Internal distribution code:

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

Datasheet for the decision of 12 June 2023

Case Number: T 1543/21 - 3.2.04

Application Number: 08777707.4

Publication Number: 2177745

IPC: F02M55/02, C21D6/00, F16L9/02, F16L9/19, C21D8/10, C21D9/08

Language of the proceedings: EN

Title of invention:
STEEL PIPE FOR FUEL INJECTION PIPE, USE AND MANUFACTURING METHOD THEREOF

Patent Proprietor:
Usui Kokusai Sangyo Kaisha Limited
Nippon Steel Corporation

Opponent:
TI Automotive (Heidelberg) GmbH

Headword:

Relevant legal provisions:
EPC Art. 52, 56

Keyword:
Novelty - (yes)
Inventive step - (yes)
Sufficiency - Fresh ground - not admitted

Decisions cited:
G 0010/91, T 0026/85, T 0806/02, T 0390/08, T 0570/91

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1543/21 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 12 June 2023

Appellant: (Opponent)	TI Automotive (Heidelberg) GmbH Dischinger Strasse 11 69123 Heidelberg (DE)
Representative:	Andrejewski - Honke Patent- und Rechtsanwälte Partnerschaft mbB An der Reichsbank 8 45127 Essen (DE)
Respondent: (Patent Proprietor 1)	Usui Kokusai Sangyo Kaisha Limited 131-2 Nagasawa, Shimizu-cho Sunto-gun, Shizuoka 411-8610 (JP)
Respondent: (Patent Proprietor 2)	Nippon Steel Corporation 6-1, Marunouchi 2-chome Chiyoda-ku Tokyo 100-8071 (JP)
Representative:	Zimmermann & Partner Patentanwälte mbB Postfach 330 920 80069 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 14 July 2021 rejecting the opposition filed against European patent No. 2177745 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	J. Wright
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. The appeal was filed by the appellant (opponent) against the decision of the opposition division to reject the opposition filed against the patent in suit.

II. The opposition division decided that the subject-matter of the claims as granted was novel and involved an inventive step.

III. The Board duly summoned the parties to oral proceedings to take place on 13 June 2023. In a communication in preparation for the oral proceedings dated 23 February 2023, the Board made observations on the relevant issues. With letter of 23 May 2023, the appellant-opponent withdrew its request for oral proceedings. In view of this, the Board cancelled the oral proceedings and has decided the case in writing.

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

V. The respondent (patent proprietor) requests that the appeal be dismissed or, in the alternative, that the patent be maintained on the basis of one of the auxiliary requests 1 to 4 all refiled with the reply to the appeal, dated 28 February 2022.

VI. The independent claims of the main request (as granted) read as follows:

"1. Use of a steel pipe for fuel injection pipe, the steel pipe consisting of, by mass percent, C: 0.12 to 0.27%, Si: 0.05 to 0.40%, Mn: 0.8 to 2.0%, and

optionally one or more kinds of Cr: 1% or less, Mo: 1% or less, Ti: 0.04% or less, Nb: 0.04% or less, and V: 0.1% or less, the balance being Fe and impurities, the impurities containing Ca: 0.001% or less, P: 0.02% or less, and S: 0.01% or less, wherein the tensile strength thereof is not lower than 900 N/mm^2, and the maximum diameter of A type, B type, or C type non-metallic inclusions present during at least 20 μm depth from the inner surface of the steel pipe is not larger than 20 μm".

"2. A fuel injection pipe being a steel pipe consisting of, by mass percent, C: 0.12 to 0.27%, Si: 0.05 to 0.40%, Mn: 0.8 to 2.0%, and optionally one or more kinds of Cr: 1% or less, Mo: 1% or less, Ti: 0.04% or less, Nb: 0.04% or less, and V: 0.1% or less, the balance being Fe and impurities, the impurities containing Ca: 0.001% or less, P: 0.02% or less, and S: 0.01% or less, wherein the tensile strength thereof is not lower than 900 N/mm^2, and the maximum diameter of nonmetallic A type, B type, or C type inclusions present during at least 20 μm depth from the inner surface of the steel pipe is not larger than 20 μm".

"3. A manufacturing method for a steel pipe for fuel injection pipe, comprising the steps of quenching a steel pipe having the chemical composition as defined below, wherein the quenching condition is that the pipe is heated to a quenching temperature of not lower than the Ac_3 transformation point and is rapidly cooled, and tempering the quenched steel pipe at a temperature of not higher than the Ac_1 transformation point, wherein the quenching and tempering are performed after a final cold drawing has been performed, the chemical composition of the steel pipe consisting of, by mass percent, C: 0.12 to 0.27%, Si: 0.05 to 0.40%, Mn: 0.8

to 2.0%, and optionally one or more kinds of Cr: 1% or less, Mo: 1% or less, Ti: 0.04% or less, Nb: 0.04% or less, and V: 0.1% or less, the balance being Fe and impurities, the impurities containing Ca: 0.001% or less, P: 0.02% or less, and S: 0.01% or less."

VII. In the present decision, reference is made to the following documents:

D1: EP 2022866 A1
D2: EP 1528114 A1
D4: EP 1914418 A1
D5: Wikipedia article "Common-Rail-Einspritzung", 21 August 2019, last revised on 3 July 2007
D12: F. Rapetz and others, "Die Edelstähle" Berlin, 1962, pages 46 and 47
D15: Dr. Sommer "Prüfbericht für Patent- und Rechtsanwalte Andrejewski-Honke" 5 March 2021

VIII. The appellant-opponent's arguments can be summarised as follows: The subject matter of granted claims 1 and 2 lacks novelty over D1. D2 takes away novelty of granted claims 1 to 3. The subject matter of claims 1 to 3 lacks inventive step starting from D2 with the skilled person's general knowledge. The invention as claimed is insufficiently disclosed.

IX. The respondent-proprietor's arguments can be summarised as follows: The cited prior art does not take away novelty or inventive step of the independent claims.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The invention (see the published patent specification, paragraphs [0001] and [0009]) relates to a steel pipe for fuel injection pipe, used for injecting a fuel into a combustion chamber. The invention also relates to a manufacturing method for such a pipe. According to the patent, the steel has a tensile strength of not lower than 900 N/mm^2 (cf. claims 1 and 2). Amongst other things, the invention aims to provide such a pipe with an excellent internal pressure fatigue resistance, for use in supplying fuel mist into a combustion chamber of a diesel engine. To this end, the pipe is made of steel consisting of certain named constituents (see the published patent specification, claims 1 to 3) and specifies certain maximum dimensions of non-metallic intrusions (see claims 1 and 2). Claim 3 is to a manufacturing method of a steel fuel injection pipe having the same chemical composition as defined in claims 1 and 2 and including the step of quenching.

3. Main request, claims 1 and 2, novelty with respect to D1

3.1 In its communication in preparation for the oral proceedings, section 2 (Main request claims 1 and 2, novelty with respect to D1) the Board gave the following opinion regarding this matter. In a first part (points 2.1 to 2.8), the Board considered certain contentious aspects of novelty with respect to D1, in particular whether the range of tensile strengths

disclosed in D1 took away novelty of the invention. The Board wrote as follows:

"2.1 The appellant-opponent has cited D1 under Article 54(3) EPC as being prejudicial to novelty of the independent claims 1 and 2.

2.2 Claim 1 is directed to the use of a steel pipe for a fuel injection pipe. Claim 2 is directed to a steel pipe. In both claims the pipe is defined in the same way, namely in terms of: its steel consisting of certain constituents in certain proportions and certain dimensional limits for non-metallic inclusions. Moreover, its tensile strength is defined as being not lower than 900N/mm^2.

2.3 D1 (see claim 1 and paragraph [0018]) discloses a pipe as a fuel injection pipe made of steel having exactly the same constituents/proportions and dimensional limits for non-metallic inclusions as claimed in the patent, claims 1 and 2. Both D1 and the patent appear to be based on the same recognition, that limiting the size of non-metallic inclusions of the identical alloy material of the steel tube raises the internal pressure limit, cf. paragraphs [0008]-[0010] of D1 and paragraphs [0010]-[0012] of the patent. As is apparent from these paragraphs both D1 and the patent also identify the same lower limit for tensile strength, 500N/mm^2, above which this effect is observed. The patent, paragraph [0013], adds the recognition that this effect subsists if the tensile strength is over 900N/mm^2. D1 and the patent also disclose example test pieces with the constituents and non-metallic inclusions as claimed in the patent (see respective tables 1 and 2, where inventive test pieces 2, 4 and 6 of D1 correspond to comparative test pieces

C, E and F of the patent). These have tensile strengths ranging from 549 to 724 N/mm^2, thus none of them are as claimed (not under 900N/mm^2).

Whereas claim 1 of D1 (to a fuel injection pipe) features a lower limit for tensile strength of 500N/mm^2, claim 1 (use of a fuel injection pipe) and claim 2 (fuel injection pipe) of the patent specifies a lower limit of 900N/mm^2. Otherwise these claims are identical (the claim to the pipe implying also its unspecific use). These claims all define ranges with a lower limit but which are open ended. On the face of it the claimed open ended range "not lower than 900N/mm^2" lies within the open ended range of D1 of "500N/mm^2 or higher". Therefore, the question of novelty hinges on whether the patent can be seen to be claiming a selection from the broader range known from D1 (see CLBA, 10th edition, 2022, section I.C.6.3).

2.4 According to established case law (CLBA, I.C.6.3.1) a selected sub-range is new when it is narrow and is far removed from the known range and any examples. Whether the selected range is purposive (and not arbitrary) at best confirms novelty but is not a prerequisite. Thus the fact that the effect is the same in D1 and the patent (increased pressure limit) is of no import for novelty.

2.5 Neither D1 nor the patent define an upper limit for tensile strength though for the alloy compositions claimed there must be an upper limit, as the skilled person knows that no steel has limitless tensile strength. The appellant-opponent has argued that for D1 and the patent, the skilled person would understand the practical limit of tensile strength to be 1500 N/mm^2,

as disclosed in D4, claim 7 (cf. grounds of appeal, page 7, lines 1 to 6).

As the appellant-opponent has pointed out in its appeal grounds (page 6, section 3.2), the tensile strength of a steel pipe depends on the make up of the alloy and the heat treatment to which it is subjected. None of the alloys disclosed in D4 (see tables 1 to 3) are according to D1, claim 1. For example, none have a Manganese (Mn) content of between 0.8 and 2% by mass, rather all are 0.6% or below. Therefore, it cannot be concluded by considering D4 that both the patent and D1's claimed material achieve a maximum tensile strength of 1500N/mm^2. Rather, it is no more than speculation. Consequently, this argument fails to shed any light on whether the claimed range of over 900 N/mm^2 (up to some practical limit) is not narrow compared to D1's range and thus not novel.

2.6 The Board notes that the only heat treatment D1 discloses for producing pipes is to anneal them and then leave them standing to cool (see paragraph [0038] and Oxford English Dictionary on line (OED), Anneal, meaning 2c: To subject (metal, glass, etc.) to a process of heating followed by (typically slow) cooling in order to remove internal stresses and make the material less brittle or more workable. Also intransitive: to undergo such a process. Cf. temper v. 14.).

In contrast hereto, the patent discloses (see paragraph [0042]) heat treatment of quenching and tempering and it is this that is said to ensure the material has a tensile strength of 900N/mm^2 (see OED meaning 14a: To bring (steel) to a suitable degree of hardness and elasticity or resiliency by heating it to the required

temperature and immersing it, while hot, in some liquid, usually cold water; applied also to the hardening of copper, etc.[...]).

That it is this particular tempering heat treatment which achieves the claimed tensile strength is also borne out by the examples in the patent (see table 2), in which none of the annealed [gradually cooled] comparative samples (3, 6 and 9) achieve tensile strengths greater than 724N/mm^2, whereas those according to the invention which are quenched/tempered (samples 2, 5 and 8) achieve tensile strengths above 900N/mm2. In this regard, a quenching action will always rapidly reduce temperature and is thus a very different process to air cooling (cf. D12, page 47, figure 45). The appellant-opponent's reference in this respect to claim 5 of the patent (10°C/S is a slow rate of cooling) is irrelevant since claim 5 does not define a cooling rate of 10°C/S but a rate of heating (heating to the quenching temperature).

2.7 This raises the question whether the disclosure of D1 is specific to annealed alloys, and if so, whether that implies an upper limit (for annealed alloys of identical composition) *below the lower limit of claims 1 and 2 of the patent (for quenched alloys). According to established jurisprudence (see CLBA, I.C.6.3.2, in particular T26/85, headnote and reasons 9), what is made available to the public by a broad range disclosed in the prior art is determined by whether the person skilled in the art would, in the light of the technical facts, seriously contemplate applying the technical teachings of the prior art document in the range of overlap. If it can be fairly assumed that [they] would do so, it must be concluded that no novelty exists. The Board does not interpret this test to be equivalent to*

examining whether the skilled person would be prevented from working in the area of overlap as the appellant-opponent has argued, nor therefore that this should represent a reversal of the burden of proof - in other words that claim 1 should be assumed to lack novelty and it should be up to the respondent-proprietor to prove that this was not the case. The fact that in the particular case of T26/85 (see reasons, point 13), there was an indication in the prior art that would dissuade the skilled person from working in a particular range does not mean that such an indication must be found in the present case. Rather, it must only be examined whether the skilled person would seriously contemplate working in the overlapping range (see T26/85, reasons point 9).

2.8 Applying the approach outlined above, the Board must therefore consider whether the skilled person would seriously contemplate applying D1's technical teaching in the range of overlap, that is at tensile strengths near or above 900N/mm^2. Here it is important to ascertain whether the recognition in paragraph [0008] to [0010] in D1 that limiting the size of non-metallic inclusions increases the inner pressure limit for tensile strengths over 500 N/mm^2 was made only within the context of annealed alloys or was of more general applicability. Based on that recognition in D1 would the skilled person have seriously contemplated trying alloys of the very same composition but produced via quenching? How is the fact that the patent in paragraphs [0010] to [0012] repeats the recognition with the same lower limit of 500 N/mm^2, adding (paragraph [0013]) that it applies also for tensile strengths over 900 N/mm^2, to be regarded in this context?"

3.2 From these parts of the communication (see in particular its questions posed in point 2.8), the Board considered that the question of novelty with regard to the range of tensile strengths disclosed in D1 hinged on whether D1's disclosure was specific to annealed alloys, and if so, whether that implied an upper limit (for annealed alloys of identical composition) below the lower limit of claims 1 and 2 of the patent (for quenched alloys). The Board explained that, applying the approach outlined in T26/85, this boils down to asking whether the skilled person would *seriously contemplate* applying D1's technical teaching in the range of overlap, that is for tensile strengths above $900N/mm^2$.

3.2.1 In its letter of 23 May 2023, announcing its withdrawal of its request for oral proceedings, the appellant-opponent refrained from addressing the Boards provisional comments. In particular it did not answer the Board's critical questions. The respondent-proprietor has likewise not done so. It therefore behoves the Board to provide the necessary answers.

3.2.2 In the background to D1's invention (see paragraph [0006]), it is explained that the strength of the steel pipe material is not the only parameter that determines the "internal pressure limit" that serves as a limit below which no fatigue failure occurs when pressure is applied to the inner side of the steel pipe. D1's object (see paragraph [0007]) is to provide a highly reliable steel fuel injection pipe with a prolonged fatigue life by enhancing the material strength while maintaining [a] high internal pressure limit.

3.2.3 In order to solve this problem (see D1, paragraph [0008]), the relationship between tensile strength and internal pressure limit was studied and fatigue failure damage analysed. The author of D1 found (see paragraphs [0009] and [0010]) that above a tensile strength of 500 N/mm^2, a pipe's failure mechanism depends on the pipe's critical pressure and can be improved by suppressing certain inclusions in the steel which have no influence on failure below this tensile strength.

3.2.4 Paragraph [0018] of D1 reiterates that the tensile strength of D1's fuel injection pipe should be greater than 500 N/mm^2 (the fatigue mechanism boundary) and it also states that, at this value, the pipe is capable of withstanding the pressure applied to the inner side of the steel pipe from the pressurised fuel. In the Board's view, here D1's teaching is that, although the tensile strength must be at least $500N/mm^2$, because this meets the working pressure requirements, no particular benefit is achieved by exceeding this.

3.2.5 In the Board's view, the fact that D1 only proposes an annealing heat treatment (standing to cool) cements the idea that tensile strengths greatly above $500N/mm^2$ are not necessary. Of the ten examples shown in table 2, samples 2, 4 and 6 are those according to D1's invention. Sample 2, with a tensile strength of $549N/mm^2$ only just exceeds the $500N/mm^2$ boundary. Sample 6 has the highest tensile strength at $724N/mm^2$ (cf. patent, table 2, comparative sample 9). Whilst this is significantly above $500N/mm^2$, it is still well below the patent's claimed $900N/mm^2$ minimum. In the Board's view, knowing that D1 teaches that a tensile strength of $500N/mm^2$ is sufficient for withstanding fuel pressure in the pipe, the skilled person would not

actively seek to increase tensile strength above the highest strengths obtained by annealing, such as 724N/mm^2. For this reason, the Board holds that the skilled person would not seriously contemplate introducing a more complex heat treatment process than the one D1 discloses to increase tensile strength. In other words, the information in D1, paragraphs [0008], [0010] that limiting the size of non-metallic inclusions increases the inner pressure limit for tensile strengths over 500N/mm^2 was made only within the context of annealed alloys achieving tensile strengths of up to 724N/mm^2 but not approaching 900N/mm^2, let alone above this strength.

3.2.6 Without prejudice to the question of admittance of D5, a Wikipedia article describing common rail injection, the Board considers that it does not change how this aspect of D1 should be interpreted: Although D5 (see page 4 "Erreichbare Drücke"), last modified a year after D1's priority, discloses that operating pressures in fuel injector pipes were then expected to rise: "An einer weiteren Erhohung auf [...] und mehr wird gearbeitet", this does not negate D1's recognition that a tensile strength of 500N/mm^2 is sufficient for its operational fuel pressure (whatever that pressure might be in absolute terms). It is with this mindset that the skilled person reads D1, rather than with the mind of one contemplating almost doubling this sufficient tensile strength.

3.2.7 The fact that the patent (see paragraphs [0010] to [0012]) repeats D1's disclosure in paragraphs [0009] and [0010] that, above a tensile strength of 500 N/mm^2 a pipe's failure mechanism depends on the pipes critical pressure, does no more than confirm this teaching. That the patent then states that it aims to

achieve much higher tensile strengths (see paragraph [0013]) has no bearing on how the skilled person reads D1's teaching (see paragraph [0018] and the claims) that a tensile strength of 500N/mm^2 is sufficient for withholding operational fuel pressure.

3.2.8 From the above, the Board holds that the skilled person would not seriously contemplate applying D1's teaching in the range of overlap (tensile strength above 900N/mm^2). Therefore, this aspect (overlapping ranges) of the appellant-opponent's novelty objection must fail.

3.3 In the last part of the Board's discussion of novelty of claims 1 and 2 with respect to D1 (communication, points 2.9 and 2.10), the Board examined further arguments of the appellant-opponent (D1 in the light of D15 and the nature of certain alloys argued as being implicitly disclosed in D1) and found them not to be convincing. There, the Board wrote the following:

"2.9 The appellant-opponent has also argued that D1 implicitly discloses tensile strengths above 900 N/mm^2 based on an interpretation of D1 in the light of D15. In this regard, the Board first notes that D15 was late filed in the opposition proceedings and the opposition division decided not to admit it into the proceedings, because it was, amongst other things, not prima facie relevant (see impugned decision, section II.A.1 and II.A.1.2).

In accordance with Article 12(6) RPBA 2020, [t]he Board shall not admit requests, facts, objections or evidence which were not admitted in the proceedings leading to the decision under appeal, unless the decision not to admit them suffered from an error in the use of

discretion or unless the circumstances of the appeal case justify their admittance.

In the present case, the appellant-opponent has only argued that it should have reached a different conclusion on prima facie relevance from the facts. It has not argued that the conduct of the opposition division was procedurally deficient. Nor does the Board see why the opposition division might have erred in the way in which it exercised its discretion when deciding not to admit D15. In particular, the matter of admittance of D15 was discussed with the parties at the oral proceedings (see minutes pages 1 and 2), so the parties were heard on the issue. Furthermore, it would seem to have been procedurally correct to consider the prima facie relevance of D15 when examining its admittance (see impugned decision, page 6).

Nor in appeal do the circumstances of the case justify D15's admittance into these proceedings. In particular, the requests being considered and the issues arising from them are the same as in the opposition proceedings. Therefore, the Board intends not to admit D15 into the proceedings, Article 12(6) RPBA 2020. In the light of this, the appellant-opponent's argument in appeal, that D15 proves that D1 implicitly discloses the subject matter of claim 1, is moot.

2.10 For completeness, the Board notes that, whether or not an alloy having the 7 alloying elements disclosed in D1 at their upper limit value for the ranges claimed in D1, or indeed some other combination of such limit values, might lead to an alloy having a tensile strength exceeding 900 N/mm^2 is not relevant to the question of novelty. This is because, such an alloy is not directly and unambiguously disclosed in D1. To

arrive at it would require the skilled person to specifically choose values for each of the 7 proposed constituents from selected limit values. The Board sees this as boiling down to a selection from several lists of options which, according to established jurisprudence, does not constitute a direct and unambiguous disclosure (see for example CLBA I.C.6.2.1 (b) and for example T0806/02, reasons 4.1.). Rather, only the specific alloys of tables 1 and 2 are directly and unambiguously disclosed, and none of these exhibit tensile strengths above 724N/mm^2."

3.3.1 In the absence of any arguments from the parties in response to the Board's provisional opinion regarding these points, the Board confirms its preliminary opinion that D15 is not admitted into the proceedings, that the appellant-opponent's argument based on D15 is moot and that D1 does not directly and unambiguously discloses specific alloys exhibiting tensile strengths above 900N/mm^2.

3.4 For all these reasons, the Board finds that D1 does not take away novelty of the independent claims 1 and 2.

4. In its communication (see sections 3 to 5), the Board considered the appellant-opponent's novelty and inventive step arguments based on D2 and found them not to be convincing. The Board wrote the following:

"3. Novelty with respect to D2

3.1 Before looking in detail at novelty with respect to D2, the Board finds it useful to look at how certain terms of claims 1 and 2 are to be interpreted.

3.2 The Board first notes that, according to established jurisprudence (see CLBA, II.A.6.1), the skilled person should try, with synthetical propensity, i.e. building up rather than tearing down, to arrive at an interpretation of the claim which is technically sensible and takes into account the whole disclosure of the patent. The skilled person gives terms their usual meaning.

3.3 Furthermore (see CLBA II.A.6.2 and for example T0390/08, reasons, 2), in claim language, the term consisting of compulsory and optional components defines a "closed" composition from which elements other than those mentioned are excluded, whereas the wording containing [certain components] leaves open the possibility that components other than the ones mentioned are present. In this case, the claims of the patent are to be examined. Therefore, the appellant-opponent's argument that consisting of should be interpreted as containing because it is so defined in the claims of the application is moot.

3.4 Claims 1 and 2 define a pipe of steel consisting of a number of named elements, one of which being impurities. These impurities are defined as containing three named components (Ca, P and S), thus it is true that this formulation leaves open the possibility that impurities, other than the ones mentioned, are present.

3.5 The term impurity (see OED, definition 3a.) means: The quality of containing some extraneous or foreign admixture, esp. of an inferior or baser kind; concrete foreign matter which detracts from the purity of any substance.

3.6 The term pipe (see OED, definition 3) is: A hollow cylinder or tube of metal, plastic, wood, or other material, used to convey water, gas, etc. In the context of a fuel injector system the skilled person understands a fuel injector pipe as signifying a tube conveying fuel, into the combustion chamber via injectors. This is consistent with what is said in the patent description: Paragraph [0001] introduces the invention by explaining that: the present invention relates to a steel pipe for a fuel injection pipe [...] used for injecting a fuel mist into a combustion chamber.

3.7 Turning now to D2, it discloses (see title and paragraph [0001] and claims 6 and 7) a fuel injection system component made of a certain free-cutting steel, in other words a highly machinable steel (cf. paragraph [0004] and [0006]). Since it is well-established case law that a generic disclosure does not take away the novelty of a species or subclass, the disclosure of a component of a fuel injection system does not take away the novelty of a steel pipe for a fuel injection pipe as claimed.

3.7.1 Nor in D2's detailed description is there a direct and unambiguous disclosure of a material or material properties for a fuel injection pipe. At most, paragraph [0031] discloses that D2's invention can be applied to a component having a joint hole. More specifically, paragraphs [0038] and [0039] with figures 7 and 8 disclose a common rail 3 and a fuel injector 2 which which must have particularly high fatigue strength, because of their many joint holes, whilst at the same time must be readily machinable since, within these, long and narrow through-holes with complicated geometries must be formed. It is only these components

that are disclosed as being made of the particular free cutting steels described in D2 (see paragraph [0040]).

3.7.2 As to any disclosure of fuel injection pipes, these are only briefly mentioned in paragraph [0036], where it is explained that the common rail 3 shown in figure 7 has injector side pipe connection portions 31 to which high pressure pipes [not shown], leading to the injectors of figure 8, are connected. Nor does the Board interpret the statement in paragraph [0041] that D2's free cutting steel can be used for any other components of the common rail-type fuel injection system, to directly and unambiguously disclose that fuel injection pipes are made of D2's free cutting steel. Also here, the understanding that the generic does not disclose the specific holds. In D2's context the skilled person would understand such other components to be those with joint holes which must be machined. Indeed, the paragraph goes on to give such an example, namely the fuel supply pump cylinder, which has joint holes formed therein. In contrast, the skilled person would understand a fuel injection pipe to be something having a joint hole machined from a solid block, but rather a pipe formed in a pipe mill for example (cf. patent, paragraph [0041]).

3.7.3 Therefore, the Board holds that D2 does not disclose the use of a steel pipe for a fuel injection pipe having the claimed components and tensile strength of claim 1, nor for the same reasons, a steel pipe according to claim 2 or the manufacturing method for such a pipe according to claim 3.

3.7.4 As to any free-cutting steel disclosed in D2 (see claim 1) it is true that it has all the components of which the steel pipe of the invention consists, but it

also has some others. Notably these include bismuth (Bi) and aluminium (Al). Central to D2's teaching is the necessity of adding Bi in significant enough quantities to improve machinability, such as drilling (see D2, paragraph [0021]). The Board holds that the skilled person would not read Bi in such a machinability changing quantity, however small in percentage terms, as falling under the claim term impurity. In other words, this would not be a technically sensible interpretation of the claim: As the appellant-opponent has pointed out (cf. appeal grounds, paragraph bridging pages 13 and 14), bismuth would be detrimental for making steel suitable for the invention (a fuel injection pipe) which needs to be particularly strong/hard, rather than soft enough to be machinable. Its presence in the quantities proposed in D2 would be considered by the skilled person as more than merely foreign matter, detracting from the purity of the steel. Rather it would fundamentally change its character, so the steel product would no longer be consisting of the individual elements listed in the claim. Therefore, whether or not the skilled person might consider D2's quantities of aluminium to be an impurity, the Board holds that this would not apply to the bismuth constituent. Thus, for this reason alone, D2 does not disclose a steel alloy having the constituents as claimed, let alone a pipe made therefrom.

This is all the more true since, as the respondent proprietor has argued, leaving aside the presence of bismuth in amounts that cannot be dismissed as merely an impurity, none of the specific steels disclosed in D2 have the claimed constituents in the claimed amounts in combination. For example, the claimed manganese content is 0.8-2.0 % and that of carbon 0.12-0.27% by

weight. From the steels specifically disclosed in D2's tables 1 and 2, only samples 7 and 21 have Mn content within the claimed range (1.01 and 0.8% respectively). However, neither of these have a carbon content falling within the claimed range, rather both have carbon contents of 0.34%.

By the same token, the Board does not consider that the various limit values of carbon, silicon and manganese given in D2 (see paragraphs [0013] to [0015]) constitute the disclosure of a specific steel constituted as claimed. To arrive at such an alloy would require the skilled person to specifically choose, for example the lowest disclosed quantity of Si (0.05%) from paragraph [0014] yet the highest preferable amount of manganese (2%) from paragraph [0015] as the appellant-opponent has suggested they might. Such a combination would amount to a selection from lists of options which, according to established jurisprudence, does not constitute a direct and unambiguous disclosure of a specific combination.

3.7.5 Since the steels disclosed in D2 are not as claimed in claims 1 and 2, it can be left undecided whether D2's paragraph [0008], with its reference to a hardness Hv of 300 (which appears from D17 - without prejudice to the question of its admittance - to correlate to a tensile strength above 900N/mm2) might apply to the steels disclosed in D2.

3.7.6 Likewise, given that D2 appears not to disclose a steel alloy constituted as claimed, it would appear to be uncritical to the question of novelty of claims 1 and 2 whether D2's steels exhibit the claimed maximum diameter of A, B and C non-metallic inclusions.

3.8 For all these reasons, the Board is of the opinion that D2 does not take away the novelty of any of the independent claims (1 to 3).

4. Inventive step of claims 1 and 2 starting from D2 with the skilled person's general knowledge

4.1 The opposition division considered that the subject matter of claims 1 and 2 involved an inventive step starting from D2 combined with the skilled person's general knowledge (see impugned decision, pages 11 and 12). The Board agrees with this conclusion.

4.2 In accordance with established jurisprudence (see Case Law of the Boards of Appeal, 10th edition, 2022 (CLBA) I.D.3.6 and the decisions cited, in particular T570/91, reasons 4.4 and 4.5), although a person skilled in the art is completely free in choosing a starting point, they are then bound by that choice.

4.3 In the present case, as has already been explained in the Board's analysis of novelty, D2 discloses certain free-cutting, that is highly machinable, steel alloys for use in the [machined] components of a fuel injection system having joint holes. These might, for example, be a common rail, fuel injectors or pump elements with long machined holes with complex geometries (see example paragraphs [0031] and [0041] with figures 7 and 8).

If the skilled person were to start from D2's free-cutting steel alloys, any further obvious development (for example changes to the alloy composition) would be constrained to the field of alloys suitable for machined parts and not one suitable for a fuel

injection pipe. Amongst other things, such a development would not include reducing the amount of bismuth (cf. D2, paragraph [0021]) to a level at which it could be considered to be a mere impurity, since bismuth provides the machinability that is central to D2's teaching. Therefore, however the skilled person might develop D2's steel compositions, they would not arrive at a steel consisting of the elements defined in the independent claims, let alone the fuel injection pipe of claim 2, nor the use of such a pipe according to claim 1.

At most, the skilled person might start from the high pressure fuel injection pipes disclosed in D2, paragraph [0036]. However, since no information is given about the material used in these pipes, the Board holds that it would require more than the mere application of routine skills to arrive from this starting point at the fuel injection pipe of claim 2, and/or the use of the same according to claim 1."

5. Claim 3, inventive step starting from D2

D2 gives no information about a manufacturing method for a steel pipe for a fuel injection pipe. At most it only mentions the existence of such pipes (see paragraph [0036]) and discloses a manufacturing method for free-cutting steel for machined parts of a fuel injection system, see paragraphs [0031] to [0032] and [0041] to [0043]. In the Board's view, however obvious any improvements to this method might be, it would remain a method of manufacturing a machined part of a fuel injection system and not that of a fuel injection pipe. Therefore, starting from D2 and applying general knowledge, the Board holds that the subject matter of claim 3 involves an inventive step.

5. In the absence of any arguments of the parties subsequent to the Board issuing its communication, the Board confirms its provisional opinion that D2 is not prejudicial to novelty or inventive step of the independent claims 1 to 3 of the main request.

6. In its communication (point 6), the Board gave the following provisional opinion about the appellant-opponent's objection based on the opposition ground of insufficient disclosure (Article 100(b) EPC):

"6. The Board notes that the opposition ground of insufficient disclosure was not raised in the opposition proceedings (see the notice of opposition, page 1, form 2300 and the impugned decision, section I. 3). Its introduction in appeal proceedings (cf. appellant-opponent's letter of 13 January 2023, top of page 7) would amount to a fresh ground. According to G 10/91 (see Headnote, point 3 and Reasons, point 18) such a fresh ground could only be introduced with the agreement of the patent proprietor. In the absence of such an agreement, the Board does not have the power to consider this issue."

6.1 The appellant-opponent has not commented this opinion, nor has the respondent-proprietor agreed to this opposition ground being introduced into the appeal proceedings. Therefore, the Board confirms its provisional opinion.

7. For the above reasons, the arguments presented by the appellant-opponent have not convinced the Board that the opposition division was wrong in finding that the grounds of opposition under Article 100(a) EPC were not prejudicial to maintaining the patent as granted (see impugned decision, conclusions III). Moreover, the Board does not have the power to examine the opposition ground under Article 100(b) EPC in appeal. It follows from this that the Board must dismiss the appeal.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated