

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

D E C I S I O N
of 15 May 2006

Case Number: T 0203/04 - 3.2.01

Application Number: 00111273.9

Publication Number: 1078819

IPC: B60R 9/05

Language of the proceedings: EN

Title of invention:
Structure for reducing wind noise

Applicant:
Toyota Jidosha Kabushiki Kaisha

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0203/04 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 15 May 2006

Appellant:

Toyota Jidosha Kabushiki Kaisha
1, Toyota-cho
Toyota-shi
Aichi-ken 471-8571 (JP)

Representative:

Kuhnen & Wacker
Patent- und Rechtsanwaltsbüro
Postfach 19 64
D-85319 Freising (DE)

Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 9 September 2003
refusing European application No. 00111273.9
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
C. Heath

Summary of Facts and Submissions

I. The appeal is directed against the decision posted 9 September 2003 rejecting European patent application 00 11 1273.9 (EP-A-1 078 819).

II. The following evidence was cited in the search report:

D1: DE-A-40 35 729

D2: Patent Abstracts of Japan vol. 1997, no. 05,
30 May 1997 (1997-05-30) & JP 09 002339 A
(Daihatsu Motor Co. Ltd), 7 January 1997 (1997-01-07)

D3: Patent Abstracts of Japan vol. 1998, no. 06,
30 April 1998 (1998-04-30) & JP 10 045046 A
(Toyota Auto Body Co. Ltd; Toyota Motor Corp.),
17 February 1998

D4: WO-A-92 12874

D5: WO-A-99 54168.

The Examining Division was of the opinion that the subject-matter of claim 1 then on file was not new with respect to the disclosures of each of D1 and D2.

III. With a letter dated 5 April 2006 the appellant requested that a patent be granted on the basis of claims 1 to 7 filed therewith.

IV. Claim 1 according to the appellant's request reads as follows, wherein in comparison with the claim as originally filed added text is indicated in italic script and deleted text is indicated in square parentheses:

"A structure (12, 14, 30) [for reducing] *adapted for reduced generation of wind noise when provided above a roof (11) along the width of a vehicle, said structure (12, 14, 30) comprising:*

- an upper surface (18, 18') of said structure (12, 14, 30), said upper surface (18, 18') introducing an attached flow of air *flowing in the direction* from the front of the vehicle to the rear of the vehicle; and
- a lower surface (20, 20') of said structure (12, 14, 30), said lower surface comprising:
 - a flow leading face (24, 24') in the center of said lower surface (20, 20') for leading the air flow [compressed] from the front of said structure (12, 14, 30) to the rear of said structure (12, 14, 30), and
 - a flow separation portion (26, 26') in the rear of said lower surface (20, 20') for separating the air [flow] *flowing* from the front of said structure (12, 14, 30)

characterized in that said structure (12, 14, 30) further comprises a flow compression face (20, 22', 22") in the front of said lower surface (20, 20') for introducing and compressing, to an increased air pressure, the air flow from the front of the vehicle, wherein said flow compression face (20, 22') is hollowed toward the interior of the cross-section of said structure (12, 14, 30) or said flow compression

face (22") is a planar inclined surface that extends downward from the front of the lower surface (20') toward the flow leading face (24')."

Claims 2 to 5 are also directed towards the structure and define features additional to those of claim 1. Claims 6 and 7 define a vehicle comprising the structure according to earlier claims.

V. The appellant's submissions in respect of inventive step may be summarised as follows:

The teaching of D1 primarily relates to reduction in noise level by preventing Karman street vortices generated by a cross-member mounted on the roof of a vehicle. It proposes an irregular form of the leading edge of the cross-member. However, whilst in the embodiments the cross-member may have a symmetrical cross-section it states that this can cause the trailing edge to generate noise. It therefore proposes that the trailing edge be covered to create a smooth surface. Although air flow over the rear portion of the lower surface is not mentioned the figures illustrate an attached flow over its entire extent. D1 is silent as regards the influence of the rear portion of the lower surface on Karman street vortices.

D2 relates to the same problem but concerns itself solely with the rear portion of the lower surface of an otherwise conventional aerofoil section.

There is no teaching in either document which would lead the skilled person to believe that a combination of the respective teachings would further reduce the production of Karman street vortices.

Reasons for the Decision

Amendments

1. The essential amendments in claim 1 and their disclosure in the application as originally filed are as follows:
 - "[for reducing] *adapted for reduced generation of wind noise when provided above a roof*": as set out in paragraph 0017 of the A-publication the structure is typically a roof rack. It is implicit to the skilled person that such a structure generates wind noise and that the present invention is directed towards reducing the generation of noise, not towards reducing wind noise which is otherwise generated. The amendment clarifies the claim to correspond to the teaching to the skilled person. The subject-matter of the claim is merely the structure and the introduction of "when" makes the wording of the claim consistent with this definition.
 - "introducing an attached flow of air *flowing in the direction* from the front of the vehicle to the rear of the vehicle": the original wording implied that the flow would be attached over the length of the vehicle. The change clarifies the claim to reflect the teaching to the skilled person when reading the application as originally filed when considered as a whole.
 - "a flow separation portion in the rear of said lower surface for separating the air [flow] *flowing* from

the front of said structure": since the flow separation portion is at the rear of the structure it is implicit that the separation does not take place at the front. The amendment removes the internal inconsistency in the wording.

- "for introducing and compressing, *to an increased air pressure*, the air flow from the front of the vehicle": this is explicitly disclosed in column 2, line 14 of the A-publication and clarifies that the claim does not specify acceleration of the air through a reduced flow area.

- "*said flow compression face is hollowed toward the interior of the cross-section of said structure or said flow compression face is a planar inclined surface that extends downward from the front of the lower surface toward the flow leading face*": this wording is based on the content of original claims 2 and 3. The wording "interior of the cross-section" replaces the wording "center point" in original claim 2 which was inconsistent with the drawings in which there was no particular relationship between the hollowed portion and the centre point of the cross-section. The wording "planar inclined surface that extends downward from the front of the lower surface toward the flow leading face" is a correct representation of the disclosure of figure 4. The original wording in claim 3 was inconsistent with figure 4 since the flow compression face did not extend to the rear of the structure.

Patentability

2. The application relates to measures to reduce the generation of noise by bars such as are commonly mounted transversely on vehicle roofs for carrying loads. During the passage of such bars through the air vortices are shed alternately from each side of the bar, resulting in von Karman street vortices. The resulting periodic pressure variation is perceived as wind noise caused by the bar.

3. D1 also relates to measures to reduce wind noise caused by the same phenomenon in the wake of a bar transversely mounted on the roof of a moving vehicle. In the preferred embodiment the bar is produced as an extruded profile having a generally elongated cross-section which is shown as being concave in the lower regions of the leading and trailing edges. A strip placed over the bar covers those regions. Along the front portion of the strip there is a series of spaced openings through which air can pass into the space formed by the concavity. At the trailing edge of the bar the strip covers the concavity to form a rather smoother outer surface and thereby helps to suppress the generation of noise. The series of openings in the leading edge destroys the homogeneity of air flow over the cross-section of the bar and according to D1 prevents periodic pressure fluctuation in the wake of the bar.
 - 3.1 D1 is essentially silent as regards the flow of air over the rear portion of the lower side of the cross-section, there being merely flow arrows in the figures which imply that it is intended that the airflow would

remain attached until it reaches the rearmost point of the cross-section. Indeed, the covering of the lower region of the trailing edge reduces the abruptness of the change of surface profile, thereby reducing the likelihood that the airflow would separate in this region.

3.2 The Board concludes that, when taken as a whole, the disclosure of D1 does not disclose a flow separation portion at the rear of the lower surface and does not anticipate the subject-matter of claim 1.

4. D2 also relates to measures to reduce wind noise resulting from periodic pressure fluctuation in the wake of a bar transversely mounted on the roof of a moving vehicle and acting as a spoiler. In the case of D2, however, at least the front of the cross-section exhibits a shape generally corresponding to an aerofoil whereby the upper and lower portions of the leading edge are convex. Immediately adjacent the stagnation point these convex surfaces would be surrounded by air which has been decelerated from its free-flow condition and so would be at a static pressure higher than the total pressure in the free-flow. It is implicit that the lower of these surfaces would also have a certain effect in leading the air to pass beneath the spoiler. The section according to D2 additionally exhibits towards the rear of the lower surface a discontinuity which causes separation of the airflow.

4.1 Since the flow compression face according to D2 is neither planar nor hollowed the disclosure of D2 does not anticipate the subject-matter of claim 1.

5. The Board concludes from the foregoing that the subject-matter of claim 1 is new with respect to D1 and D2 (Article 52(1) EPC).

6. Having established that the subject-matter of claim 1 is new with respect to each of D1 and D2 the Board exercises its discretion in accordance with Article 111(1) EPC and continues with examination of the case.
 - 6.1 Both D1 and D2 relate to the solution of the same problem as the present application and it appears that either could serve as the closest prior art. The subject-matter of claim 1 differs from that of D1 by the feature that in the rear side of the lower surface of the structure there is a flow separation portion for separating the air flowing from the front of the structure. The subject-matter of claim 1 differs from that of D2, on the other hand, by the feature that the flow compression face is hollowed toward the interior of the cross-section of the structure or is a planar inclined surface which extends downwardly from the front of the lower surface towards the flow leading face. In each case the differentiating feature would serve to further reduce the generation of noise by periodic pressure variations in the wake of the transverse member. Whichever of D1 and D2 is taken as the closest prior art the essential matter is whether the skilled person would be encouraged to combine the features according to D1 relating to the leading edge with those according to D2 relating to the rear lower surface.

6.2 In all figures of D1 illustrating a cross-section the strip is used to cover the depression in the lower region of the trailing edge of the bar to create a somewhat smoother surface. This serves to suppress a particular component of the wind noise ("Rauschanteil"). Whilst this is an indication that the lower region of the trailing edge is of some importance as regards noise generation, there is no indication that it is relevant to the particular mechanism of noise generation with which D2 is concerned. Moreover, since the strip covers the depressions it reduces the severity of change of profile and the teaching therefore is in the opposite direction to the surface discontinuity taught by D2. Furthermore, the purpose of the non-uniform cross-section according to D1 is to deliberately reduce the homogeneity of airflow over the lower surface of the cross-section according to D1. In so doing it fundamentally changes the character of the airflow from that in which the discontinuity of D2 is intended to operate. The skilled person therefore would have no reason to believe that the discontinuity on the lower surface of the aerofoil would still function in its intended manner if used together with a cross-section as shown in D1.

6.3 It follows from the foregoing that, irrespective of which of D1 and D2 is considered as being the closest prior art, the skilled person would not consider combining their teachings.

6.4 The remaining prior art cited in the search report is less relevant. In particular, the disclosures of D3 and D4 broadly correspond to that of D2 whilst D5 teaches reducing wind noise by providing discontinuities on the

leading edge of an aerofoil section with the aim of delaying separation of the flow.

- 6.5 In the light of the foregoing the Board concludes that the subject-matter of claim 1 involves an inventive step (Article 56 EPC). Since claims 2 to 7 contain all features of claim 1 this conclusion applies equally to those claims.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of the first instance with the order to grant a patent on the basis of the following documents:
 - description and claims as filed with the letter of 5 April 2006;
 - drawings as granted.

The Registrar:

The Chairman:

A. Vottner

S. Crane