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DECISION of 10 November 2005

T 0537/03 - 3.2.03 Case Number:

Application Number: 95906279.5

Publication Number: 0739472

IPC: F25D 23/06

Language of the proceedings: EN

Title of invention:

Thermal insulation system of the vacuum type

Patentee:

ELCOLD-Tectrade I/S

Opponent:

Aktiebolaget Electrolux

Headword:

Relevant legal provisions:

EPC Art. 87(1), 54, 84, 123(2)

Keyword:

"Priority not valid, main request: lack of novelty (implicitly known features)"

"First auxiliary request: unallowable amendment (extension)"

"Second auxiliary request: lack of clarity"

"Third auxiliary request: not admitted"

Decisions cited:

G 0002/98

Catchword:



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Boards of Appeal

Chambres de recours

Case Number: T 0537/03 - 3.2.03

DECISION

of the Technical Board of Appeal 3.2.03 of 10 November 2005

Appellant: ELCOLD-Tectrade I/S

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Decision under appeal: Decision of the Opposition Division of the

European Patent Office posted 12 March 2003 revoking European patent No. 0739472 pursuant

to Article 102(1) EPC.

Composition of the Board:

Chairman: J.-P. Seitz
Members: Y. Jest

G. Ashley

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Summary of Facts and Submissions

The appeal is directed against the decision of the opposition division posted on 12 March 2003, to revoke European Patent No. 0 739 472.

According to the decision under appeal, the opposition division held that the claimed priority (DK0081/94 filed on 19 January 1994) was not valid and that the subject-matter of independent claim 1 of both the main and the auxiliary requests lacked inventive step.

The proprietor, hereinafter the appellant, lodged an appeal on 12 May 2003 and paid the appeal fee on the same day. With the statement of grounds, which was received on 2 July 2003, the appellant requested maintenance of the patent as granted.

II. The following documents are of relevance in these proceedings:

D1: EP-A-0 587 546

D2: US-A-4 668 555

D3: US-A-1 898 977

D4: WO-A-97 43 587

D7: "Radiation Contribution as an Element of Thermal Conductivity", in Polyurethanes World Congress 1987, September 29 to October 2, pages 85 to 90

E1: EP-A-0 188 806

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- III. With a communication dated 18 May 2005 the Board expressed its provisional view on the validity of the claimed priority and invited the parties to oral proceedings, which took place on 10 November 2005.
- IV. The appellant requested that the decision be set aside and the patent be maintained as granted, or as amended according to three auxiliary requests filed during oral proceedings.

Independent claim 1 as granted (main request) reads:

"A thermally insulating unit or, respectively, a device or apparatus with such a unit, e.g. a refrigerator cabinet, said unit being built with a core plate of a cellular material located between tight cover plates and encapsulated for use in evacuated condition, characterized by the combination of the following features:

- the unit being permanently connected with an associated vacuum pump;
- the encapsulation being not absolutely hermetically tight;
- the vacuum pump being adapted to maintain, after an initial phase, a pressure of the magnitude 0.1-25 mbar in the unit; and
- the cellular material, preferably consisting of a blown-up plastic foam of the open celled type, having cell or pore sizes predominantly in the range of 0.5-0.1 mm or less."

Independent claim 1 according to the first auxiliary request reads as claim 1 of the main request except for

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the last characterising feature, in which the expressions "preferably" and "or less" are deleted:

"A thermally insulating unit ...

characterized by ...

 the cellular material, consisting of a blown-up plastic foam of the open celled type, having cell or pore sizes predominantly in the range of 0.5-0.1 mm."

Independent claim 1 according to the second auxiliary request is based on the combination of claim 1 and dependent claims 4 and 5 of the main request, wherein the expression "preferably" in the last feature of granted claim 1 is deleted:

"A thermally insulating unit or, respectively, a device or apparatus with such a unit, e.g. a refrigerator cabinet, said unit being built with a core plate of a cellular material located between tight cover plates and encapsulated for use in evacuated condition, characterized by the combination of the following features:

- the encapsulation being not absolutely hermetically tight; as there is a potentially untight area in the encapsulation
- the unit being permanently connected with an associated vacuum pump; which is operatively connected with the core material with a relatively large spacing from that untight area
- the vacuum pump being adapted to maintain, after an initial phase, a pressure of the magnitude 0.1-25 mbar in the unit; and

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- the cellular material, consisting of a blown-up plastic foam of the open celled type, having cell or pore sizes predominantly in the range of 0.5-0.1 mm or less
- in which the encapsulation is provided with a controllably openable and closable leak."

Independent claim 1 according to the third auxiliary corresponds to claim 1 of the auxiliary request filed in the opposition procedure; it reads as claim 1 of the main request, except for the last characterising feature, in which the expression "preferably" is deleted:

"A thermally insulating unit ...

characterized by ...

- the cellular material, consisting of a blown-up plastic foam of the open celled type, having cell or pore sizes predominantly in the range of 0.5-0.1 mm or less."
- V. The appellant's arguments can be summarised as follows:
 - (a) Claimed priority.

During the oral proceedings before the Board, the appellant accepted that the priority claimed from priority document DK0081/94 is not valid and that, as a matter of consequence, prior art document D1 is state of the art within the meaning of Article 54(2) EPC.

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(b) Main request - Novelty

The invention is based upon the general concept of combining foam having open cells with sizes predominantly in the range of 0.5-0.1 mm or less with an encapsulation that is not absolutely hermetically tight, the vacuum being created by a pump adapted to maintain, after an initial phase, a pressure of 0.1 to 25 mbar in the unit. This concept provides satisfactory long-term insulation that is less expensive to produce than having fully hermetically sealed foam with small closed cells and pre-established vacuum.

Prior art D1 does not teach the concept of the invention as defined above for the following reasons.

The insulating material of D1 is characterised as "hermetically sealed" and would therefore never be regarded by a skilled person as not absolutely hermetically tight. When the expression "hermetically tight or sealed" is used in the state of the art (for instance in D2, D4 or E1), it always defines units which are intended to be tight or sealed for the duration of their whole life time, thus these units are considered as being absolutely hermetically sealed. The claimed unit differs from this type of construction in that an untight area is deliberately provided in the encapsulation; the term used for this kind of unit is "not absolutely hermetically tight", the meaning of which is completely clear, particularly when read together with the description as indicated by Article 69(1) EPC.

In addition, the insulation according to D1, which uses foams with closed cells, is only suitable for absolutely air tight systems because it is extremely difficult to remove air from pockets located between the closed cells. As to the function of the pump in D1, it is activated and deactivated only during the initial setting of the machine and only until a uniform vacuum pressure is achieved in the foam: it plays no role at later stages or during the life time of the unit, in contrast to the operation of the pump according to the invention.

Moreover, D1 fails to disclose any values for the size of the foam cells. The appellant agreed that the skilled person would know from his general knowledge that the size of the foam cells must be adapted to the vacuum pressure. This is because the thermal conductivity of the gas is reduced as the distance between the cell walls enclosing the gas becomes less than the length of the mean free path of the gas; the mean free path is itself a function of the pressure, increasing as the pressure decreases. This is illustrated for instance in D2 (column 3, lines 7 to 28), or in E1 (page 5, line 24 to page 6, line 10), and in D3 (more generally for filler material: page 1, lines 20 to 36).

The person skilled in the art when applying this theory to D1, which refers to pressures about 0.1 mbar, would inevitably arrive at cell sizes significantly smaller than 0.01 mm, such cell sizes being substantially smaller than the values suggested by the patent.

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In summary, the claimed subject-matter differs from D1 by the combination of the size of foam cells together with not absolutely hermetically tight encapsulation.

None of the remaining cited documents prompt the skilled person to modify the arrangement of D1 in a manner that would achieve the invention.

(c) First auxiliary request

The amendments made to claim 1, i.e. the deletion of the expressions "preferably" and "or less" in the last feature of the claim, are supported by the application documents as originally filed and thus meet the requirement of Article 123(2) EPC.

In particular the limitation of the range claimed for the cell size by defining 0.1 mm as lower limit while maintaining the claimed pressure range unchanged is supported in the original disclosure of the patent. The value of 0.1 mm is explicitly disclosed in last paragraph of page 3 of the published application documents. The basic concept behind the invention is that the generally accepted theory, that the cell size has to be determined in accordance with the required vacuum pressure, does not apply if the insulation is based on an open celled-foam and a not absolutely hermetically tight encapsulation (see page 3 of the application). It is therefore clear that the value of 0.1 mm defines the lower limit of the range in the invention.

(d) Second auxiliary request

The amendments meet the requirements of Article 84 EPC. The added features of dependent claims 4 and 5 define an untight area of the encapsulation, the connection of the pump to the unit at a location relatively remote from said untight area, and a controllable leak in the encapsulation. The person skilled in the art would be able to predict the areas of the encapsulation which might potentially leak, such as the connecting areas of adjacent cover plates which may comprise sealing gaskets, joints or welds.

(e) Third auxiliary request

This request corresponds to the auxiliary request filed during the opposition procedure. Although this request is late filed, the appellant argued that it should be admitted since it could represent the very last chance to maintain the contested patent.

VI. The opponent, hereinafter the respondent, requested that the appeal be dismissed and the patent be revoked for lack of novelty or at least for lack of inventive step of its subject-matter.

The respondent presented its arguments as follows:

(a) Priority

The claimed DK priority is not valid since claim 1 of the patent contains two features which are neither explicitly disclosed nor implicitly derivable by the person skilled in the art from the priority document, - 9 - T 0537/03

i.e. from its English translation. The claimed invention is therefore not contained in the scope of the priority document.

Since the priority claim is not valid, document D1 lies within the state of the art as defined by Article 54(2) EPC.

(b) Main request

The product described in D1 explicitly discloses the features of claim 1 except that the encapsulation is not absolutely hermetically tight and that the cell sizes are predominantly in the range of 0.5-0.1 mm or less. However these apparently distinguishing features are implicit in D1 for the following reasons.

The vacuum pump used in D1 is operated either continuously or sequentially, in order to maintain the vacuum pressure. This indicates that from time to time the pressure must increase, which is normally due to ingress of air. The only logical consequence would therefore be that the expression "hermetically sealed" used in D1 cannot mean "absolutely sealed". It is generally accepted in the field of such vacuum isolating components that an absolute sealed space cannot be achieved in practice, or only at exceptionally high production time and costs, which is clearly not intended in D1. Therefore the expression "not absolutely" does not make any substantive distinction over D1, since in practice a not absolutely hermetically tight element is indistinguishable from a so-called hermetically sealed element.

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As regard the feature of the cell size, the skilled person knows from his general knowledge that, in order to obtain high vacuum, foam material having small cells should be selected. This general knowledge is based on a well-established theory as illustrated in E1, D7 and which is acknowledged in the Danish priority document itself.

By applying this general theory, the person skilled in the art would determine the cell size for the foam of D1 appropriate for the vacuum pressure indicated in D1, i.e. 0.1 mbar or less (see column 2, line 50). In doing so, he would arrive at values for the average cell size substantially lower than 0.5 mm. Since the corresponding feature in claim 1 actually defines only the upper limit of the range (0.5 mm), foam having the cell size defined in claim 1 is implicitly known from D1.

The feature defining the foam cells as being open is optional in claim 1 as granted, and hence need not be taken into consideration in assessing novelty.

(c) First auxiliary request

The amended claim 1 infringes Article 123(2) EPC because of the added lower limit for the cell sizes. The application documents teach that there is a close interaction between the size of the cells and the desired vacuum pressure. The deletion of the values between 0 and 0.1 mm from the originally defined range, without defining the corresponding pressures for the new range thus adds unallowable subject-matter.

(d) Second auxiliary request

Although the respondent considered that the wording of the amended set of claims leaves open different assessments of the claimed subject-matter, no formal objections under Article 84 EPC were raised.

(e) Third auxiliary request

The respondent submitted that this request should not be admitted because it is late filed. The subject-matter of the request had already been considered as non-patentable by the opposition division in the impugned decision. The respondent was of the view that the appellant had purposely not filed this request with the appeal, and its introduction at such a late stage of the proceedings would amount to an abuse of procedure.

Reasons for the Decision

- 1. The appeal is admissible.
- 2. Claim of priority (Article 87 EPC)

The English translation of the Danish priority document was considered in these proceedings, the accuracy of the translation was not contested.

The thermally insulating unit, as defined in the patent, is not covered in the priority document.

Claim 1 according to each of the submitted requests contains the following two features, which are neither

explicitly disclosed nor implicitly derivable by the person skilled from the priority document.

- 2.1 The first feature concerns the upper limit of the vacuum pressure range: "a pressure of the magnitude 0.1-25 mbar". The sole reference in the priority document, on page 6, discloses values in the order of 1/10 mbar or less for the vacuum pressure. The claimed range thus clearly lies outside the range indicated in the priority document.
- 2.2 The priority document also provides no support for the second feature of the patent relating to the upper limit of 0,5 mm for the cell size. In the priority document the cell size is defined as being smaller than 0,3 mm and preferably smaller than 0,1 mm (see page 5 of the English translation).
- 2.3 In conclusion, the invention as claimed according to all the requests for maintenance of the patent, is not the same as that disclosed in the priority document (G 2/98, OJ 10/2001, 413). The claim of priority does not meet the requirements of Article 87(1) EPC and is thus not valid.

Hence the relevant date of the patent, either as granted or as amended according to the auxiliary requests, is the effective filing date, 19 January 1995 of PCT/DK95/00028, and not the priority date (19 January 1994).

2.4 Document D1, which was published on 16 March 1994, thus after the claimed priority date but before the

effective filing date of the patent, is state of the art as defined by Article 54(2) EPC.

- 2.5 During the oral proceedings before the Board, the appellant (patentee) agreed that the full scope of the claimed subject-matter according to each of the requests is not disclosed in the priority document.
- 3. Main request
- 3.1 The aim of the invention disclosed in D1 is to create high-quality vacuum insulation (column 1, line 56).

 This is achieved by using a small, cheap and energy saving vacuum pump 18 in communication with hermetically sealed spaces 14 filled with insulating material (column 2, lines 2 to 18). The pump is activated at least during the initial operation of the machine (which is for example a refrigerator), and this can extend over a relatively long period (one week to several months) until the desired vacuum pressure is achieved (less than 0,1 mbar, column 2, line 50).

After the initial period, the pump may be either stopped or further activated. This is carried out either continuously or periodically in order to maintain the desired vacuum pressure (column 3, lines 7 to 20). The insulating material is a foam having closed cells (column 2, lines 35 to 40).

- 3.2 The following features of claim 1 are thus explicitly disclosed in D1:
 - a thermally insulating unit or, respectively, a device or apparatus with such a unit, e.g. a refrigerator cabinet (see e.g. column 1, lines 1 to 11

and also claim 1), said unit being built with a core plate of a cellular material 14 located between tight cover plates 12,13 (see Figure 1) and encapsulated for use in evacuated condition (see column 2, lines 29 to 35 and lines 40 to 44, Figure 1), in which

- the unit is permanently connected with an associated vacuum pump 18 (see column 3, lines 7 to 9);
- the vacuum pump being adapted to maintain, after an initial phase, a pressure of the magnitude 0.1-25 mbar in the unit (actually the purpose of the arrangement of D1 is the same, i.e. upholding a vacuum pressure of 0,1 mbar after a week, see column 2, lines 48 to 53; this implies that the pump is able to maintain a pressure of between 0,1 and 25 mbar at least during the initial phase).
- 3.3 The remaining features of claim 1, not explicitly known from D1, are the following:
 - (a) the encapsulation is <u>not absolutely</u> hermetically tight;
 - (b) the cell sizes are predominantly in the range of 0.5-0.1 mm or less.

The feature relating to the "open celled type" of the foam is not taken into account for the assessment of novelty, since this feature is defined as optional.

In dispute is whether features (a) and (b) mentioned above are implicitly disclosed by the general teaching of D1 when read by the person skilled in the art.

3.4.1 The appellant submits that the passage of column 3, lines 7 to 20 of D1, which indicates that the pump may be kept continuously or sequentially activated, only refers to the initial phase of operation. The function of the pump is defined as enabling the end user to obtain the desired vacuum pressure, and not, as is usually the case, to set the vacuum during the manufacturing process. However, the skilled person would also understand the aforementioned passage to include activation and deactivation during its life time after the initial setting of the machine, since the pump remains in the machine and can be operated in conjunction with the compressor.

The purpose of the controlled activation of the pump as disclosed in D1 is to maintain the vacuum pressure during the life time of the machine, taking into account that pressure may increase due to ingress of air at relatively untight areas of the unit.

The appellant further argues that the expression "hermetically sealed" used in D1 cannot be construed as meaning "not absolutely hermetically sealed", because a hermetically sealed product is usually made absolutely hermetically sealed in the sense that it is sealed at least for the life time of the product.

The qualification "not absolutely hermetically tight" (underlining added for emphasis) of claim 1 has no generally recognised or accepted specific meaning in the field of vacuum isolating panels. This expression leaves completely open, when and to which extent the encapsulation is not tight when compared with the "normal" hermetical encapsulation described in D1.

Neither can a distinction between absolutely hermetical and not absolutely hermetical units be derived from the

other cited documents. Contrary to the appellant's opinion, the mere fact that the insulation unit of D1 uses foams with closed cells does not provide evidence that the unit is absolutely hermetically tight, even though it is generally accepted that it would be more difficult to pump air out of such a foam material in the event of a leak.

It may be additionally mentioned that no details of the meaning of the expression are given in the description of the patent. According to the embodiment defined in dependent claim 5, a controllable leak is deliberately provided in the encapsulation; the expression can therefore be construed to mean any leaking area occurring during the life time of the product.

The Board also agrees with the respondent that an absolute sealed space can in practice rarely be achieved, and then only with high production costs and long production and testing methods. This is certainly not the case in D1, which seeks to find a balance between thermal insulation efficiency and limited production costs (see for instance column 1, line 38 to column 2, line 1).

The Board therefore reaches the conclusion that the qualification "not absolutely hermetically tight" in the context of claim 1 cannot provide a clear and unambiguous distinction over prior art D1.

3.4.2 According to established case law of the Boards of Appeal, in assessing novelty there must be a high degree of certainty that a feature not contained explicitly in a document is inevitably disclosed therein. In this case it is not disputed that values

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for the average cell size are not explicitly mentioned in D1. However, the skilled person would inevitably arrive at the values defined in the claim for the following reasons.

D1 indicates that vacuum pressures in the foamed material should be about 0,1 mbar (see column 2, lines 48 to 53). The skilled person, when performing the invention disclosed in D1, would have thus to design the foam material by using general knowledge in the field.

The parties agree that the person skilled in the art knows the general principle that establishes a close relationship between pressure and cell size, in the sense that the higher the pressure of the gas, the smaller the mean free path length is before a gas molecule strikes an object e.g. the wall of the cell. In addition, it is general knowledge that thermal insulation is improved if the cell size is smaller than the mean free path length; this interrelationship is illustrated for instance in E1 (line 24 of page 5 to line 9 of page 6), D2 (column 3, lines 13 to 28), D3 (page 1, lines 20 to 29) and is acknowledged as basic knowledge in the priority document itself (English translation, page 5, lines 8 to 23) and in the patent (page 2, paragraph [0003]).

By applying this common knowledge, the skilled person, starting from a preselected vacuum pressure, is thus able to determine the average cell size.

As explained by the appellant himself, the person skilled in the art generally knows that vacuum pressures about 0.001 mmHg (0.0013 mbar) require cell sizes in a foam material usually comprised between 0.3

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and 1.0 mm (as illustrated for instance in D1), and that, by means of a straightforward extrapolation, cell sizes in the order of 0.003 to 0.010 mm must be chosen for pressures about 0.1 mbar (pressure described in D1).

These results for the cell sizes are thus inevitably disclosed in D1 in the light of the general knowledge attributed to that technical field. This implicit disclosure of cell sizes of 0.010 or less is fully in line with the characterising feature of claim 1, which defines cell sizes in the range of 0.5-0.1 or less, i.e. there is no lower limit of the range defined in claim 1.

The appellant argued that the invention reveals surprising effects, namely meeting satisfactory insulation properties, while departing from the aforementioned general theory for dimensioning cells with respect to the vacuum pressure.

According to the invention, the cells are bigger than they should be when determined in line with said theory, and it is accepted that the unit is not sealed but connected to a pump. Even though this general technical concept may be understandable as such, there is, as discussed above, no clear limitation in claim 1, which could define such a distinction over the prior art.

3.5 Since the remaining features a) and b) are implicitly disclosed by D1, the unit defined by claim 1 as granted lacks novelty when compared to D1.

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4. First auxiliary request

The amendment to claim 1, namely the deletion of the expression "or less" in the last feature of the claim as granted, infringes the requirements of Article 123(2) EPC.

Since the value of 0.1 mm for an average cell size is disclosed in the originally filed documents of the patent application (see for instance claim 1 and page 2, line 6), the question arises whether such an exemplified feature can form the basis for a new range as claimed. The value of 0.1 mm for the cell size is cited in page 1, line 51, but only in connection with pressures of about 1 mbar. However, the claimed device refers to pressures between 0.1 to 25 mbar, thus significantly lower or greater than 1 mbar. No indication of any preferred cell size range corresponding to the full range for the vacuum pressure is given in the originally filed documents of the patent. On the contrary, from the patent application as a whole and from the aforementioned general theory, the skilled man would have readily recognized that values for cell sizes lower than 0.1 mm, which are now excluded, were presented as having a close functional dependency on the values of the upper part of the defined pressure range, i.e. for pressures between 1 and 25 mbar. Consequently, in this case the cell size of 0.1 mm cannot be detached from an example, and used to form a basis for a generalised lower limit for the cell size range, without taking into consideration the corresponding pressure range. It is clear that the ranges indicated in claim 1 as granted, i.e. between 0.1 and 25 mbar for the pressure and open ended range

(0.5-0.1 mm or less) for the average cell size are to be understood as closely linked or interactive with respect to the results to be achieved, i.e. good thermal insulation properties.

Hence, claim 1 of the first auxiliary request is not based on the application as filed.

The appellant argues that the basic merit of the invention is the finding that there is not always a strict accordance between the theory discussed above and the practice relating to the dependency of cell size and pressure; this is set out in the disclosure of the patent, see for instance page 2, lines 21 to 26. However, in the absence of any additional information in the application documents concerning the extent to which the invention departs from the rigid scheme suggested by the theory, it cannot be concluded that the values lower than 0.1 mm for the cell size, though admittedly greater than the values implied by pure application of the theory, would not be expected for higher pressures within the claimed range.

5. Second auxiliary request

The amendments do not meet the requirements of Article 84 EPC.

5.1 Firstly, the combination of features of amended claim 1 does not clearly define the device. Some of the added features were comprised in dependent claim 4 as granted, and define a potentially untight area in the encapsulation. The qualification "potentially untight" means that there may or may not exist an untight area,

and as such does not constitute a limiting feature for the claimed device. Since the added features are linked to the original feature that the encapsulation is "not absolutely" hermetically tight, it is not unambiguous if, how and where the unit should actually be untight.

In addition, this now leads to a lack of clarity concerning the feature relating to the connection of the pump with the unit. According to claim 1, the pump should be connected to the unit at a relatively large spacing from the potentially untight area. However, as it is questionable whether such an untight area exists, the meaning of a feature defining the connection of the pump at a large spacing from the untight area cannot be clearly determined.

5.2 Secondly, claim 1 of the second auxiliary request is not supported by the description. The patent as a whole describes one embodiment having a deliberately provided untight area in form of a controllable leak (see paragraph [0013] of page 3), and wherein the pump is connected to the unit opposite to said leak.

The unit according to the definition of claim 1 now comprises, on one hand, a potentially untight area distant from the pump and, on the other hand, a controllable leak which may be provided anywhere, even in close vicinity to the pump. Such duplication of untight areas is not supported by the description, and even appears to be in contradiction with the detailed embodiment.

6. Third auxiliary request

This request corresponds to the auxiliary request considered in the opposition procedure, the subjectmatter of which was deemed to lack inventive step in the impugned decision. It was not maintained as a request with the appeal as filed, but was only introduced at the very end of the oral proceedings. The sole amendment made in comparison with claim 1 of the main request is that the open celled form of the foam material is no longer an optional feature. The patentability of the subject-matter of such a revised claim, in particular when compared to D1, would still be questionable since the meaning of an open celled foam is broad, as indicated in the patent itself, e.g. foams including only 15% of open cells are also considered to be of the claimed type (see page 3, lines 44 to 46 of the patent).

Because of the late filing and since its subject-matter does not prima facie appear to meet the requirements of Article 52(1) EPC it was not admitted by the Board.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

J.-P. Seitz