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D E C I S I O N
of 14 November 2001

Case Number: T 0483/98 - 3.3.5

Application Number: 90912103.0

Publication Number: 0439579

IPC: A62D 1/08

Language of the proceedings: EN

Title of invention:

Fire extinguishing methods and blends utilizing fluoropropanes

Patentee:

GREAT LAKES CHEMICAL CORPORATION

Opponent:

AUSIMONT S.p.A.
Minnesota Mining and Manufacturing Company

Headword:

Fire extinguishing/GREAT LAKES

Relevant legal provisions:

EPC Art. 56

Keyword:

"Selection invention - no, obvious improvement, choice from a number of equally suitable possibilities"

Decisions cited:

-

Catchword:

-



Case Number: T 0483/98 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 14 November 2001

Appellant:
(Opponent II)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 17 March
1998 concerning maintenance of European patent
No. 0 439 579 in amended form.

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division to maintain European patent No. 0 439 579 in amended form with claims 1 to 10 filed during oral proceedings on 27 January 1998.

Claims 1 and 2 of read as follows:

Claim 1:

"A method for extinguishing a fire comprising the steps of introducing to the fire a fire extinguishing concentration of one or more compounds selected from the group consisting of $\text{CF}_3\text{CHF}\text{CF}_3$, $\text{CF}_3\text{CH}_2\text{CF}_3$ and $\text{CF}_3\text{CHF}\text{CHF}_2$, and maintaining the concentration of the compound until the fire is extinguished."

Claim 2:

"A method as claimed in claim 1 wherein said one compound is $\text{CF}_3\text{CHF}\text{CF}_3$."

With respect to inventive step, the Opposition Division considered that the problem underlying the invention was to provide alternative fire fighting agents that could replace the commonly used bromine and/or chlorine containing halon compounds, which were known as capable of destructing the earth's protective ozone layer and of contributing to the greenhouse warming effect. Reference was made, inter alia, to the following documents:

D7: Findings of the chlorofluorocarbon chemical substitutes international committee EPA-600/9-

88/009, April 1988,

D14a: US-A-3 715 438,

D15: National Advisory Committee for Aeronautics,
Technical Note 3565 (1955), Chemical action of
halogenated agents in fire extinguishing,

D21: US-A-1 926 396,

D27: US-A-2 494 064.

They concluded that no combination of documents would render the subject matter of claim 1 obvious to a person skilled in the art. With respect to D7 they argued that heptafluoropropane was only disclosed therein as a candidate for refrigeration and that the utility as fire extinguisher was nowhere mentioned throughout the whole document. Neither did D7 give any information as to the toxicity of hexa- or heptafluoropropanes (point 6.3.3).

- II. In the statement of the grounds of appeal, the appellant (opponent II) argued, inter alia, that the subject matter of claims 1 and 2 lacked an inventive step.

- III. The respondent (patentee) refuted the appellant's arguments. During oral proceedings, which took place on 14 November 2001, the set of claims allowed by the Opposition Division was maintained as a main request and a new set of claims 1 to 6 was submitted as an auxiliary request. The subject-matter of claim 1 of the latter was identical to that of claim 2 of the main request.

IV. Opponent III, as a party of the appeal proceedings according to Article 107, second sentence, made no submissions during the appeal proceedings and did not attend the oral proceedings.

V. Apart from the documents cited above, the inventive step arguments were further based on the following documents already cited by the opponents during the proceedings before the Opposition Division:

D6: Report of the Halons Technical Options Committee, Draft For Peer Review, June 2, 1989,

D7a: Appendix A of D7,

D26: ASHRAE Journal, Dec. 1987, pages 69-77,

D47: The Evolution of the Montreal Protocol.

D47 was published after the filing date of the patent in suit but comprised the text of "The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer". It was uncontested that the text of that protocol was available before the earliest priority date of the patent in suit.

VI. The appellant's arguments with respect to claims 1 and 2 of the main request can be summarized as follows:

It was known in the art that bromine containing halons were efficient fire extinguishing agents but had the drawback of being harmful to the environment because of their high ozone depletion potential (ODP). It was recognized in the Montreal Protocol that the halons had the highest ODP of the industrially used halogenated

carbons and that their use, if not banned, should be controlled. It was thus obvious to look for fire extinguishing agents which could replace the halons. The skilled person would consider D14a disclosing perfluoropropane as a fire extinguishing agent. The skilled person was aware that this agent would have zero ODP, but had the disadvantage that it was chemically inert and would therefore have a high greenhouse effect or global warming potential (GWP). The skilled person also knew that replacing one fluor atom in perfluoropropane with hydrogen would reduce its GWP but not its fire extinguishing property. It was thus obvious to consider heptafluoropropane as a substitute for halons. Since there were only two kinds of heptafluoropropane it was obvious to choose the claimed isomer, which was readily available and could be produced without difficulty at reasonable costs. Furthermore a routine screening program for searching replacement candidates for halons which would have zero ODP and low GWP provided only five compounds of which two were already known as fire extinguishing agents. The present choice was thus only one out of three remaining candidates, which could not involve an inventive step. Moreover, it was known from D27 that fluorinated hydrocarbons having only one hydrogen atom such as heptafluoropropane had utility as fire extinguishing fluids.

VII. The respondent's arguments in favour of inventive step of claim 2 of the main request can be summarized as follows:

The problem underlying the invention was not simply to find a fire extinguishing agent having low ODP and GWP but one which had further the combination of important

properties of the halons 1301, 1211 and 2402, in common use at the priority date of the patent in suit, so that no major changes in the fire fighting equipment were necessary. It was not a priori necessary that the replacing agent did not comprise chlorine or bromine atoms because a low ODP value was tolerable in view of the relatively low amount of extinguishing agent which was actually released in the atmosphere. Most of it was never used and could be recovered. The choice was thus not limited to fluorinated hydrocarbons. D14a was not a suitable starting point for an inventive step analysis because that document related to the forming of a habitable combustion-suppressant atmosphere and not to a fire extinguishing agent. The analysis of the appellant, requiring the combination of unrelated old documents, was based on hindsight. According to D6, which did not belong to the state of the art but illustrated expert opinions around the priority date of the patent in suit concerning the replacement of halons, it would be difficult, if not impossible, to find a suitable replacement for the halons on the market and that it would take at least 6 years to develop a suitable alternative. It was thus not obvious to a person skilled in the art to find a suitable replacement and it was highly surprising that the heptafluoropropane used in the method according to claims 1 and 2 of the main request solved the problem. There was a need for the replacement of halons since 1974. It nevertheless took 15 years until the present solution to this problem was found. The commercial success of FM-200 (the 1,1,1,2,3,3,3 isomer of heptafluoropropane) was a further indication that its claimed use involved an inventive step.

VIII. The appellant requested that the decision under appeal

be set aside and that the European patent No. 0 439 579 be revoked.

As a main request the respondent requested that the appeal be dismissed. As an auxiliary request the respondent requested that the decision under appeal be set aside and the patent be maintained on the basis of the auxiliary request filed during oral proceedings on 14 November 2001.

Reasons for the Decision

1. Claim 2 of the main request is based on claim 8 as granted with the further limitation that the compound introduced to the fire is 1,1,1,2,3,3,3 heptafluoropropane. Claim 8 as granted corresponds to claim 8 as originally filed. The use of the specific isomer is disclosed in the description as granted (page 2, line 48 and page 3 line 1) and the description as originally filed (page 4, line 17 and page 5, line 17). This claim, therefore, satisfies the requirements of Article 123(2) and (3) EPC.
2. The subject-matter of claim 2 of the main request is also novel. Since the novelty of this claim was not contested no further observations in this respect are necessary.
3. The parties agreed that at the first priority date of the patent in suit halons, and in particular halon 1301, 1211 and 2402, were in common use as fire extinguishing agents. This common use, also acknowledged in the patent in suit, can be considered as the nearest state of the art. It is also uncontested

common general knowledge that these halons have the drawback of having a high ODP and a high GWP and that their emission should be controlled; see D47, pages 266 and 275; and D7a, page A-2. According to the patent in suit it was an object of the invention to provide a method for extinguishing fires that extinguishes fires as rapidly and effectively as the techniques employing halon agents while avoiding their environmental drawbacks (page 2, lines 33 to 35). This object was, however, not achieved by the method according to claim 2 of the main request, since the examples in the patent in suit showed that the fire fighting performance of the agent used according to claim 2 of the main request was not as effective as that of the halons. In the majority of the tests the extinguishing time and the amount of agent needed to extinguish the fire was roughly twice as large as for halon 1301.

4. The respondent submitted that the technical problem was not only to provide an agent having low ODP and GWP but to provide an agent which was also efficient, non-destructive, chemically stable, thermally stable, compatible with contact material during storage, electrically non conductive, non-flammable, non-toxic, which does not form toxic decomposition products when introduced to the fire, which has satisfactory flow properties and can be manufactured at acceptable cost (letter dated 6 April 1999, pages 23 to 24). These properties are, however, self-evident for a non-destructive fire extinguishing agent. Without specification of limits which have to be satisfied and without experiments showing that the agent actually meets these limits, these properties cannot be taken into consideration to define the problem underlying the invention. Moreover, the respondent has not shown that,

apart from ODP and GWP, the product used in the claimed method is superior in any of the said properties to the halons in common use at the priority date of the patent in suit. As regards efficiency and production costs the agent used in the claimed method is indisputably inferior in comparison to the halons. Under these circumstances the Board can consider as the problem underlying the invention only the provision of a method for extinguishing a fire with an agent having a low ODP and GWP which can replace halons in common use at the priority date of the patent in suit. The patent in suit proposes to solve this problem inter alia by using 1,1,1,2,3,3,3 heptafluoropropane as the fire extinguishing agent. This heptafluoropropane has zero ODP and a low GWP. Although being inferior to halons in respect of some of the other relevant properties, it is, in view of the post-published documents submitted by the respondent, credible that said heptafluoropropane isomer can replace the halons. The Board is thus satisfied that the method according to claim 2 of the main request actually solves the above mentioned problem.

5. The bromine containing halons belong to the class of halogenated hydrocarbons. It is known in the art of fire fighting that halons are not the only halogenated hydrocarbons having fire extinguishing properties but that many other compounds of this type, depending on the amount and kind of halogens present, have these properties; see e.g. D14a, column 1, lines 28 to 55; D15, the summary on page 1, and D21, page 1, lines 9 to 32. It is also common general knowledge that chlorine and in particular bromine in the atmosphere destroys the ozone layer (D26, page 72, left column and page 74, footnote under right column). It is true that D26 does

not directly concern the art of fire fighting but relates to the environmental impact of chlorofluorocarbons (CFCs) used as refrigerants. At least after the publication of the 1987 Montreal Protocol the public in general was aware of the environmental problems of CFC. Thus a skilled person, trying to find a substitute for halons, which are even more harmful to the ozon layer than the CFCs, must be expected to take knowledge of all documents related to the environmental impact of halogenated hydrocarbons. Moreover, for more than 50 years there has been a close relationship between the use of halogenated carbon derivatives as fire fighting agents and as refrigerants. The authors of D21, Midgley and Henne, which document specifically relates to fire fighting, were also pioneers in the development of CFCs as refrigerants; see D26, page 71, right hand column to page 72, left hand column. In view of these circumstances the skilled person trying to solve the above-mentioned problem will consider compounds from the class of halogenated hydrocarbons and in particular from the subclass of only fluorine containing hydrocarbons (HFC). The Board does not dispute the respondent's allegation, that because of the relatively low amount of fire extinguishing agent which is actually released in the atmosphere, chlorine containing hydrocarbons having a low atmospheric lifetime should not be excluded as potential substitutes. Trying to find an agent without chlorine is, however, in the Board's view an option which a skilled person will take into consideration in the first place. Only if he does not find a suitable candidate among the HFCs he will consider other agents having a reduced ODP with respect to halons. Although it is known in the art that fluorine is less effective

than chlorine, and chlorine less effective than bromine in fire extinguishing agents (see eg D15, page 10), there is no prior art document suggesting that hydrocarbons containing only fluorine as halogen are not suitable as a fire extinguishing agent. On the contrary, according to D15 the results of flammability peak tests of some of the agents containing only fluorine as halogen are equivalent to agents containing also bromine (Table 1 on pages 21 and 22). Moreover it is known from D14a that perfluoroalkanes have fire extinguishing properties. They were not generally used because they were less effective than the chloro- and/or bromofluoroalkanes (column 1, lines 51 to 55). If the latter agents are to be avoided for environmental reasons it is obvious that the perfluoroalkanes again become interesting as fire extinguishing agents. As acknowledged by the respondent, perfluoropropane is now indeed used as a substitute for halons. The skilled person, however, also knows that perfluoroalkanes are very stable and therefore have a high GWP. Since the agent for replacing halons should preferably have a low GWP, he will in the first place consider alternatives which are more reactive and decompose easily in the atmosphere, thus, in particular, the hydrogen containing compounds; see in this respect D7, page 2 to 7, first paragraph. Although D7 is primarily directed to the findings of the chlorofluorocarbon chemical substitutes in their application as refrigerants, cleaning and blowing agents, the environmental problems faced with are inherently the same. For the same reasons as indicated above with respect to D26, a skilled person trying to solve the environmental problems of halogenated hydrocarbons used as fire extinguishing agent will also consider documents relating to the environmental

problems of the same compounds in other uses. Moreover, according to D7a, an annex to D7, halons used as fire extinguishing agents are treated in the same context (page A-2). The skilled person further knows that the presence of hydrogen in the molecule is generally not detrimental to its fire extinguishing properties as long as there is enough halogen to make the agent inflammable; see D15, page 1, summary, page 11, second paragraph, page 17, point 2 of the conclusions, and D21, page 1, lines 30 to 32. Thus in order to solve the above-mentioned problem the skilled person would in the first place consider fluorinated alkanes having a low hydrogen content. A suitable substitute for halons should preferably also have similar physical properties as the halons. To avoid major changes in existing fire extinguishing apparatus and total flooding installations and to meet the requirement of non-destructiveness it should preferably be a gas at ambient temperatures. This excludes the use of fluorinated alkanes with 4 or more carbon atoms. A further essential requirement for a fire extinguishing agent is its relatively non-toxicity. The broad use of fluorinated hydrocarbons is at least partly due to their non-toxicity (D21, page 1, lines 57 to 64 and D26, page 72, left hand column, and pages 75 to 76). The known anaesthetic properties of hydrogen containing fluorinated hydrocarbons do not disqualify them as fire extinguishing agent. Their use as anaesthetics rather implies that they are not irreversibly toxic. Moreover also the bromo-fluoroalkanes which are to be replaced have an anaesthetic action and are toxic at higher concentrations (D14a, column 1, lines 42 to 50). The skilled person had no reason to suspect that HFC's would be more toxic than the halons in common use as fire extinguishing agent. Thus, on the basis of these

obvious considerations, the skilled person would in the first place consider inflammable hydrogen containing fluorinated methane, ethane and propane as potential substitutes for replacing halons as fire extinguishing agents. This reduces the candidates to trifluoromethane, tetrafluoroethane, pentafluoroethane, hexafluoropropane (4 isomers) and heptafluoropropane (2 isomers). The selection of any agent of this group does not involve an inventive step as long as its choice is arbitrary and not based on the discovery of an unknown property which can be used to solve an additional technical problem. In other words, the selection of one or more compounds from a group of compounds can only involve an inventive step if it is associated with a surprising effect. No such effect, however, is apparent or has been made credible for the heptafluoropropane isomer used in the method according to claim 2 of the main request. Even if the group of potential halon substitute candidates were much larger and comprised chlorine substituted alkanes as well, the present choice would, in the absence of a surprising effect, still be arbitrary and therefore not involve an inventive step.

6. The finding that heptafluoropropane may have fire extinguishing properties is also in conformity with the disclosure of D27, which already suggests that heptafluoropropane may have this property. According to D27, fluorinated alkanes having one hydrogen atom, have the same utilities as the corresponding perfluorinated compounds. Among other utilities, their utility as fire extinguisher fluids is explicitly disclosed. The only compounds specifically mentioned in this context are perfluoropropane, a known fire extinguishing agent, and heptafluoropropane (column 2, lines 1 to 13).

7. The Board cannot agree with the respondent's argument that the obviousness reasoning is based on hindsight because the specific combination of old documents was only possible with the knowledge of the invention. Since halons dominated the fire fighting market for a long time because of their unmatched combination of favourable properties, the skilled person, trying to solve the above-mentioned problem, had to look in the older history of fire fighting agents. The above reasoning is not based on a specific combination of old documents. The cited documents only illustrate the knowledge of the person skilled in the art of fire fighting agents, namely, that halons are a subclass of the halogenated alkanes with the best fire extinguishing properties but that in principle all halogenated alkanes which do not burn have fire extinguishing properties and that only the fluorinated, hydrogen containing alkanes which do not comprise other halogens have zero ODP and low GWP. With this basic knowledge and the obvious considerations as set out above, the skilled person would have reached the conclusion that the heptafluoropropane according to claim 2 was a good candidate to replace the halons. He was aware that the fire extinguishing properties of this agent were probably inferior to that of the halons, but he would have tried this agent to find out what its actual performance was. The results found by the respondent corresponded to what a skilled person would have expected.
8. The respondent's argument that around the priority date of the patent in suit experts in the field of fire fighting did not expect to find a suitable replacement for halons within 6 years, if at all, so that the substitute found by the respondent was a surprise and

could not have been obvious to people skilled in the art, is not convincing. In view of its reduced effectiveness, it is questionable whether in the opinion of the experts cited on page 63 of D6 dated June 2, 1989, heptafluoropropane would have been regarded as a suitable alternative for the halons in use. D6 further indicates that promising candidates are now undergoing testing. When the application forming the basis of the patent in suit was filed, heptafluoropropane was no more than a promising candidate. Before it could be put on the market a lot of testing, especially with respect to its toxicological properties, had still to be done in order to obtain the required official allowances. Thus, even if heptafluoropropane was to be regarded as a suitable alternative, said expert opinion was not far from reality and not an indication that the claimed proposal to solve the above-mentioned problem involved an inventive step.

9. The respondent's further argument in favour of inventive step, namely that there was a long felt but unsatisfied need for replacing halons because the problem of ozone depletion had already been known since 1974, from a publication of Rowland and Molina in "Nature", is also not convincing. As admitted by the respondent, much of the halons used in fire extinguishing systems can be recovered so that only a relatively low amount is released into the atmosphere. Thus directly after the said publication there was no urgent need for replacing them. Only after the Montreal Protocol in 1987, according to which the use of halons should be controlled or eventually completely banned, the urgent need for an environmentally less harmful product arose. For similar reasons also the argument of

commercial success must fail in this case. If the use of a successful product is regulated or its production will possibly be forbidden in the future, any reasonable alternative is likely to become a commercial success. If, for instance, in some area cars powered by a combustion engine are banned for environmental reasons, electrical powered cars are likely to become a commercial success in that area. A commercial success in such a situation is not an indication that replacing combustion engines by electrical powered engines involves an inventive step.

10. For these reasons the Board holds that the method according to claim 2 of the main request does not involve an inventive step within the meaning of Article 56 EPC. Since the subject-matter according to claim 1 of the auxiliary request is the same as that of claim 2 of the main request, both requests must fail.

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:

U. Bultmann

R. Spangenberg