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File Number: T 560/89 - 3.3.2  
Application No.: 82 100 325.8  
Publication No.: 0 056 645  
Title of invention: Filler for an acetylene storage vessel

Classification: F17C 11/00

DECISION  
of 24 April 1991

Proprietor of the patent: N.I. Industries, Inc.  
Opponent: 01) Linde Aktiengesellschaft,  
Wiesbaden  
02) Svenska  
Silikatforskningsinstitutet  
Headword: Filler mass/N.I. Industries  
EPC Articles 123(2) and 56  
Keyword: "Relevant state of the art - problem well known to  
the public in a different technical field - related  
materials"  
"Inventive step (affirmed) - unexpected function"

Headnote

A person skilled in the art who is confronted with a technical problem in a specific technical field would consider consulting another technical field where the same problem is well known to the general public owing to widespread debate thereon, even if this other field is neither a neighboring field nor a broader general field provided that there exists a relationship between the kinds of materials used in the specific field and those used in this other field (see point 5 of the Reasons for the decision; further to T 176/84, OJ EPO 1986, 50 and T 195/84, OJ EPO 1986, 121).



Case Number : T 560/89 - 3.3.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.2  
of 24 April 1991

**Appellant :**  
(Opponent 01)

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**Respondent :**  
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**Decision under appeal :**

Decision of the Opposition Division of the  
European Patent Office dated 20 July 1989  
rejecting the opposition filed against European  
patent No. 0 056 645 pursuant to Article 102(2)  
EPC.

**Composition of the Board :**

**Chairman :** Lançon P.A.M.  
**Members :** Eberhard M.M.  
Holtz E.M.C.

## Summary of Facts and Submissions

- I. European patent No. 56645 was granted with twelve claims on the basis of European patent application 82 100 325.8. Independent Claim 1 read as follows:

"An acetylene storage vessel (10) comprising:

a metal shell (20); and  
a hardened monolithic calcium silicate filler (30) comprising at least 35 percent by weight crystalline phase and having a porosity of at least about 88 percent disposed in and substantially filling said metal shell for receiving an acetylene gas solution with said porosity being provided by substantially uniformly distributed very fine pores having a size of about 0.05 to 25 microns and with said calcium silicate filler (30) being substantially absent of voids; said calcium filler material having a settling resistant agent and a fibrous reinforcing material disposed substantially uniformly throughout said calcium silicate; characterized in that said filler (30) is asbestos free; and an alkali resistant glass fibre is provided both as said fibrous reinforcing material and as said settling resistant agent in a quantity so as to constitute from 0.5 to 7 percent the weight of said hardened calcium silicate filler (30)."

Independent Claim 9 related to a process for manufacturing this acetylene storage vessel.

- II. Appellants I and II (Opponents I and II) filed a notice of opposition requesting revocation of the patent on the ground of lack of inventive step. After expiry of the

opposition period Opponent II further objected that the amendments in Claim 1 were not in conformity with the requirements of Article 123(2). Of the documents cited in support of the oppositions, only the following ones were relied upon at the appeal stage:

- (1) US-A-2 883 040
- (2) GB-A-1 401 972
- (3) Sonderdruck aus Betonwerk + Fertigteil-Technik, Heft 9, September 1973, "Glasfaser Beton"
- (4) Sonderdruck aus der Zeitschrift "Beton", Heft 4/1977 "Erstes Schalendach aus Glasfaserbeton in Deutschland"
- (5) Prospekt "CEM-FIL" der Pilkington-Group.

Three additional documents were cited after expiry of the opposition period, in particular document (10) DE-C-1 187 763.

III. The Opposition Division rejected the oppositions. Claim 1 was regarded as meeting the requirements of Article 123(2). The late filed documents were disregarded and document (1) was considered as closest prior art. In the Opposition Division's view although it was known for cement products in the building industry to replace asbestos fibres by glass fibres, none of the cited documents suggested to use glass fibres in the particular claimed amount in order to provide an acetylene storage vessel whose calcium silicate filler exhibited the properties suitable for receiving a dissolved acetylene gas solution and wherein the glass fibres fulfilled the dual function as a reinforcing agent and as a settling resistant agent.

IV. Appellants I and II lodged an appeal against this decision. At the appeal stage they sought to introduce for

the first time five further documents into the proceedings, especially document (13) DE-C-1 494 773.

- V. Oral proceedings took place on 24 April 1991. Although duly summoned, Appellant II did not attend these proceedings. The Respondent (Patentee) handed over a new set of ten claims as well as amended pages 4 and 5 of the patent as single request.

Claim 1 differs from the granted one in that the lower amount of glass fibre stated in the characterising part of the claim has been replaced by 2%. The same amendment was made in the independent process claim. Dependent Claims 3 and 12 as granted were deleted and Claims 4 to 11 were renumbered.

- VI. Appellant II contended that the requirements of Article 123(2) were not met since the independent claims included a feature, i.e. the function of the glass fibres as settling resistant agent, which was neither claimed in the original application nor considered as inventive in the description thereof.

The Appellants' arguments as regards inventive step may be summarised as follows:

When the health risk of asbestos fibres and the problem of their replacement came up this represented a generally known topic which extended beyond a specific field. Even the public was aware of this problem concerning first of all the building industry. Furthermore, the calcium silicate product of (2) and the filler mass of gas storage vessels were very closely related as regards the materials themselves and their preparation, and they pertained to direct neighbouring technical fields having mutual influence upon each other. Moreover, as document (13)

disclosed the similarity of properties of a hard mass for acetylene storage vessels and of concrete and the use of cement in the preparation of a great number of hard masses, the person skilled in the field of filler masses was also familiar with the knowledge of (2) to (5). Hence, it was obvious to the skilled person faced with the problem of asbestos fibres replacement in the filler mass of the acetylene storage vessels known from (1) to use the asbestos fibres substitute proposed in (2) or (3) to (5), namely alkali resistant glass fibres. Reference was made to the decisions T 176/84 (OJ EPO 1986, 50) and T 195/84 (OJ EPO 1986, 121). The determination of the appropriate amount of glass fibres laid within the realm of the skilled person in view of the teaching of (2) or (2) to (5). It was further known from (10) to prepare a filler mass without incorporating a suspending agent into the slurry. The suspending effect attributed to the lime in (10) was indeed only a presumption and the asbestos fibres might have contributed to the settling resistance as disclosed in the patent in suit. Therefore, the function of glass fibres as settling resistant agent could have been expected.

VII. The main arguments submitted by the Respondent may be summarised as follows:

The building industry products could not be considered as closely related to the very specific field of acetylene storage vessels since they had to fulfill characteristics which were not relevant to acetylene storage vessels and vice-versa. This very specific art did not fall within a broader technical field and the only link between these two technical fields was the problem of asbestos fibre replacement. Documents (2) to (5) were silent as to the essential properties, apart from strength, which were necessary to make a useful acetylene storage vessel.

Moreover, in the porous filler mass of (1) the suspending agent and the asbestos fibres were provided in a total amount between 12 and 37 wt% whereas the claimed amount of glass fibres acting as both reinforcing and settling resistant agent is surprisingly low. The prior art did not suggest that it could be dispensed with the suspending agent used in (1) without replacing it by other means such as the particular treatment of the lime disclosed in (10). Even in the hindsight retrospective it was not possible by combining (1), (2) and (10) to arrive at the claimed subject-matter since (10) required the treatment of lime.

VIII. The Appellants requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed and the patent be maintained on the basis of the European patent specification, pages 1-3 and 6-11 as granted and pages 4, 5 and 12 as submitted during the oral proceedings.

#### Reasons for the Decision

1. The appeal is admissible.
2. There are no objections under Article 123(2) to the amended claims. The porosity of 88% stated in the independent Claims 1 and 8 is based upon Claim 2 of the application as originally filed and the range of 2 to 7% for the glass fibre content is supported by page 12, lines 1-2 thereof. With regard to the additional function of the glass fibres as "settling resistant agent", the Board concurs with the Opposition Division's opinion that this feature is clearly disclosed in the original description, at page 7, lines 6-8 and page 12, lines 1-2.

When considering conformity of the amendments with Article 123(2) it does not matter whether or not the concerned feature is presented as essential and inventive in the original application, it is sufficient that this feature be disclosed therein in combination with the other features. Therefore, the Board cannot follow Appellant II's arguments in this respect.

In addition, the amended Claims 1 and 8 manifestly do not broaden the scope of the granted Claim 1 since the range for the amount of glass fibres has been restricted.

3. After examination of the eight late filed documents of its own motion, the Board has decided to take into consideration documents (10) and (13) in view of their relevance. Thus, (10) discloses relevant information in connection with the use of a suspending agent or of alternative means for preventing settling of the slurry and (13) mentions similarities between concrete and the calcium silicate lattice of filler masses in acetylene storage vessels. The remaining documents are not more relevant than the documents filed on time and do not disclose matter which could change the outcome of the decision. Therefore, it was decided to disregard them pursuant to Article 114(2).
4. The disputed patent relates to an acetylene storage vessel comprising a metal shell and a porous hardened monolithic calcium silicate filler disposed in and substantially filling the metal shell for receiving an acetylene gas solution. The filler exhibits a porosity of at least 88%, which is provided by substantially uniformly distributed very fine pores, and it is substantially absent of voids. The calcium silicate filler further contains a fibrous reinforcing material disposed uniformly throughout its mass. Acetylene storage vessels of this kind are already



known from document (1) which the Board considers as the closest state of the art in agreement with the Opposition Division and all the parties.

The hardened calcium silicate filler described in (1) includes inert mineral fibres, in particular asbestos fibres, as fibrous reinforcing material, and is prepared from an initial composition comprising a suspending agent in addition to the silica, the lime and the asbestos fibres (cf. Claim 2; column 2, lines 27-45; column 3, lines 30-34). As indicated in the patent in suit, "due to the well known concern that asbestos fibres may pose health and pollution problems", it was desirable to seek substitutes for asbestos fibres.

In the light of the closest prior art (1), the technical problem underlying the patent can, therefore, be seen in providing an acetylene storage vessel which avoids the health and pollution risks associated with the use of asbestos fibres and wherein the filler mass exhibits the high porosity, the uniform distribution of very fine pores, the strength, shrinkage, heat sink and gas discharge characteristics suitable for receiving a dissolved acetylene gas solution.

It is proposed to solve this problem by the features recited in the characterising part of Claim 1, namely (a) the asbestos fibres are replaced by alkali resistant glass fibres, (b) the glass fibres are provided both as the fibrous reinforcing material and as the settling resistant agent, that is to say a suspending agent as used in document (1) is not necessary and (c) the amount of glass fibres constitutes from 2 to 7 percent the weight of the hardened calcium silicate filler.

In view of the examples in the patent and of the physical properties reported in the tables, the Board is satisfied that the technical problem has been plausibly solved. This was anyway not contested by the Appellants.

4. After examination of the cited documents, the Board has come to the conclusion that none of them discloses an acetylene storage vessel with a calcium silicate filler having the features (a), (b) and (c) stated above. Since the issue of novelty has not been raised by the Appellants, it is not necessary to consider this matter in further detail.
5. It still remains to be examined whether the requirement of inventive step is met by the claimed subject-matter.
  - 5.1 The teaching of document (1) itself is not limited to the use of asbestos fibres as reinforcing material for a porous calcium silicate filler mass, since the possibility of using inert mineral fibres in general is also foreseen (cf. column 3, lines 30-35). However, no information is given as to the kind of mineral fibres which would be suitable as substitute for asbestos fibres under the highly alkaline pH and the operating conditions prevailing during the manufacture of the filler mass.
  - 5.2 According to the established jurisprudence of the Boards of Appeal, a person skilled in the art seeking a solution to a given problem in a specific technical field would, in the absence of useful information in this field, look for suggestions in neighbouring fields or in a broader general field in which the same or similar problems arise. He is expected to be aware of such general fields (cf. T 176/84, OJ EPO 1986, 50 and T 195/84, OJ EPO 1986, 121).

It was well known to the skilled person that the problem of health risks associated with asbestos fibres had been encountered and dealt with in a number of technical fields other than the specific field of acetylene storage vessels, in particular in the building industry. As pointed out by the Appellants and not contested by the Respondent, even the general public was well aware of this problem in that industry before the priority date, owing to widespread debate thereon and to the resulting public safety precautions. Furthermore, it is pointed out in document (13), which relates to the preparation of a hard filler mass for acetylene storage vessels, that the calcium silicate lattice of filler masses exhibits essentially the same chemical properties as concrete despite a different preparation and that cement is one of the components used for the manufacture of many of them (cf. column 1, line 66 to column 2, line 5). Thus, although in the Board's opinion the building industry can be regarded neither as a neighbouring field in particular in view of the very different porosity properties and uses of the products nor as a broader general field as defined in the decisions mentioned above, it is derivable from (13) that there exists a relationship between the kinds of materials used in the specific field of acetylene storage vessels and those used in that industry. The Board finds that, under these circumstances, the skilled person faced with the problem stated above would naturally have considered looking for suggestions in that field of the building industry concerning the reinforcement of cementitious products with fibres. In the course of his investigations he would have come upon document (2) which he would certainly have considered with great interest for the following reasons.

Although (2) relates to materials which are used in the building industry in the form of insulation boards, bricks or sheets, it is, however, directed to the reinforcement

of autoclaved calcium silicate materials which are prepared by autoclaving at 150-200°C mixtures of lime and silica with a lime to silica mole ratio of 0.8 to 1.2 and optional additions of other binders such as cement, i.e. materials which are closely related to those of the filler masses for acetylene storage vessels (cf. page 1, lines 52-76 and page 3, table). Furthermore, this document also deals with the problem arising from the possible health hazards associated with the use of asbestos fibres in such products and proposes alkali resistant glass fibres as a substitute for these fibres (cf. page 1, line 44 to page 2, line 8). According to (2), fibres of an alkali resistant glass containing  $ZrO_2$  are highly successful as reinforcing elements in autoclaved calcium silicate materials (page 1, lines 48-52).

It is the Board's conviction that in the light of this teaching and taking into account the severe alkaline conditions and high temperatures prevailing during the manufacture of these products as in the case of the filler masses of (1), the skilled person faced with the problem of avoiding the asbestos fibre health risks in these filler masses would have been encouraged to replace the asbestos fibres by the glass fibres recommended in (2) for their highly successful performance as reinforcing agent.

The fact that the products of (2) have a too low porosity for filler masses and that no information is given about the properties, except strength, which are required in a filler mass would not deter the skilled person from performing tests with the glass fibres since the porosity of the products disclosed in (2) is adapted to their specific use and it is not derivable therefrom that higher porosities cannot be achieved. Furthermore, the conditions which must be respected to obtain a high porosity of at

least 88% and a uniform distribution of fine pores are already indicated in (1).

5.3 To arrive at the subject-matter of Claim 1 of the patent in suit the skilled person would not only have to replace the asbestos fibres with the alkali resistant glass fibres of (2) but would further have to omit the suspending agent present in the compositions of (1) in an amount of 8-16.5 wt% (see column 2, lines 26-45) and to determine the appropriate amount of glass fibres.

5.4 According to (1), it is necessary for the obtention of a calcium silicate filler mass with an increased porosity, i.e. a porosity within the range 86-93%, a uniform distribution of very fine pores and a strength adequate to withstand commercial use without settling or formation of voids that the slurry contains a suspending agent (cf. column 1, lines 38-72 and column 2, lines 1-3 and 27-43). The amount and type of suspending agent should be merely sufficient to keep the slurry from settling or stratifying before it becomes set and also insufficient to detract from the desired physical properties of the final filler (cf. column 2, lines 18-22). Amounts of 8-16.5 wt% on a dry basis are indicated. According to (1) this amount may be reduced when very fine particle size silica and amorphous silicas are included in the composition; however, the proportions of ingredients reported at column 3, lines 15-24, correspond to a minimum theoretical amount of about 6 wt% suspending agent.

In view of this teaching the skilled person faced with the problem of avoiding the health risks due to the asbestos fibres while at the same time providing a filler mass with a high porosity (at least 88%) and uniformly distributed fine pores would not have considered omitting the suspending agent even when the asbestos fibres are

replaced by glass fibres in the slurry of (1), since the teaching of (1) is not limited to asbestos fibres but also applies to other kinds of inert mineral fibres (cf. column 2, lines 27-35; column 3, lines 34-35) and it is not suggested in (2) that the glass fibres might also function as suspending agent.

- 5.5 Document (10) also concerns calcium silicate filler masses with a high porosity of about 90% for acetylene storage vessels. In connection with the prior art it is pointed out that the addition of a suspending agent such as aluminium sulphate or bentonite to the slurry of lime, silica and asbestos fibres on the one hand improves the homogeneity of the filler mass but on the other hand has to some extent a diluting action and thus decreases the strength thereof (cf. column 1, lines 20-30). Instead of adding this suspending agent, it is proposed to submit the slaked lime to a pre-treatment in a micronizer in order to obtain a very finely divided lime and a uniform dispersion. It is assumed that this finely divided and well dispersed calcium hydroxyde exerts the necessary suspending action upon the slurry so that no settling or stratifying occurs and a uniform filler mass texture is formed (cf. column 2, lines 41-52; column 4, lines 2-9). Therefore, the skilled person would have inferred from (10) that the suspending agent may indeed be omitted provided that it is replaced by a particular treatment of the lime in order to achieve the necessary suspending effect. Furthermore, document (10), like (1) or (2), does not suggest that alkali-resistant glass fibres might have a suspending or settling resistant action. Under these circumstances, even if the skilled man had omitted the suspending agent of (1) he would have replaced it by the lime pre-treatment of (10), since he could not expect to obtain a filler mass with a high porosity and a uniform distribution of fine pores in the absence of any means for

preventing settling and stratifying of the slurry. Thus, he would not have arrived at the claimed process and product which do not require such means in view of the unexpected function of the glass fibres as suspending agent.

- 5.6 The Board cannot follow Appellant I's arguments in connection with document (10) (see VI above). It is true that the suspending effect attributed to the finely divided lime is an assumption of the author, however, this effect is disclosed and there is no evidence to the contrary. In contrast thereto, the Appellant's own assumption that the asbestos fibres might contribute to the necessary suspending (or settling resistant) effect is indeed indicated in the patent but not disclosed in the cited prior art. Even if it were assumed to the Appellant's benefit that this contribution was known, then the skilled person would have concluded in view of (1) and (10) that the suspending effect of the asbestos fibres is not sufficient to avoid settling and stratifying to the desired extent since addition of a suspending agent or pre-treatment of the lime is necessary to obtain the desired settling resistance. Therefore, it could not be expected in view of (1), (2) and (10) that the alkali resistant glass fibres would function as a suspending agent such that other suspending means could be dispensed with.

Assuming that Appellant II wanted to refer to document (10), then the Board cannot agree with his allegation that according to column 2, lines 49-51, the fibres can also serve as settling resistant agent. This passage discloses in fact that the finely divided calcium hydroxyde serves as suspending agent, not the fibres.

5.7 The remaining documents (3), (4) and (5) relate to glass fibre reinforced concrete of the building industry. However, as the matrix is not an autoclaved calcium silicate material, these documents are more remote from the subject-matter of Claim 1 than document (2). Furthermore, they contain no indication which could suggest that the alkali resistant glass fibres used as reinforcing agent might function as suspending agent.

5.8 Therefore, for the reasons given above, the Board considers that it was not obvious in the light of the cited prior art to provide the alkali resistant glass fibres both as the reinforcing agent and as the settling resistant agent in the filler mass of an acetylene storage vessel (i.e. feature b) in order to solve the problem defined above. Under these circumstances, it is not necessary to further examine whether the additional feature (c) involves an inventive step.

It results from the preceding that the subject-matter of Claim 1 meets the requirement of inventive step set out in Articles 52(1) and 56.

6. The reasons given above apply analogously to the process Claim 8 which is directed to a process for forming an acetylene storage vessel having the characteristics recited in Claim 1. Thus, this process is also considered to involve an inventive step.

Dependent Claims 2 to 7, 9 and 10, which relate to preferred embodiments of Claims 1 and 8, derive their patentability from that of Claims 1 and 8.



**Order**

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent in an amended form on the basis of the European patent specification, pages 1-3 and 6-11 as granted, and pages 4, 5 and 12 as submitted during the oral proceedings.

The Registrar:

The Chairman:

P. Martorana

P.A.M. Lançon