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**Datasheet for the decision
of 18 January 2022**

Case Number: T 2623/17 - 3.5.02

Application Number: 09779737.7

Publication Number: 2441075

IPC: H02B13/055, H01B3/56

Language of the proceedings: EN

Title of invention:
Dielectric Insulation Medium

Patent Proprietors:
ABB Schweiz AG
Hitachi Energy Switzerland AG

Opponents:
3M Innovative Properties Company
Siemens Aktiengesellschaft

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - (no) - claim directed to the use of a component of a gaseous mixture, not of the mixture itself
Inventive Step - (yes) - third auxiliary request
Admissibility - could be left undecided



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Case Number: T 2623/17 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 18 January 2022

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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted on
13 October 2017 concerning maintenance of the
European Patent No. 2441075 in amended form.

Composition of the Board:

Chairman R. Lord
Members: F. Giesen
A. Bacchin

Summary of Facts and Submissions

I. The present appeal by opponent 3 (Siemens AG) lies from the interlocutory decision of the opposition division of the European Patent Office posted on 13 October 2017 concerning maintenance of the European Patent No. 2 441 075 in amended form on the basis of the then third auxiliary request.

The respondents are the patent proprietors 1 and 2 (ABB Schweiz AG and Hitachi Energy Switzerland AG).

Opponent 1 (3M Innovative Properties Company) did not file an appeal against the decision of the opposition division and is therefore a party as of right to the appeal proceedings pursuant to Article 107 EPC.

Opponent 2 (Solvay Fluor GmbH) withdrew their opposition by letter dated 14 February 2018, by which procedural act opponent 2 ceased to be a party to the proceedings.

II. Reference will be made to the following documents:

- D1 Tuma P.E.: "*A Low-GWP Fluoroketone Potential Alternative to SF₆ in Some Dielectric Applications?*", NEMA Ad Hoc Task Group on SF₆, 5 February 2009
- D4 Garzon, R.D: "*High Voltage Circuit Breakers - Design and Applications*", 1997, ISBN 0-8247-9821-X, pages 140, 141, 162, 163, 170 to 177

D11 Giere, S.: "*Vakuumschalttechnik im Hochspannungseinsatz*", 1. Auflage, Göttingen Cuvilier 2004, pages 1 to 6

III. Oral proceedings before the board took place on 18 January 2022 in the form of a videoconference, to which the appellant and the respondent had given their consent. As announced by letter dated 14 December 2021 the party as of right was not represented at the oral proceedings.

The parties' requests were as follows:

The appellant (opponent 3) requested that the decision under appeal be set aside and the patent be revoked.

The respondents (proprietors 1 and 2) requested that the appeal be dismissed or, as an auxiliary measure, that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of one of the 1st and 2nd auxiliary requests filed with the reply to the appeal or of one of the 3rd to 9th auxiliary requests filed with letter dated 22 November 2021.

The party as of right did not submit any requests during the appeal procedure.

IV. The **main request** contains seven independent claims.

Claim 1 reads as follows:

"1. Dielectric insulation medium comprising an insulation gas, said insulation gas comprising at operational conditions a fluoroketone having from 4 to 12 carbon atoms, characterized in that the fluoroketone has a boiling point of at least -5 °C at ambient pressure and the insulation gas is a gas mixture, which further comprises oxygen."

Claim 19 reads as follows:

"19. Use of a fluoroketone according to any of claims 1 to 18 in a dielectric insulation medium."

The wording of the remaining independent claims is not reproduced here.

V. The **1st and 2nd auxiliary requests** contain claims 1 and 19 of the main request in unamended form.

VI. The **3rd auxiliary request** contains claim 1 of the main request in unamended form. The wording of independent claims 7, 13, 19 and 31 is as follows:

"7. Dielectric insulation medium comprising an insulation gas, said insulation gas comprising at operational conditions a fluoroketone having from 4 to 12 carbon atoms and having the general structure

R1-CO-R2

wherein R1 and R2 are at least partially fluorinated chains, said chains being independently

from each other linear or branched and having from 1 to 10 carbon atoms, and the insulation gas being a gas mixture, which further comprises oxygen."

"13. Dielectric insulation medium comprising an insulation gas, said insulation gas comprising at operational conditions a fluoroketone, characterized in that the fluoroketone has 6 carbon atoms and the insulation gas is a gas mixture, which further comprises oxygen."

"19. Apparatus for the generation, the distribution or the usage of electrical energy, said apparatus comprising a housing defining an insulating space and an electrical active part arranged in the insulating space, said insulating space comprising an insulation medium, characterized by the dielectric insulation medium according to any of the claims 1 to 18."

"31. Method for dimensioning an electrical apparatus according to any of claims 19 to 29, characterized by the steps of

- determining for the apparatus a permissible electrical field strength of the desired insulation medium and a minimal permissible operating temperature of the desired insulation medium,*
- determining from the pressure-reduced breakdown field strength of the desired insulation medium as a function of the molar fraction of the fluorketone [sic], and from the permissible field strength the absolute pressure curve of the insulation medium as a function of the partial pressure of the fluorketone [sic],*
- selecting a desired absolute filling pressure of the insulation medium,*

- determining from the absolute pressure curve the minimal required partial pressure of the fluorketone [sic], and from the vapour pressure curve the corresponding vaporization fluorketone [sic], and temperature of the fluorketone [sic] and
- determining whether the vaporization temperature is above the minimal permissible operating temperature of the desired insulation medium."

The remaining claims of the 3rd auxiliary request are dependent on one or more of these independent claims.

VII. The arguments of the appellant that are relevant for the present decision can be summarised as follows:

Lack of novelty of claim 19

The subject-matter of claim 19 of the main, first and second auxiliary requests was not new in view of document D1.

Claim 19 of the main request was not directed to the use of the dielectric insulation medium according to claim 1, which comprised a gaseous mixture of a fluoroketone with oxygen, but only to the use of the fluoroketone in a dielectric insulation medium. The use of a fluoroketone with all limitations of claim 1 in a dielectric insulation medium was known from D1.

Since claims 1 and 19 of the first and second auxiliary requests were identical to those of the main request, the same arguments applied to these requests.

Lack of inventive step starting from D11

Document D11 should be admitted to the appeal proceedings, in particular due to its *prima facie* relevance.

The subject-matter of claim 1 of the main request did not involve an inventive step in view of D11 and D1. D11 represented the closest prior art because it was also in the technical field of high voltage switchgear. It concerned the same technical problem as the opposed patent, namely to reduce the environmental impact of SF₆ in gas insulated switchgear. To this end, D11 disclosed gaseous mixtures, in particular SF₆/O₂. D11 disclosed that no pure replacement gas had been found that could satisfactorily replace pure SF₆, but contrary to the respondent's submission, it presented a gaseous mixture with oxygen as an improved insulation gas. A skilled person who wanted to further reduce the impact on the environment would have consulted D1. The combination of D11 and D1 suggested replacing SF₆ in the gaseous mixture with oxygen by a C6-fluoroketone, which had the required boiling point and number of carbon atoms. D1 also predicted that due to the presence of carbon atoms in the fluoroketone backbone carbon could be produced in case of arcing, which is predicted to potentially preclude the use in switchgear. A skilled person would therefore recognise a further reason to provide oxygen disclosed in D11 also in a gaseous mixture with a fluoroketone. Oxygen is the most prominent oxidising agent. This amounted to school knowledge. In this way, if carbon were formed under arcing, it would be oxidised to C-O containing compounds.

The technical problem of dealing with decomposition products after arcing alleged by the appellant was also already suggested in D1, which stated on slide 6 that thermal decomposition products under arcing conditions were expected to be similar to those of PFCs (perfluorocarbons) of similar molecular weight. Additionally, the evidence provided by the appellant was not convincing. The graph shown in Annex 1 suggested that it took several days between depletion of oxygen and the onset of formation of reactive fluorocarbons. Given the expected reaction speed, this result was highly surprising. This graph rather also suggested that the oxygen was depleted by reaction with carbon.

The same applied to the subject-matter of claims 13, 19 and 21 *mutatis mutandis*.

Lack of inventive step starting from D4

The disclosure of D4 was similar to that of D11. D4 disclosed the use of gaseous mixtures of SF₆ with air in high and medium voltage switchgear. For the same reasons as when starting from D11, a skilled person would replace SF₆ in the gaseous mixture by a fluoroketone with all features required by claim 1.

VIII. The arguments of the respondent that are relevant for the present decision can be summarised as follows:

Novelty of claim 19 of the main request

Neither the grounds of the decision under appeal nor the statement of grounds of appeal contained an objection against the use claim 19 of the main request.

Such an objection of lack of novelty based on D1 against claim 19 of the main request was therefore not part of the appeal.

Admissibility of objections and inventive step of the claims of the third auxiliary request

The objections of lack of inventive step starting from documents D11 and D4 should not be admitted into the proceedings pursuant to Article 12(4) RPBA 2007. They were completely new objections that could and should have been raised in the opposition proceedings.

Document D11 had been presented only two days prior to the oral proceedings before the opposition division and was not admitted into the proceedings. Document D4 had been filed with the notice of opposition but had never been mentioned before in the context of the appellant's arguments concerning lack of inventive step.

Moreover, D11 was not *prima facie* relevant. It identified SF₆ as the *de facto* standard insulation medium in switchgear as well as its high negative impact on the environment. Gaseous mixtures with SF₆/O₂ and SF₆/N₂ were characterised as an attempt to solve this problem. The results of this attempt were clearly described as disappointing. The unequivocal message of D11 was that SF₆ was essential as far as arc quenching capabilities were concerned. D11 investigated vacuum breakers as an alternative to this disappointing attempt. Fluoroketones were nowhere mentioned or suggested in D11. There was thus no suggestion in D11 which might lead a skilled person to a gaseous mixture of a fluoroketone with oxygen.

Even if D11 were to be considered admissible, the subject-matter of claim 1 involved an inventive step in view of D11 and D1. D11 taught in a different direction - vacuum breakers as a solution to the environmental impact problem of SF₆ - and did not suggest the use of a fluoroketone at all. Document D1 did not contain any suggestion of using a gaseous mixture of SF₆ and oxygen. The technical effect of the oxygen was to react with reactive fluorocarbons, which were formed under arcing. This effect was demonstrated by Annex 1. Fluoroketones differed from SF₆ in that under arcing the decomposition products of SF₆ could recombine, whereas this was not the case for fluoroketones. Even if a skilled person consulted D1 despite that fact that D11 did not teach in the direction of fluoroketones, D1 also taught away from using fluoroketones in switchgear. It clearly stated that not much was known about their behaviour under arcing conditions and that carbon was likely to be produced in analogy to PFCs, which might preclude the use of fluoroketones in switchgear. D1 did not offer any solutions to the problems it identifies. In particular, D1, similar to D11, was completely silent on using a gaseous mixture of SF₆ and oxygen to deal with reactive fluorocarbon decomposition products. D1 rather suggested using methods known from scrubbing PFCs, than using oxygen.

IX. The party as of right, opponent 1 (3M) did not submit any arguments in the appeal proceedings.

Reasons for the Decision

1. *Admissibility of the Appeal*

The appeal complies with the requirements of Articles 106 and 108, as well as Rule 99 EPC. It is therefore admissible.

2. *Main Request - Novelty*

2.1 The subject-matter of claim 19 of the main request is not new in view of Document D1.

2.2 It was no longer contentious between the parties in the appeal proceedings that the contents of D1 belonged to the state of the art. Furthermore, the matter could be decided on the basis of the written disclosure of D1 alone. Consequently, the board did not need to decide on either the appellant's request to admit the affidavit of Mr. Glaubitz or on the request to hear him as a witness, nor on the respondent's request to the contrary.

2.3 The appellant argued that the objection of lack of novelty of claim 19 over document D1 was not part of the appeal. The board came to the conclusion that this objection had been part of the appeal since its outset for the following reasons.

2.3.1 The appellant raised an objection of lack of inventive step against claim 1 of the main request (then third auxiliary request) in the statement of grounds of appeal. From the reasoning it followed clearly that the appellant considered the only distinguishing feature of

claim 1 over D1 to be seen in the gaseous mixture of a fluoroketone with oxygen. It also followed that the appellant considered switchgear with fluoroketone as an insulation gas to be known from D1. Moreover, the appellant also raised an objection of lack of novelty in view D1 of the subject-matter of claim 1 of the fourth auxiliary request (then sixth auxiliary request). This claim was amended to be essentially directed to the use of a fluoroketone in an electrical switch for extinguishing an arc.

The objection of lack of novelty against claim 19 of the third auxiliary request (current main request) does not involve any new matter of discussion and follows from the direct application of the facts and arguments adduced by the appellant in the context of the above-mentioned objections to other claims.

- 2.3.2 A yet further observation is important. The request maintained by the opposition division has seven independent claims. The various opponents had raised several distinct objections against the various independent claims. Among those various objections was in particular the above objection concerning a lack of novelty against claim 19 presented by opponent 1 in point II.2.2 of their letter dated 13 July 2017.

Surprisingly, the impugned decision does not deal with this objection. It is also not apparent from the minutes that any discussion whatsoever about this objection took place during the oral proceedings.

It is established case law that in order to safeguard a party's right to be heard, all their requests and arguments, at least in so far as they can have a bearing on the outcome of the proceedings, have to be

taken into account and demonstrably be dealt with. The decision under appeal does not even contain a statement to the effect that the reasons for considering claim 1 allowable applied to all other independent claims.

Due to the fact that the opposition never discussed the objection of lack of novelty against claim 19 and the appellant's drafting style of the statement of grounds, which is restricted to stating why the decision under appeal is considered to be wrong, the objection that had clearly been raised in the first instance proceedings, was still not clearly raised in the statement of grounds of appeal.

Returning to the fact that a corresponding objection was raised by opponent 1, the board wishes to state that submissions made during the opposition proceedings are not automatically part of the appeal proceedings, pursuant to the clear provisions of Article 12 RPBA 2020. What is however important in the present case is that the respondent was demonstrably aware of the objection against the use claim 19 and that the facts and evidence concerning claim 1 of the main and fourth auxiliary requests, which were specifically presented by the appellant, were straightforwardly applicable to the question of novelty of claim 19. The board thus considers this objection to be part of the appeal proceedings.

2.4 As to the substance of the objection, the board observes the following:

Claim 19 is directed to the

"use of a fluoroketone according to any of claims 1 to 18 in a dielectric insulation medium".

The dielectric insulation medium according to claim 1 is defined as

"comprising an insulation gas, said insulation gas comprising at operational conditions a fluoroketone having from 4 to 12 carbon atoms, characterized in that the fluoroketone has a boiling point of at least -5 °C at ambient pressure and the insulation gas is a gas mixture, which further comprises oxygen."

Claim 19 is directed to the use not of the dielectric insulation medium of claim 1, nor of the insulation gas, but only of the fluoroketone according to claim 1, viz. only a component of the gas mixture. The only limitation of the fluoroketone according to claim 1 is that it has between 4 and 12 carbon atoms and a boiling point of at least - 5 °C at ambient pressure. Claim 19 is in particular not directed to the use of a mixture of fluoroketone and oxygen.

Document D1 discloses a C6-fluoroketone sold under the trade name NOVEC 649, which according to slide 2 is a fluoroketone having 6 carbon atoms, viz. from 4 to 12 carbon atoms. According to slide 4 of D1 its boiling point is 49°C, viz. at least - 5 °C. According to the title on slide 1, and the first bullet point of the summary on slide 7, the fluoroketone can be used as a replacement for SF₆ in dielectric applications. The skilled person knows that SF₆ is a dielectric insulation medium and that hence, D1 proposes to use fluoroketone as a dielectric insulation medium.

The subject-matter of claim 19 of the main request therefore lacks novelty in view of D1.

3. *First and Second Auxiliary Requests - Novelty*

Since the first and second auxiliary requests contain claims 1 and 19 in unamended form, the conclusion of lack of novelty concerning claim 19 of the main request applies directly to these requests.

4. *Third Auxiliary Request - Inventive Step*

4.1 Claim 1 of the third auxiliary request involves an inventive step within the meaning of Article 56 EPC in view of the available prior art.

4.2 The respondents requested that the board exercise their discretion pursuant to Article 12(4) RPBA 2007 so as to hold inadmissible document D11 and the objection of lack of inventive step based on it, because it had not been admitted by the opposition division, as well as to hold inadmissible the objection of lack of inventive step based on document D4, because this objection should have been presented in the opposition proceedings but was not. The appellant submitted a request to the contrary.

Document D11 was not admitted by the opposition division on the ground that it was *prima facie* not relevant because it only disclosed mixtures of SF₆ with O₂. No technical effect related to the oxygen content of the mixture SF₆/O₂ was mentioned, nor was there any discussion of a reaction of fluoroketones with O₂.

The *prima facie* relevance is an established criterion for assessing the admittance of late filed documents in

the first instance proceedings. The opposition division therefore applied a correct criterion.

Any discussion as to whether the criterion of *prima facie* relevance was applied in a reasonable manner inherently touches upon the substance of the case. In the present case, this discussion during the oral proceedings before the board became so detailed that it could eventually only be considered a full-fledged discussion of inventive step. The board therefore left the question of admissibility open. In view of the outcome of the discussion, neither party is adversely affected by proceeding in this manner.

4.3 Inventive Step in View of D11 and D1

4.3.1 Starting point

The board is satisfied that Document D11 is a suitable starting point for the assessment of inventive step, even though the board is also of the opinion that document D1 might be a more promising springboard (see below, point 4.5).

4.3.2 Distinguishing features

The appellant is correct in arguing that D11 discloses gas insulated switchgear using SF₆ and that it points out its negative environmental impact. D11 further discloses that in order to mitigate this, gaseous mixtures of SF₆ and O₂ or N₂ are used.

It follows, that the subject-matter of claim 1 differs from the insulation medium according to D11 in a

fluoroketone having a boiling point of at least -5 °C and from 4 to 12 carbon atoms.

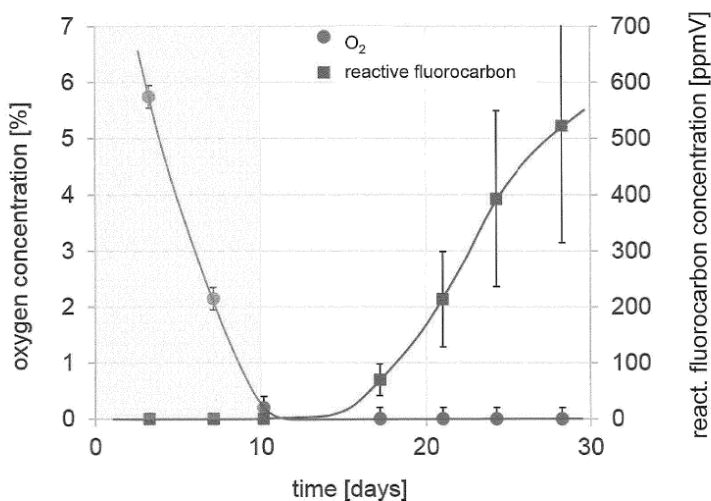
4.3.3 Technical effect and objective technical problem

The technical effect achieved by the subject-matter of claim 1 of the third auxiliary request is as follows:

The fluoroketone C6 is a dielectric insulation medium with less impact on the environment than SF6. It is known as a coolant and fire extinguishing fluid. Furthermore, as D1 suggests it has suitable dielectric characteristics to replace SF6 in some dielectric applications.

³ Oxygen and Reactive fluorocarbon concentrations

Annex 1



The oxygen is consumed and disappears over time

04/07/2018
ABB Group
Slide 3

APPEAL-CNPL
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ABB

Reproduction of slide 3 of Annex 1

Annex 1, filed by the respondent, contains experimental data on the behaviour of a particular fluoroketone C5 on slide 2, and a gaseous mixture of C5 and oxygen on slide 3 under partial electrical discharges. The data

on slide 3 shows that the fluoroketone is decomposed under discharges. Furthermore, the data on slide 5 indicates that in a gaseous mixture of C5 and oxygen, the oxygen concentration diminishes over time, i.e. with the number of partial discharges. When the oxygen is depleted, the concentration of reactive fluorocarbons rises. This suggests that oxygen is suitable to react with the reactive fluorocarbons, which form in response to the partial discharges.

This demonstrates, that the technical effect achieved by the subject-matter of claim 1 compared to the prior art D11 is that a more environmentally friendly insulation gas can be used in applications where arcing occurs, such as switchgear.

The appellant argued that the data in Annex 1 did not show convincingly that reactive fluorocarbons reacted further with oxygen. The time between depletion of oxygen and the onset of the rise in reactive fluorocarbon concentration was several days, which is much longer than the expected time needed for the alleged chemical reaction.

This argument does not convince the board. What the respondents argue is that as long as there is oxygen in the partial discharge reactor, no reactive fluorocarbons are detected because they react with the oxygen. However, after depletion of oxygen, the reactive fluorocarbon concentration rises because no chemical reaction can take place to scrub them. The appellant does not even explain what chemical reaction they refer to, nor how a chemical reaction was supposed to lead to the increase of fluorocarbon concentration. This increase is caused by the absence of a chemical reaction with oxygen. The delay between oxygen

depletion and onset of the increase of fluorocarbons is determined by the time between the taking of consecutive samples (here: several days), and the rate of rise of fluorocarbon concentration is determined by the rate of formation of fluorocarbons during the electrical discharges. The board cannot discern anything in the data that could cast a doubt on the interpretation of them offered by the respondent.

In conclusion, the board has no doubts that the subject-matter of claim 1 achieves a more environmentally friendly insulation medium suitable for applications in which arcing occurs.

The objective technical problem is therefore to provide a dielectric insulation medium suitable for dielectric applications in which arcing occurs with a reduced environmental impact.

4.3.4 Assessment of the claimed solution

The appellant argued in the statement of grounds of appeal that document D11 demonstrated that long before the priority date of the opposed patent the skilled person had been faced with the technical problem of replacing SF₆ in gaseous mixtures, particularly with oxygen, by a more environmentally friendly gas. D1 suggested to the skilled person that a fluoroketone was more environmentally friendly. The skilled person would therefore have replaced SF₆ in the mixture and arrived at a mixture of fluoroketone and oxygen.

The board considers this to be a misrepresentation of the disclosure of D11. According to page 5 of D11, the research into gaseous mixtures of SF₆ with either nitrogen or oxygen is represented as an attempt at

reducing the environmental impact of SF₆ by replacing some of it with other more environmentally neutral gases. Although D11 does not say this explicitly, the board agrees with the respondents' argument that O₂ or N₂ are merely used to replace some of the harmful SF₆ by a less harmful gas to render the mixture as a whole less harmful for the environment. If a skilled person found a pure insulation gas which is more environmentally friendly, there would be *a priori* no need to further dilute it with oxygen or nitrogen, as is the case with SF₆.

Moreover, according to D11, from an electrical performance point of view, gaseous mixtures are not represented as an improvement over pure SF₆. As far as the switching power is concerned, according to D11 gaseous mixtures have a "significantly worse performance". Results with gaseous mixtures have been "disappointing". In particular, it was necessary to distinguish between the dielectric strength of a material and its capability to extinguish arcs. The respondents are correct in arguing that D11 states that for arc extinguishing SF₆ is still essential. The only improvement of the gaseous mixture over pure SF₆ according to D11 lies in its reduced impact on the environment. Therefore, a skilled person when seeking to improve the environmental impact has no incentive to retain the oxygen when replacing SF₆.

The respondents appear to be correct in characterising the mixture as a mere dilution of the harmful SF₆ by a less harmful gas, such as O₂, which means that D11 does not disclose any interaction between the constituents of the mixture. D1 on the other hand suggests that the fluoroketone is an environmentally friendly gas by itself, which does not need to be diluted with oxygen

in order to achieve this desired technical effect. Since D11 does not suggest any technical interaction between SF₆ and oxygen, there is no apparent reason why the skilled person would, rather than merely could, have retained the oxygen, when replacing SF₆ by a fluoroketone.

The board agrees that when starting from D11, the skilled person would have considered D1 in order to solve the objective technical problem.

Given the preceding discussion, the combination of D11 and D1 would have initially only suggested to a skilled person to replace the entire gaseous mixture of D11 by the fluoroketone instead of just one of its components, the SF₆.

In the board's opinion, arguing that a skilled person would retain the oxygen, just because it is disclosed in D11, amounts to hindsight reasoning. A skilled person would retain those features of a prior art document which would also serve a technical purpose in the context of the claimed subject-matter, i.e. after the starting point of the prior art has undergone the proposed inventive development. This concept can be illustrated by the following analogy in a more familiar field. If a skilled person wanted to improve a car with a diesel engine so as to be less harmful to the environment, and the solution to this problem was to provide the car with an electrical motor, a skilled person would have a good reason to retain the rear view mirror of the diesel car, because it is still necessary to supervise the rear of the car even when it is modified to have an electrical drive. However, the urea injection and catalyst of the diesel engine cease to be useful when the latter is replaced by an electrical

drive. A skilled person would therefore not have any motivation to retain it, even though it is mentioned in the prior art as an improvement over a diesel engine without NO_x particle reduction.

Moreover, the appellant argued that D1 itself suggested using oxygen in combination with a fluoroketone since D1 mentioned that due to the carbon atoms in the fluoroketone formation of carbon under arcing was likely. This could preclude the use of the fluoroketone in switchgear. However, it amounted to school knowledge that carbon could be reacted to CO₂ using oxygen.

The board is not persuaded by this line of argument. The appellant essentially argues that merely because document D1 identified a potential problem (formation of carbon under arcing) the claimed solution would have been immediately apparent. However, D1 itself offers absolutely no hint to provide oxygen in order to deal with carbon formation, i.e. it does not suggest any solution. The reason for providing oxygen in D11 is merely to dilute SF₆. There is no suggestion at all in D11 of any technical effect of oxygen in combination with fluoroketone under arcing conditions. The argument that the claimed solution amounted to school knowledge is rather unpersuasive. What is taught in school chemistry is maybe that carbon and oxygen react to form CO or CO₂. However, clearly the reaction dynamics in high voltage switchgear under arcing are more complex and not part of any school curriculum. The appellant merely asserted that under arcing conditions the reactive decomposition products of fluoroketone comprised pure carbon and that the presence of oxygen led to the reduction of pure carbon formation without providing any evidence. The board is persuaded that such allegations would always have to be experimentally

verified before a skilled person would rely on them. To give just one example, the oxidation of carbon is very dependent on temperature. It is part of the everyday experience that while the flame of a candle is hot, it still produces soot despite burning in air, viz. an atmosphere containing oxygen. Whether the temperatures under arcing are such as to be suitable to oxidise pure carbon is something a skilled person would have to verify by experiment.

What the appellant's argument really demonstrates is that a skilled person, even when considering the combination of D11 and D1, would still not arrive at the claimed solution but would have had to make the further modification of adding of oxygen, which itself is motivated by non-obvious insights, such as that fluoroketone decomposition products do not recombine as readily as those of SF₆ and that oxygen can be used to scrub them.

4.4 Inventive step in view of D4 and D1

The appellant's objection of lack of inventive step starting from D4 (and its admissibility) is entirely analogous to that starting from D11. D4 proposes to dilute SF₆ by air. Starting from this document the same considerations apply as discussed in sections 4.3.3 and 4.3.4 above.

4.5 Inventive step in view of D1

In the board's view, D1 is the closest prior art because it has already made the step of replacing SF₆ by a fluoroketone in dielectric applications, which would still have to be made when starting from either D11 or D4.

The distinguishing feature is again to be seen in the provision of oxygen. The technical effect is the same as discussed above in the context of D11. The technical problem is slightly different because the aspect of providing a more environmentally friendly substitute is no longer present. Rather, the technical problem is to be seen in (only) reducing reactive fluorocarbon decomposition products under arcing.

As the previous discussion has already revealed, D1 itself merely cautiously identifies a potential problem, namely that the formation of carbon is expected in analogy to perfluorocarbons (PFCs) due to carbon atoms in the fluoroketone molecules. D1 does not provide any confirmation of that hypothesis, nor does it provide any suggestion as to a solution. It merely states that it was known how to scrub decomposition products of perfluorocarbons. This does not represent a clear hint at the solution of providing oxygen, and anyway the appellant has not argued in this respect.

The board finally notes that the graph on slide 5 of D1 discloses a gaseous mixture of N₂ saturated with fluoroketone. Since N₂ is an inert gas this disclosure does not provide any suggestion towards dealing with the reactive non-recombinant decomposition products under arcing by a reactive gas such as oxygen.

- 4.6 Therefore, the subject-matter of claim 1 involves an inventive step in view of the available prior art.
- 4.7 The further independent claims 7 and 13 are directed to similar subject-matter. Claims 7 and 13 are directed to the same class of fluoroketones as claim 1, however they define them in a different manner, i.e. by

reference to their chemical formula rather than by reference to their physical properties.

It is not clear to the board why the examining division decided to grant a patent based on those claims in view of the requirements of Rule 43(2) EPC. However, this discussion has no place in opposition proceedings. Moreover, it is immediately apparent that the reasoning above for acknowledging an inventive step for claim 1 applies directly also to the subject-matter of claims 7 and 13.

The subject-matter of apparatus claim 19 of the third auxiliary request refers back to the insulation media according to claims 1, 7 and 13 and is therefore also limited to them. The same is true for the method according to independent claim 31 of dimensioning an apparatus according to claim 19, which in turn refers back to the insulation medium according to claim 1.

The reasoning in sections 4.3 to 4.5 above applies therefore in an analogous manner to all independent claims of the third auxiliary request.

5. *Conclusions*

Since no further objections had been raised against it, the board accedes to the third auxiliary request of the respondents. The parties did not object to the case being remitted to the opposition division for the adaptation of the description to the amended claims.

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 in amended form on the basis of claims 1 to 32 of the third auxiliary request, filed with the letter of 22 November 2021 and a description to be adapted.

The Registrar:

The Chairman:



U. Bultmann

R. Lord

Decision electronically authenticated