat transfer coefficient. According to D3 hydrogen is used in a concentration of at least 50% and according to the example in an amount of 75% of the cooling gas (see D3, English translation, page 5).

Although the apparatus according to D3 was suitable for higher blowoff speeds the two experiments were carried out at speeds of only about 61 m/sec and about 50 m/sec, respectively.

D6 does not mention any overaging step and teaches to use 70-90% hydrogen at normal temperature, i.e. room temperature.

There is no indication in these documents D3 and D6 that a temperature of 80-150°C could be used while still obtaining the desired cooling rate. Both D2 and D7 are acknowledged in the patent in suit and do not mention any hydrogen and aim to provide a new nozzle arrangement. Paragraph [0005] of the patent in suit links "fluttering" and the temperature of the cooling gas; likewise the equations (7), (9) and (10) on pages 7 and 8 of the patent include the temperature of the gas or are depend on the temperature such as the gravity (see patent, pages 7 and 8). Thus it is clear that the cooling gas temperature is important and that it is linked with the objective problem. Furthermore, it produces a more even distribution of temperature over the strip width (compare Annex B). The three parameters influence each other so that a compromise has to be found while still a cooling rate of at least 60°C can be achieved. Other parameters do not play a role. Compared with D3 and D6 hydrogen costs and energy costs are saved. Additionally the cooling arrangement is simpler since no refrigerator and no sophisticated heat exchangers are necessary. The blowoff speed does not result in additional costs of the blowers. Figures 10 and 11 of the patent represent a compromise and relate to different steels which were cooled to

different temperature values. Figure 9 shows the correlation between the hydrogen concentration and the blowoff speed at a specific temperature and it is not necessary to show it for all possible temperature values. With respect to inventive step only the obviousness is checked and not whether there exists an improvement or an effect over the prior art. The problem of "cooling buckles" as well as "fluttering" is clearly disclosed in the patent in suit (see page 2, lines 31 to 33, page 4, lines 13 to 16 and page 5, lines 33 to 35). The temperature range of claim 1 is not only selected for economical reasons but on the overall consideration as explained at page 2, lines 29 to 48 of the patent and as explained in Annex B. A combination of D3 or D6 with D2 or D7 is not obvious due to the use of different cooling gas temperatures and air, or of unspecified gas according to D2 and D7, respectively. Furthermore, air could be used since a pickling step could remove any scale formed during the annealing process. Therefore claim 1 as maintained involves an inventive step.

It is requested that a new request based on a combination of claims 1 and 2 of the patent as maintained be admitted. It would be unfair to the patent proprietor not to admit such a request. A reasonable approach had to be taken. The patent was maintained by the first instance and the respondent had no doubt that the patent could be maintained since there was no indication in the summons that the patent would be revoked. A fair treatment necessitated the possibility of filing a new request and the proposed combination of claims 1 and 2 was a straightforward one.

Reasons for the Decision

1. *Novelty (Article 54 EPC)*

Novelty of the subject-matter of process claim 1 of the single request was not disputed by the appellant. The Board is satisfied that none of the submitted documents, particularly D1, D2, D3, D6 and D7, discloses a primary cooling process having all the features of claim 1.

The Board therefore concludes that the subject-matter of claim 1 is novel with respect to these documents.

2. *Inventive step (Article 56 EPC)*

- 2.1 Document D3 discloses a process for cooling low-carbon steel strip for press forming in an apparatus comprising a continuous annealing furnace comprising a heating zone 5, a soaking zone 6, a quenching zone 7 (= a primary cooling zone), a carbon precipitating zone 8 (= an overaging zone) and a final cooling zone 9 (= a secondary cooling zone); said quenching zone 7 comprises gas jets for blowing out protective gas containing $\geq 50\%$ hydrogen (H_2) for rapid cooling the heated strip (see figures 1 to 3 of Japanese original; see English translation, claim 1; page 3, line 16 to page 4, line 10; page 4, lines 28 to 30). In general a gas of 8% H_2 and 92% N_2 is used as protective gas in the continuous annealing mechanism 11 but a higher H_2 -concentration increases the cooling power of the cooling gas and allows that ammonia can be used by decomposing the same for making a gas containing 75% H_2 and 25% nitrogen (N_2) (see page 4, lines 5 to 10; page 5,

lines 2 to 12; page 6 to page 7, page bridging paragraph). The use of a cooling gas composition containing $\geq 50\%$ H_2 - compared to a composition of 8% H_2 and 92% N_2 according to the prior art - while resulting in higher cooling rates allows to prevent the "fluttering" of the strip so that the strip is not damaged although higher blowoff speeds compared to the aforementioned gas composition are used (see page 3, lines 9 to 11 and lines 16 to 22).

D3 neither specifies an exact value of the cooling gas temperature which is stated to be cooled to "about a room temperature" (see English translation, page 4, second paragraph) nor the blowoff speed of the cooling gas. The latter feature b3), however, can be calculated according to the formula given in Annex A on the basis of the gas pressures specified in D3, i.e. the disclosed broad range of from 50 to 1000 mm Aq (see page 5, lines 8 to 12) corresponds to blowoff speeds of from about 25,1 m/sec to about 112,1 m/sec, respectively; and the values of 200 mm Aq, 300 mm Aq and 800 mm Aq mentioned in the context of the experiments (see page 6, lines 14, 22, 27 and 35; page 7, line 16) correspond to blowoff speeds of about 50,1 m/sec, 61,4 m/sec and 100,1 m/sec, respectively. Thus D3 does not disclose only feature b2) of claim 1.

2.2 Taking account of paragraph 2.1 above, document D3 is considered to represent the closest prior art for process claim 1.

2.2.1 Document D3 is additionally considered to meet all criteria for determining the closest prior art as set out in the existing case law of the Boards of Appeal

(see Case Law of the Boards of Appeal of the European Patent Office, 4th edition 2001, sections I.D.3.1 to I.D.3.5).

2.2.2 This is also because D3 aims to solve the problem of providing an improved cooling process for steel strip from a continuous annealing process compared to a process which uses a cooling gas of 8% H₂ and 92% N₂, which allows

(a) to obtain cooling rates of $\geq 30^{\circ}\text{C}$ when cooling the strip to temperatures of $\leq 500^{\circ}\text{C}$, and which

(b) avoids the "fluttering" of the strip, and thus requires a minimum of process modifications although it does not mention any specific cooling gas temperature value.

2.2.3 This is also supported by the fact that D3 was among the documents cited as the closest prior art in the description of the application as originally filed (see WO-A-97 24468, page 2, lines 20 and 21).

2.3 *Problem to be solved*

2.3.1 The cooling process according to claim 1 therefore only comprises the following feature which is not present in D3:

[b2] the blowoff temperature of said cooling gas is 80-150°C (emphasis added by the Board).

The purpose of this feature is to improve the efficiency of the process by reducing the operational costs of the process and/or of the apparatus costs.

2.3.2 The objective technical problem to be solved with respect to the process of D3 is thus the provision of a cooling process which is more efficient and less expensive (compare patent in suit, paragraph [0006] in combination with paragraphs [0005]).

2.3.3 In this context the Board remarks that the alleged advantage of avoidance of "cooling buckles" - at least in this generalized form - has no basis in the application as originally filed. It is only mentioned in the context of the slow cooling step which, however, has no counterpart in claim 1 under consideration so that this alleged advantage cannot be considered in accordance with the Case Law (see Case Law of the Boards of Appeal of the European Patent Office, 4th edition 2001, sections I.D.4.5 and I.D.7.7.1).

2.4 *Solution to the problem*

The problem as defined in paragraph 2.3.2 above is solved by a cooling process as defined in claim 1 of the single request.

It is credible that the claimed measures provide a solution to the technical problem. The appellant's arguments to the contrary cannot be accepted as no evidence has been filed with which would have proven that the operational costs and/or apparatus costs cannot be reduced. This is due to the fact that the Board considers that at least the operational costs for

electricity will be reduced while the hydrogen costs are not necessarily reduced since the hydrogen concentration can be identical with that of D3.

2.5 The Board considers, however, that the subject-matter of claim 1 of the single request is obvious to the person skilled in the art for the following reasons:

2.5.1 The problem underlying the patent in suit represents an optimisation problem. This fact was implicitly acknowledged by the respondent by arguing that according to the invention the three parameters b1) to B3) of claim 1 are "adjusted and optimized".

2.5.2 Furthermore, the cooling capacity for reducing the temperature of the steel strip from T_1 to T_2 with a given cooling rate requires a specific - calculable - amount of cooling gas. The cooling gas has a specific heat capacity based on its flow rate (=blowoff speed multiplied by the nozzle diameters), its temperature and its H_2 -concentration. It belongs to the common general knowledge that an increase of the H_2 -concentration increases the heat transfer coefficient (see D4, page 1, fourth paragraph, point 3).

It is also clear to the skilled person that the range of the minimum blowoff speed of said cooling gas is determined at its lower value by the desired heat transfer coefficient to be achieved which is based on the said desired cooling rate, while its maximum upper value is determined by the "fluttering" tendency of the steel strip resulting from a too high blowoff speed (compare patent, page 9, lines 5 to 9).

2.5.3 These considerations imply that a certain amount of hydrogen must be contained in the cooling gas to obtain on the one hand the desired cooling rate and on the other hand to avoid the "fluttering" resulting from higher blowoff speeds since - as is apparent from D3 - the H₂-concentration influences both the heat transfer coefficient and the "fluttering" tendency at higher blowoff speeds. In this context it is also clear to the skilled person that a higher H₂-concentration increases the gas costs of the process (due to the gas losses), while due to an improved heat transfer rate caused by the increased H₂-concentration the electricity costs are reduced compared to a similar process using a lower H₂-concentration (compare point 2.5.5 below).

2.5.4 After its use in the cooling zone the cooling gas is recycled and has to be cooled down in a heat exchanger by the use of a cooling medium or coolant. In this context it is evident that a lower cooling gas temperature increases the efficiency of the (rapid) cooling step. This is proven by Annex B and Annex E which show a higher cooling gas temperature of from 80-150°C requires more cooling gas (and a longer cooling line) in order to obtain the same cooling effect as in the case with the cooling gas having a temperature of 30-80°C (compare also patent, page 8, lines 1 to 3; see Annex B, Table and graphs on page 2; and Annex E, graphs 1 and 2).

2.5.5 According to D3 the cooling gas is cooled to "about room temperature" which is interpreted by the Board as meaning about 20°C to about 35°C depending upon the country involved.

As undisputed by both parties such a cooling gas temperature of "about room temperature" according to D3 is obtained by using a refrigerator using fluorocarbon, ammonia or the like as the coolant (compare patent, page 8, lines 1 and 2). This implies additional electricity costs as well as additional costs for a more sophisticated heat exchanger and the refrigerator apparatus itself as convincingly argued by the respondent.

- 2.5.6 Water represents the simplest and most common coolant in plants of the steel industry. Furthermore, water will be already used as coolant in such a continuous annealing/cooling apparatus for e.g. cooling the rolls so that the skilled person would consider replacing the said refrigerator by a water cooled heat exchanger for cooling the recycled cooling gas.

The skilled person additionally would expect that such cooling of the recycled cooling gas with water is cheaper than the known alternative using a refrigerator since additional electricity for running the same is no longer required. Thus taking account of the overall costs of the process the use of such water cooling is considered to be obvious since the skilled person would go for the simplest solution to solve his problem, i.e. to use water as the coolant.

- 2.5.7 Through such a variation of the apparatus and the coolant the temperature of the recycled cooling gas will be somewhere around 100°C, according to the patent about 80-100°C can be reached (compare patent, page 3, lines 49 to 51; page 7, lines 52 to 57). Consequently, the use of water for cooling the recycled cooling gas

inherently leads to a temperature of the cooling gas within the range of claim 1 of from 80-150°C.

Furthermore, there exists no prejudice to use a cooling gas temperature of 100°C which is mentioned in documents D2 and D7 (see D2, page 14, line 22; D7, English translation, page 10, line 7) in connection with a cooling gas which undoubtedly has a lower cooling efficiency than that according to claim 1 of the patent in suit since in any case it will contain a higher amount of nitrogen in its composition than that allowed by claim 1. The Board therefore considers that the skilled person would use such a temperature value also for a gas mixture containing 30-60% hydrogen with the remainder being nitrogen. Thereby the skilled person would arrive at the solution as defined in claim 1 of the single request.

The Board remarks in this context that it is clear that the gas used according to D2 and D7 was not air as alleged by the respondent. This is not only because air would oxidise the steel surface but also when account is taken of the heat transfer coefficients of about 400 kcal/hr.m².°C specified in D2 (see page 14, Table 1) and D7 (see English translation, page 9, Table 1) which according to figure 3 of D6 are only reachable with a mixture of hydrogen and nitrogen. Furthermore, the patent itself (see paragraph [0040]) confirms that D7 uses a cooling gas comprised of 5% hydrogen and 95% nitrogen.

2.5.8 The respondent's arguments concerning a too low blowoff speed of D3 cannot be accepted since - although the examples were made with certain pressures of 200 mm

Aq or 300 mm Aq - the teaching of D3/D6 cannot be restricted to these examples since the general teaching is to use a specific cooling gas composition.

Furthermore, a much broader general pressure range resulting in blowoff speeds of from about 25,1 m/sec to about 112,1 m/sec is described in D3.

2.5.9 Likewise the respondent's arguments that the drawbacks of the prior art were found by the patent proprietor cannot be accepted. This is because the "fluttering" problems were already addressed in D3 (see point 2.1 above), the textbook D4 (see page 3), D6 (see English translation, page 2, first paragraph; page 3, first paragraph) and D7 (see English translation, page 4, second paragraph) while the drawbacks concerning the hydrogen costs and lowering of the cooling efficiency are self-evident taking account of the expected gas losses and of the heat transfer laws.

2.5.10 The respondent's arguments concerning the more even temperature distribution over the strip width caused by the cooling gas temperature cannot be accepted, either.

The cooling apparatus according to D7, which apparently includes an identical cooling gas blowing device (compare paragraphs [0015] to [0018] and figures 3-5 of the patent with figures 3, 4a, 4b and 6 and page 7, first paragraph to page 9, first paragraph of the English translation of D7) produces an homogeneous temperature distribution over the width of the steel strip (see D7, English translation, page 8, lines 11 to 17). Consequently, the homogeneous temperature distribution is the result of the relationship between

steel strip, nozzle and the blowing distance and not of the cooling gas temperature.

The Board notes in this context that the virtual experiments according to Annex B would not appear to be relevant since they are based on two - apparently very different - heat transfer coefficients of the cooling gas at the centre, i.e. the middle of the strip width, and the edges of the steel strip resulting in an uneven temperature distribution over the width of the steel strip which is not plausible, particularly in view of D7.

2.5.11 Furthermore, although an effect might be visible at 100°C but demonstrated to occur at a single point cannot support an inventive step for the whole range, particularly when considering that also a temperature such as 70°C will be effective and that a further point above the upper limit of 150°C - to prove a purposive selection - has not been provided.

2.5.12 The fact that there was a period of about 21 years between filing of the patent in suit and the publication date of D3 does not play any role since no prejudice against the teaching of the document exists. A finding of obviousness, based on an objective evaluation of the state of the art, cannot be affected by the mere fact that the skilled person had not published a combination of common general knowledge with a document for a considerable period of time (compare Case Law of the Boards of Appeal of the European Patent Office, 4th edition, 2001, chapters I.D.7.3 and I.D.7.4).

2.6 The Board therefore concludes that the subject-matter of claim 1 of the single request lacks an inventive step (Article 56 EPC).

This request is thus not allowable.

3. *Admissibility of an auxiliary request*

In the oral proceedings before the Board the respondent stated for the first time that it was prepared to file an auxiliary request in the case that the request then on file would be found by the Board to lack an inventive step. This auxiliary request would be directed to a combination of claims 1 and 2 as maintained by the Opposition Division.

With respect to the admissibility of this request, the Board observes the following:

3.1 In the oral proceedings no new matter arose which had not been addressed in the preceding written appeal proceedings. In the communication accompanying the invitation to oral proceedings the Board *inter alia* expressed its provisional opinion with respect to inventive step pointing out some crucial issues which needed to be discussed during the oral proceedings. In inter-partes cases a party should be aware that arguments of its counter party might convince the Board to take a decision negative for the former party. The fact that a Board does not give any conclusive provisional opinion in a communication in an inter partes case is not an indication that it is predisposed to find for or against any of the parties. Therefore, the respondent should also have been prepared for a

negative outcome and have filed an auxiliary request as a precaution. Furthermore, the parties were requested to make any submissions at least one month before the oral proceedings and the parties were advised to take note of the amended Rules of Procedure of the Boards of Appeal, in force as of 1 May 2003 and particularly of Article 10b.

The respondent's complaint that it was surprised by the Board's decision is not convincing for the above reasons. The respondent also complained that other Boards take other positions, accepting requests filed during oral proceedings. In the absence of details of the particular decisions and the pertaining circumstances, the present Board cannot consider this argument.

3.2 Although being the combination of two claims, the amendment indicated is quite extensive and raises new issues which have not been considered so far in the opposition or appeal procedure, mainly because of a significantly raised number of variables compared to claim 1 as maintained. Admitting this request would have either obliged the Board to remit the case to the opposition division so as to avoid the loss of an instance by the losing party or to arrange for a further oral proceeding.

3.2.1 From Article 10b of the Rules of Procedure of the Boards of Appeal (RPBA) it is clear that amendments to a party's case after the issue of the summons to oral proceedings shall not be admitted if they raise issues which the Board or the other party cannot reasonably be

expected to deal with without adjournment of the oral proceedings.

3.2.2 The fact that the respondent submitted with its letter of 25 July 2006 further arguments as a reaction to the Board's communication (see point V above) shows that the respondent was aware of the risk that the patent could be revoked and therefore could have filed such an auxiliary request earlier than during the oral proceedings. Thus in the Board's view the respondent had sufficient opportunity to defend its patent.

3.2.3 The respondent argued that it would be unfair to the patent proprietor not to admit this straightforward request, see the end paragraph of point IX above.

As already indicated above, point 3.1, no new matter was raised during the oral proceedings. The respondent's arguments are not justified in the present case. The respondent was the only party who knew in advance that it might want to file an auxiliary request and who thus was prepared to present the corresponding argumentation at the oral proceedings. The appellant was not aware of the respondent's intention to optionally file such an auxiliary request. Particularly it could not expect a request on the basis of the combination of claims 1 and 2 as maintained by the Opposition Division. The respondent had never proposed this combination before and had proposed a somewhat different auxiliary request during the opposition proceedings. It would have been unfair to the appellant to confront it with this new auxiliary request during the oral proceedings. This would at least have prompted adjournment of the present oral proceedings and

arrangement of a further date for them, a situation addressed in Article 10b(3), RPBA, as an express reason for not admitting an amendment to a party's case.

- 3.3 Furthermore, such auxiliary request would have necessitated the preparation of further evidence of the same type as prepared against the main request and optionally a further search to be done by the appellant.
- 3.4 The Board therefore decided not to admit the auxiliary request into the proceedings.
4. The patent, based on the single remaining request of the respondent, must therefore be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

G. Nachtigall

C. Holtz