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D E C I S I O N
of 14 October 2004

Case Number: T 1164/02 - 3.2.1

Application Number: 96116947.1

Publication Number: 0770808

IPC: F16L 27/111, F01N 7/18

Language of the proceedings: EN

Title of invention:
Flexible connection tube for automotive exhaust system

Patentee:
CALSONIC CORPORATION

Opponent:
Witzenmann GmbH Metallschlauch-Fabrik Pforzheim

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 111(1), 114(2)

Keyword:
"Novelty (yes)"
"Inventive step (yes)"
"Decision re.appeals - remittal (yes)"
"Late submitted material - evidence admitted - yes"

Decisions cited:
T 0056/87

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1164/02 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 14 October 2004

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 21 October 2002 rejecting the opposition filed against European patent No. 0770808 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
G. E. Weiss
Y. A. F. Lemblé
A. Pignatelli

Summary of Facts and Submissions

I. The appeal is directed against the decision posted 21 October 2002 in which the Opposition Division rejected the opposition against European patent No. 0 770 808.

II. The following prior art documents cited during the opposition procedure played a role also during appeal:

D1: DE-A-42 02 808

D2: "Tuboflex-Wellschläuche", publicity brochure 561/01 Chr. Berghofer & Co.;

D3: Publicity brochure TIFT S.A.;

D4: Publicity brochure Arrowhead Products, pages 1, 2, 6;

D13: DE-A-37 02 676.

With the grounds for appeal the appellant also referred for the first time to an alleged instance of public prior use by display at an exhibition and offered a witness in support of its allegations.

III. During oral proceedings held 14 October 2004 the appellant requested that the decision under appeal be set aside and that the patent be revoked. The respondent requested that the appeal be dismissed (main request) or in the alternative that the patent be maintained in amended form on the basis of claims 1 to

8 (first auxiliary request) or claims 1 to 6 (second auxiliary request) filed with a letter of 30 July 2003.

IV. Claim 1 according to the respondent's main request reads:

"Flexible connection tube for an automotive exhaust system comprising:
a flexible bellows (1) connected between a series of exhaust pipes (6, 7) for absorbing expansion or contraction of said exhaust pipes (6, 7);
an outer knitted metal wire braid (2) provided to cover an outer periphery of said bellows (1) for protecting said bellows (1) from damage and for preventing said bellows (1) from stretching to its full length;
said outer knitted metal wire braid (2) being formed of a plurality of metal-wire bundles (2a), each bundle (2a) being produced by connecting a plurality of metal wires parallel to each other and in contact with each other with respect to a lateral direction of said metal wires, and said outer knitted metal wire braid (2) being formed into a substantially cylindrical shape by knitting said plurality of metal-wire bundles (2a) alternately with each other in spiral directions with respect to an axial direction of said bellows (1) so that each of said metal-wire bundles (2a) extends along the outer periphery of said bellows (1) in its spiral direction over both ends of said bellows (1); and
a plurality of apertures (4) being defined by many groups of four adjacent metal-wire bundles (2a) knitted alternately with each other, characterized in that a total opening area of all of said apertures (4) is set within a range of 20% to 50% with respect to an over-all area of a curved surface of said outer knitted

metal wire braid (2), for providing a substantially cylindrical low-density knitted outer metal wire braid (2)."

Claims 2 to 8 define features additional to those of claim 1.

V. The arguments of the appellant in respect of the respondent's main request may be summarised as follows:

D13 discloses a flexible connection tube intended for use in a subterranean gas pipeline and which comprises all features of the subject-matter of claim 1 except those concerning the intended use in an automotive exhaust system. However, it is implicitly suited for that use, also in respect of the presence of a heat-shrink sheath. Present claim 1 does not exclude the presence of such a sheath and future developments in heat-shrink materials may render such a sheath suitable for use in an automotive exhaust system. D13 discloses a range of open area of 0% to 65% and the requirement according to D13 of providing a particular breaking strength would lead the skilled person to the presently claimed range of opening area; moreover, this represents only a normal braid and not a purposive selection. The subject-matter of granted claim 1 therefore is not novel with respect to D13.

Each of D2 to D4 also destroys novelty of the subject-matter of granted claim 1. The illustrations in D2 provide more detail than merely schematic drawings, there is reference to use in exhaust systems and the open area of the braid can be determined as being within the presently claimed range even without the

need for measurements. In the decision T 56/87 (OJ EPO 1990, 188) it was found that a feature derivable by dimensioning a diagrammatic representation is not disclosed if there is a contradiction with the description. However, that is not the case in D2 and the bar on disclosure following that decision does not apply in this case. D3 reproduces photographs of connecting tubes so that the question of the admissibility of deriving dimensions does not arise and it can be seen without recourse to measurements that an open area falling within the presently claimed range is shown. There is reference to use of the tubes with internal combustion engines. Also D4 contains images derived from photographs and the product referenced "4" shows an opening area falling within the claimed range. Although this is not visible along the entire length of the braid the structure of a braid requires that the opening area be constant throughout.

As regards inventive step, the closest prior art is that disclosed by D1, corresponding to the preamble of claim 1 and having an open area of around 5%. The problem of improving corrosion resistance which is mentioned in the description of the present patent is not solved by the claimed range of 20% to 50% open area. Tests have shown that the braid has no influence on corrosion. The realistic problem solved by the claimed subject-matter is therefore to reduce weight and cost of the connecting tube. Open areas of the braid on connecting tubes within the claimed range are known from each of D2, D3, D4 and D13 and the skilled person seeking to reduce cost and weight subject to the limits of the mechanical duty of the braid would inevitably arrive at an open area within the claimed range.

Alternatively, it would be obvious to employ a connecting tube known from D3 for automotive purposes as disclosed in D1.

The subject-matter of granted claim 1 also is anticipated by the display on the stand of a company IWK Regler und Kompensatoren GmbH at the IAA exhibition in September 1995 of a flexible connecting tube for the exhaust system of the 1996 Renault Clio. It can be seen from the photographs of the displayed tube that the open area of the braid is within the presently claimed range and a witness, Herr Pontzen, can testify to the facts. It was not possible to bring forward this evidence at an earlier stage because it relates to the activity of a competitor of the appellant, resulting in difficulties in obtaining the information.

VI. The respondent's reply can be summarised as follows:

The connecting tube according to D13 is not suitable for use in an automotive exhaust system. The presently claimed range of open area is not disclosed and the external heat-shrink sleeve renders it unable to solve the problem addressed by the contested patent. D2 discloses a variety of connecting tubes and a variety of intended applications, only those for containing high pressures being provided with an outer braid. There is no indication of which tube is suitable for which application. Moreover, the illustrations are not working drawings which may be used for measurements. Also D3 discloses a variety of tubes and various intended applications and fails to show an open area over the whole of the braid falling within the claimed range. As regards D4, in the illustration referenced

"4" an open area neither is shown over the whole of the braid surface nor falls within the claimed range. It follows that none of the documentary evidence relied on by the appellant destroys the novelty of the subject-matter of present claim 1.

As regards inventive step, the tests performed by the appellant fail to put into question the solution of the stated problem by the claimed subject-matter, the detailed results quoted in the patent specification showing improved corrosion resistance. D1 discloses braid having almost no open area and it previously was thought that this would be necessary to provide the required protection. However, by increasing the open area the corrosion resistance is improved to such an extent that the material of the bellows can be reduced in thickness, permitting a reduction also in the number of corrugations, thereby resulting in a reduced weight of the entire assembly. No hint in this direction is to be found in the available prior art.

Reasons for the Decision

1. The patent relates to a flexible connection tube for use between the front and rear portions of an automobile exhaust system. Such a connection tube serves to prevent vibrations in the forward portion of the exhaust system from passing into the rearward portion and absorbs relative movement between the two portions due to thermal expansion. The tube comprises a metal bellows surrounded by a flexible metal braid which acts to limit longitudinal extension of the bellows and protect it from mechanical damage such as

from stones. The design of the bellows conventionally balances the requirements of a suitable spring constant to provide flexibility and sufficient wall thickness to withstand corrosion. The braid comprises a series of openings between knitted strands and during use on roads which have been treated with salt, salt solution passes through the openings and coats the bellows. As set out in the patent specification, the salt solution dries to form particles which may be unable to escape through openings in the braid which are too small, leading to a build-up of salt within the braid and reduced life of the bellows due to corrosion.

Main request

Novelty with respect to documentary evidence

2. D13 relates to a flexible connection tube for allowing relative movement between connected sections of a gas pipe located below the ground. The tube comprises a metal bellows surrounded by a metal braid which has been designed to ensure that, in the event of unintentional disturbance of the gas pipe, the tube provides a point of weakness. The braid has a minimum closed area of 35%. The tube is surrounded by a heat-shrink sheath coated internally with sealing material which softens during the application of heat to shrink the sheath, in order to avoid earth entering the spaces between the corrugations of the bellows.

2.1 Contested claim 1 requires that the tube be "for" an automotive exhaust. This is to be understood as meaning that the tube is "suitable for" that application and if a prior art disclosure is to destroy novelty of the

subject-matter of the claim it must be directly and unambiguously recognisable as being suitable for that purpose. The presence of the heat-shrink sheath on the tube according to D13 renders it unable to satisfy that requirement because the sheath would evidently not be capable of coping with the high temperatures encountered by a tube when part of an automotive exhaust. The appellant did not contest this but argued that the wording of claim 1 did not exclude the presence of such a sheath. This is not the case because such a sheath is clearly excluded by the requirement in claim 1 that the tube be "for", i.e. suitable for, an automotive exhaust system. The appellant's further argument that future developments in polymers may allow such a sheath to be fitted on an automotive exhaust system cannot be accepted because the disclosure of a prior art document is to be understood as the teaching at the time of writing and not as that which might be read into it in the light of subsequent developments in science and technology.

2.2 D13 does not disclose the presently claimed range of open area of 20% to 50% or any value falling within that range. The only explicitly disclosed value of closed area is of at least 35% which corresponds to a maximum open area of 65%. This falls outside of the claimed range. The Board cannot accept the appellant's allegation that the claimed range defines no more than the normal range of open area encountered in a metallic braid since this is a mere allegation devoid of supporting evidence.

3. D2 publicises various metallic bellows having the designation "TUBOFLEX" and includes products both with and without external metallic braid. The brochure states that steel bellows may be used in exhaust systems and that bellows equipped with a braid are designated as high pressure. There are illustrations of eighteen types of end fittings attached to bellows assemblies, twelve of which are suitable for use at temperatures above 150°C and it is the illustration "I" amongst this group, which shows a tube having a braid, which the appellant sees as anticipating the subject-matter of present claim 1.

3.1 The illustration "I" is intended to show an end fitting and there is no indication that the particular tube shown is suitable for use in an automotive exhaust system. Indeed, it appears from the total information contained in D2 that it is intended for high pressure applications. The duty of the connecting tube in an automotive exhaust system requires that it must possess a spring constant such that it is able to effectively insulate the rear portion of the exhaust system from vibrations and relative movement of the front portion. A connecting tube suitable for high pressure applications would not necessarily exhibit a spring constant of a suitable value for that duty. It is therefore not directly derivable from D2 that the tube in the illustration "I" is suitable to be used for duty in an automotive exhaust system.

3.2 The Opposition Division denied the relevance of the D2 disclosure on the basis that the illustration "I" was a schematic drawing. At least as far as the end fittings are concerned, which the illustrations are intended to

show, the Board considers that this is not the case. However, whereas two illustrations on the first page of the brochure, which appear to be taken from photographs, show very different percentages of open areas, all of the illustrations of end fittings appear to show approximately the same percentage of open area. This leads the Board to take the view that the representation of the braid in the illustration of the end fittings is schematic, intended only to denote the presence of braid as relevant to the end fitting and devoid of technical teaching in respect of a combination of the end fitting and a particular braid. The finding of T 56/87 (*supra*), referred to by the appellant, was that a feature derivable by dimensioning a diagrammatic representation is not disclosed if there is a contradiction with the description. However, the converse of this finding, that there is a disclosure of such a feature in the absence of a contradiction with a descriptive text, is not an automatic conclusion and the referenced decision does not help the appellant's case. On the basis of the foregoing the Board considers that the illustrations cannot be considered as a disclosure of a braid exhibiting a particular open area.

4. The brochure D3 contains illustrations, apparently taken from photographs, of a series of different metal connecting tubes both with and without braid and refers to a plurality of applications including ones at high temperature such as on internal combustion engines. Specific reference to vehicle exhaust systems, however, is restricted to a particular type of tube ("agrafé") having neither a metal bellows nor a braid. The appellant argues that a tube shown vertically in the upper right hand illustration of the page headed "TUYAUX

METALLIQUES" anticipates the subject-matter of present claim 1. However, only one end of the tube is shown and neither its size nor which form of end fitting it carries at the other end can be determined. The failure to disclose this type of tube as being suitable for an automotive exhaust system and the lack of information regarding the size of the particular tube leads the Board to conclude that the suitability of the illustrated tube for an automotive exhaust system cannot be determined. Moreover, as far as the percentage open area can be determined from the illustration it does not clearly fall within the claimed range.

5. The brochure D4 also contains illustrations apparently based on photographs of a variety of connecting tubes but only one, referenced as "4" and described as being intended for use in a stabiliser de-icing device is of potential relevance in respect of novelty of the subject-matter of present claim 1. However, the openings in the braid are clearly visible only in the central portion of the total visible area of the tube; it is not apparent whether they are present along the remainder of the tube and if so whether they would exhibit the same open area as in the central portion. Moreover, the illustration of the component is so small that even in the central portion it cannot serve as a reliable disclosure of the percentage opening area.

6. From the foregoing it can be seen that none of the documentary prior art relied on by the appellant directly and unambiguously discloses the subject-matter of claim 1 which therefore is novel with respect to that prior art (Article 54 EPC).

Inventive step with respect to documentary evidence

7. There is no dispute between the parties that the closest prior art is that disclosed by D1 which relates to a flexible connecting tube intended for an automotive exhaust system and which comprises the features contained in the preamble of present claim 1. The text is silent as regards the open area of the braid material. The braid is illustrated in the upper half of figure 1 which is stated to be a schematic side view. The schematic nature of the view is clear also from the figure itself since the generally cylindrical braid is shown as being flat. In accordance with the practice of the boards such a schematic view alone cannot serve as a disclosure of the open area of the braid.

7.1 The subject-matter of present claim 1 differs from that of D1 by the feature that:

– the total open area of all of the apertures is set within the range of 20% to 50% with respect to the overall area of the curved surface of the outer knitted metal wire braid.

As acknowledged in the patent specification, conventional thinking has been to provide flexible connecting tubes for automotive exhaust systems with a high density braid, i.e. one having a relatively small open area. Irrespective of the degree of the open area of the braid, salt solution resulting from the application of salt to roads covered with water, ice or snow passes through the braid into the space around the

bellows. Evaporation of the solution results in the formation of salt particles. With the conventional braid having a relatively small open area these particles can become trapped within the braid, resulting in an environment of high salt concentration conducive to corrosion of the bellows.

The increased open area of the braid in accordance with present claim 1 increases the ability of the crystallised salt to escape and the resultant lower concentration of salt around the bellows leads to reduced corrosion.

7.2 None of the prior art documents relied on by the appellant either mentions the problem of reducing corrosion of the bellows or suggests the presently claimed solution. As set out above when considering novelty, none of D2, D3, D4 and D13 even forms a disclosure of an open area falling within the range of 20% to 50% of the overall area of the braid of a flexible connecting tube. Moreover, even if any of the documents were to be considered as such a disclosure there would be no reason for the skilled person to consider it in combination with D1.

7.3 The appellant contends with the support of test results that the claimed range of open area of the braid has no effect on corrosion of the bellows. However, none of the appellant's tests was on a connecting tube according to claim 1. Indeed, the laboratory test samples were limited to simple metallic plates, the resulting corrosion pattern of which is merely stated to be as is achieved on the bellows of the tube according to D1 with an essentially closed braid. The

appellant furthermore asserted that flexible connection tubes which had been fitted to two vehicles driven for at least 85,000 km and of which one had a braid with an open area within the claimed range whilst the other had a smaller open area exhibited corrosion patterns which were comparable ("vergleichbar"). By comparison, the patent specification contains in figure 6 the graphically presented results of tests performed as set out in the specification column 10, lines 21 to 48. The test samples were two connecting tubes differing in as far as the open area of the braid fell within and outside of the claimed area respectively. Figure 6 shows some 50% reduction in corrosion on the sample having the larger open area. In the light of such results the vague assertions by the appellant in respect of unrepresentative test samples and undocumented test conditions have no evidentiary value.

7.4 The Board also cannot accept the appellant's contention that the subject-matter of present claim 1 would be the obvious result of attempts to reduce weight of the connecting tube according to D1. Many possibilities would be available to the skilled person wishing to reduce weight and the subject-matter of present claim 1 contradicts the conventional thinking regarding the open area of the braid.

8. The appellant argued in the alternative that the subject-matter of claim 1 would be obvious in the light of a combination of D3 and D1, the latter making clear that the tube disclosed in the former could be used in an automotive exhaust system. However, as set out under 4 above, D3 does not clearly disclose an open area within the presently claimed range and the skilled

person would receive no encouragement from the combination of D3 and D1 to adopt such an open area.

9. The Board concludes from the foregoing that the subject-matter of present claim 1 is not rendered obvious by the documentary evidence relied on by the appellant, in the light of which it therefore involves an inventive step (Article 56 EPC).

Late filed evidence of public prior use

10. With the grounds of appeal the appellant for the first time submitted that public prior use of a connecting tube had taken place by exhibition at the IAA in Frankfurt during September 1995, supplied photographs of the stand and the exhibited article, offered a witness in support of the alleged facts and explained why the evidence had not been made available earlier in the procedure. The respondent requested that the newly filed allegation be disregarded in accordance with Article 114(2) EPC. In accordance with case law of the boards in such a case the Board has to examine both the potential relevance of the new evidence and whether there may have been an abuse of the procedure before deciding whether to admit it. In order to avoid going into detail which might prejudice the outcome of further proceedings the Board merely states that it finds the evidence to be potentially highly relevant. Moreover, the appellant's argument that the evidence relates to display of an article by one of its competitors, such that the appellant initially perhaps was unaware of it and would experience some difficulty in obtaining evidence, appears a plausible ground for a delay in bringing the matter forward. The Board

therefore exercises its discretion and allows the late filed submission into the procedure. In order to ensure that the parties have the benefit of two levels of jurisdiction, the Board exercises its discretion in accordance with Article 111(1) EPC and remits the case to the first instance for further examination.

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 for further prosecution.

The Registrar: The Chairman:

A. Vottner S. Crane