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DECISION
of 25 October 2005

Case Number:	T 0076/03 - 3.3.03
Application Number:	94309753.5
Publication Number:	659821
IPC:	C08L 9/06
Language of the proceedings:	EN

Title of invention:
Tread rubber composition for tyres

Patentee:
Sumitomo Rubber Industries, Ltd.

Opponent:
Bridgestone Corporation

Headword:
-

Relevant legal provisions:
EPC Art. 52, 54, 56, 100(b)

Keyword:
"Novelty (yes) - prior disclosure of implicit features (no)"
"Inventive step (yes) - problem and solution"
"Inventive step - ex post facto analysis"
"Opposition grounds - sufficiency of disclosure (yes)"

Decisions cited:
-

Catchword:
-

Case Number: T 0076/03 - 3.3.03

DECISION
of the Technical Board of Appeal 3.3.03
of 25 October 2005

Appellant: (Proprietor of the patent)	SUMITOMO RUBBER INDUSTRIES LIMITED 6-9, 3-chome, Wakinohama-cho, Chuo-ku Kobe-shi, Hyogo-ken (JP)
Representative:	Manitz, Finsterwald & Partner GbR Martin-Greif-Strasse 1 D-80336 München (DE)
Respondent: (Opponent)	Bridgestone Corporation 10-1, Kyobashi 1-chome Chuo-ku, Tokyo (JP)
Representative:	Lamb, Martin John Carstairs Marks & Clerk 90 Long Acre London WC2E 9RA (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office of 16 October 2002 issued in writing on 12 November 2002 revoking European patent No. 659821 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman:	R. Young
Members:	A. Däweritz H. Preglau

Summary of Facts and Submissions

I. The grant of European patent No. 0 659 821 in respect of European patent application No. 94 309 753.5, filed on 23 December 1994 and claiming the priority of 27 December 1993 of an earlier patent application in Japan (332991/93), was announced on 22 March 2000 (Bulletin 2000/12) on the basis of a set of five claims, Claim 1 reading as follows:

"1. A tread rubber composition for tires, which comprises rubber components consisting, when the weight of the rubber components is assumed to be 100 parts by weight, of 20 to 80 parts by weight of a diene rubber and 80 to 20 parts by weight of one or more styrene-butadiene copolymers having a glass transition temperature of from -50°C to -25°C and satisfying a relation shown by the equation: $4.8X-Y \geq 32$, in which a bonded styrene content is represented by X% by weight and a 1,2-bond content in butadiene portion is represented by Y% by weight; characterised in that a temperature dispersion curve of tan δ of the rubber composition having two peaks; the temperature difference between the peak on the highest temperature side thereof and a single peak of a rubber composition using the styrene-butadiene copolymer alone as a rubber component being within 10°C; and a tan δ measured at 50°C being 0.08 to 0.20.".

The remaining dependent Claims 2 to 5 related to elaborations of this subject-matter.

Styrene-butadiene copolymer rubber(s) will be referred herein below as "SBR" or "SB-rubbers", "T_g" will be used to indicate the glass transition temperature of the SBR, and the loss factor measured at a given temperature T°C will be symbolised by "$\tan \delta|_T$". Thus, the last feature in Claim 1, as quoted above, would be referred to as "$\tan \delta|_{50}$ being 0.08 to 0.20". The above requirement "$4.8X-Y \geq 32$" will referred to as the "equation".

II. On 20 December 2000, a Notice of Opposition was filed, in which revocation of the patent in its entirety was requested on the grounds of Articles 100(a) and (b) EPC, because of lack of novelty and of inventive step and because the patent would not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The grounds of opposition under Article 100(a) EPC were based on the following documents:

D1: US-A-4 906 697,
D2: US-A-4 485 205,
D3: EP-A-0 447 066,
D4: ASTM E 1356-91, Standard Test Method for Glass Transition Temperatures by Differential Scanning Calorimetry or Differential Thermal Analysis",
D5: G. Kraus et al., "Properties of Random and Block Copolymers of Butadiene and Styrene. I. Dynamic Properties and Glassy Transition Temperatures", J. Appl. Polym. Sci., 11 (1967), 1581 to 1591,
D6: EP-A-0 048 618,

Appendix I:

"Calculation of Glass Transition Temperature" and

Appendix II:

"SBRs of E1" (amended version of Fig.8 of the patent in suit)

The Board uses the denotation of the documents used in the decision under appeal (D1 to D6 instead of E1 to E6 as used in the Notice of Opposition).

(1) Firstly, an objection of lack of clarity of Claim 1 was raised by the Opponent (Article 84 EPC). Whilst it was accepted that this was not a ground for opposition, the practice of the EPO to disregard features of a claim, which were not clear, should, according to the Opponent, also be followed in this case, and, therefore, the T_g range of from -50 to -25°C in Claim 1, above, should not be regarded as a distinguishing feature. This view was explained by means of the argument that, according to D4, T_g could be determined by different methods, differential scanning calorimetry (DSC) or differential thermal analysis (DTA), and there was, along the respective curve, measured by either method, more than one conceivable point which could be taken as the T_g. Moreover, T_g could be calculated, according to D5, by means of the so-called Gordon-Taylor equation (herein below: "G-T-equation"), as presented by the Opponent in Appendix I.

(2) Secondly, on the basis of its interpretation of page 3, lines 24 to 26 of the patent in suit, the Opponent took the view that the claimed subject-matter was insufficiently disclosed, if tan δ, which was an

essential feature of the claimed subject-matter, was affected by some feature or variable other than the T_g.

(3) This argument was, in particular, used in the context of an objection of lack of novelty raised with regard to D1. According to the Opponent, this document related, like the patent in suit, to tread rubber compositions for tyres comprising rubber components, which consisted of diene rubber and SBR, and these known compositions showed also a bimodal tan δ-temperature curve, ie two peaks. However, D1, admittedly, did not explicitly disclose that the temperature difference between the peak on the high temperature side of the above loss factor-temperature curve of the rubber composition and the single peak of a rubber composition using SBR alone (herein below: the "ΔT-value") was within 10°C as required in Claim 1. However, the Opponent submitted that the compositions of D1 inherently had this feature.

(4) In particular, the 50:50 composition of natural rubber and SBR of Example 4 of D1 allegedly anticipated the claimed subject-matter of the patent in suit. Inferring from the fact that (i) the "SBR-D" fulfilled the "equation" and (ii) its composition was very close to that of "SBR-A" used in some examples of the patent in suit (facts and arguments: page 4, penultimate paragraph), all of which gave acceptable results, and further inferring from the patent specification (page 3, lines 14 to 18) that (iii) the ΔT-value would tend to become larger than 10°C, when the "equation" was not fulfilled, the Opponent submitted that SBR-D in Example 4 of D1 would automatically have a ΔT-value as required in Claim 1. Any argument of the Patent

Proprietor used to dispute this finding would indicate that the subject-matter was insufficiently disclosed (facts and arguments: at the bottom of page 4).

(5) If, despite the arguments presented above, the T_g range required in Claim 1 was nevertheless taken into account, the Opponent argued on the basis of Appendix I (above), that even the T_g requirement was met by SBR-D of D1, although the document had been silent in this respect.

(6) Instead of $\tan \delta|_{50}$-values, Table 2 of D1 provided $\tan \delta|_{60}$-values for all its compositions, all of which were in the range of 0.08 to 0.2. As shown for its Example 1 in Fig.1 of D1, the loss factors measured at those two temperatures were not, in the Opponent's view, significantly different from each other and both would in any case be < 0.2. This could also be expected for the other examples of D1. Nor did the patent in suit itself appear to distinguish between $\tan \delta$-values measured at different temperatures between 50 and 70°C; rather, it was only required that $\tan \delta|_{50-70}$-values were sufficiently low. On page 3, lines 24 to 26, the patent in suit, moreover, indicated that a T_g of <-25°C was required to give adequate $\tan \delta|_{50-70}$-values. Since, the SBR-D in Example 4 of D1 appeared to have such a low T_g, it could be inferred that it would also have a suitable $\tan \delta$, otherwise the disclosure in the patent in suit would be insufficient (cf. section II (2), above).

(7) In order to fill the gaps of missing T_g-, $\tan \delta|_{50}$- and ΔT-values in D1, the Opponent additionally filed an experimental report with a letter dated 14 August 2002 (Declaration signed on 9 August 2002 by Mr Nakamura).

(8) Document D1 was also identified by the Opponent as the closest state of the art for its arguments concerning inventive step, because its tread rubber composition "aimed at exactly the same purpose as the patent in suit", ie it was designed to improve tyre grip and to reduce frictional resistance. In order to achieve this, a bimodal tan δ-temperature curve of the composition was required. Moreover, as shown in Table 2 of D1, the desired properties had been achieved by those compositions, so that the primary objects of the patent in suit had already been met by D1. If novelty of the claimed subject-matter over D1 was acknowledged, the only distinguishing features could be seen in the tan $\delta|_{50}$- and ΔT-values. However, no beneficial effect had been demonstrated which could rely on these features. Consequently, there was no inventive step.

(9) According to the Notice of Opposition, similar comments applied to documents D2 and D3.

(10) These arguments were disputed by the Patent Proprietor in letters dated 14 August 2001 and 16 August 2002. Together with the latter submission, it filed three auxiliary requests and copies of the following Exhibits A to E:

A: ASTM D 3418-82,
B: "Rubber Chemistry and Technology", Vol. 53, No. 3, July-August 1980, pages 437 to 445,
C: "JSR Handbook", 1988, pages 17 to 19, (in Japanese)
D: Handbook of Rubber Industry (in Japanese), 4th Edition, 1994, pages 217 and 1278 to 1279,

together with a translation of paragraph 10.2.1 (page 1278) into English, and

E: an experimental report of the determination of the T_g of SBR 1500 on 5 July 2002.

(11) The Auxiliary Requests differed from the claims as granted by the following modifications (cf. section I, above):

first Auxiliary Request: in Claim 1, the ΔT-value of the composition was to be "within 6°C";

second Auxiliary Request: Claim 1 contained a narrower T_g-range of from "-40°C to -30°C" and Claims 3 and 5 as granted had been deleted;

third Auxiliary Request: the "equation" in Claim 1 read "$4.8X-Y \geq 70$".

III. In the decision orally announced at the end of oral proceedings on 16 October 2002 and issued in writing on 12 November 2002, the patent was revoked.

(1) The Opposition Division rejected the ground for opposition under Article 100(b) EPC (insufficient disclosure), accepted that the amendments in the auxiliary requests did not contravene Article 123(2) EPC and acknowledged novelty of the subject-matter according to the Main Request and each of the Auxiliary Requests with regard to each of D1, D2, D3 and D6.

(2) In particular, the difference with regard to D1 was seen in the lack of a clear disclosure of the T_g, the calculation of which according to D5 would have required the knowledge of "additional features such as the content of the cis/trans-configuration". Moreover, although requiring two tan δ peaks on the loss factor-

temperature curve, D1 was found to be silent with respect to the temperature difference between these peaks; nor was the temperature dependency of tan δ explicitly disclosed in D1. Neither D2 nor D3 disclosed the "equation" $4.8X-Y \geq 70$ (in Claim 1 of the third Auxiliary Request) or ≥ 32 (in each Claim 1 of the higher ranking requests), nor could the ΔT-feature be determined from the loss factor-temperature curve. As regards D6, it was held that it did not unambiguously disclose all the essential features of Claim 1.

(3) Concerning the question of inventive step, the decision under appeal started from an initially formulated technical problem to be solved vis-à-vis the closest state of the art, D1, relating to the provision of a styrene-butadiene rubber composition having a superior balance between rolling resistance and braking.

However, since no convincing evidence had been provided to show that this problem had been solved by means of the distinguishing feature or features, the Opposition Division reformulated the problem so as to relate to the provision of further rubber compositions, and found that it would have been obvious to the skilled person to test rubbers similar to those as known from D1. Consequently, it was held that the claimed subject-matter according to each of these requests did not involve an inventive step with respect to D1.

IV. On 15 January 2003, a Notice of Appeal was filed by the Patent Proprietor/Appellant against this "decision in its entirety". The prescribed fee was paid on the same date. In the Statement of Grounds of Appeal, received on 19 March 2003, the Appellant requested that the decision under appeal be set aside and that the patent in suit be maintained on the basis of those requests dealt with in the decision under appeal, ie the set of claims as granted, as the Main Request, or, in the alternative, on the basis of one of the sets of claims filed on 16 August 2002, as first to third Auxiliary Requests (section II (11), above).

(1) The Appellant pointed out that Claim 1 of the Main Request required (i) the SBR to have a T_g of from -25 to -50°C and to satisfy the equation $4.8X-Y \geq 32$ and (ii) the tread rubber composition as a whole to show two peaks in the tan δ-temperature-dispersion curve and to have a ΔT-value ≤ 10°C in order to provide tyres manufactured therefrom having a good balance between rolling resistance and wet grip characteristic. Moreover, several examples given in the patent in suit (Table 2) would, in comparison with the comparative examples, show how to compound SBR as required (cf. item (i), above) in order to obtain a composition fulfilling the above requirements as mentioned in item (ii), above. Hence, Article 83 EPC would be met.

(2) In regard of the reasons in the decision under appeal, the Appellant assumed that the Opposition Division had misinterpreted Claim 1, and pointed out that all features in this claim concerning the tan δ-temperature dispersion curve related to the rubber composition as a whole, but not to the SBR alone.

(3) With respect to the assessment of inventive step in the decision under appeal, the Appellant emphasised that each of the measurements of the rolling resistance and of the wet grip characteristics as given in the

examples was an index value relative to a reference value (set to "100" in each case) of a tyre made from the conventional tread rubber composition described in Comparative Example 5 of the patent in suit. As opposed to the comparative examples, wherein at least one of these properties was inferior to the above reference tyre, the examples in accordance with the claimed subject-matter showed, according to the Appellant, improved results in respect of both features. Therefore, the conclusion drawn by the Opposition Division was based on errors and misinterpretations, and it was, consequently, not justified.

V. The Respondent, however in a letter dated 25 July 2003, maintained its initial request. In particular, it reiterated its previous objections under Article 100(b) EPC. With respect to both items of Article 100(a) EPC at issue, novelty and inventive step, the Respondent supported the Opposition Division's assessment and disputed that they had clearly been based on misinterpretations of the claims.

(1) In particular, the Respondent maintained its previous opinion that the composition of Example 4 of D1 destroyed the novelty of the claimed subject-matter. Furthermore, the Respondent expressed its belief that the decision under appeal had been wrong, when it had held that the T_g of SBR-D could not be derived from D1. It rather believed that is was derivable that the T_g fell within the scope of D1 (paragraph bridging pages 6 and 7).

(2) Starting from a technical problem as to "furnish a tread rubber composition for tyres enabling the rolling

resistance to be decreased without lowering the grip characteristics of the tyre on a wet road surface", the Respondent argued that the first property was directly measurable by the tan $\delta|_{50\text{-}70}$-value, and went on to assert that the problem set out in the patent already appeared to have been solved by document D1, because the tan $\delta|_{60}$-value in Example 4 meant even an improvement over the tan $\delta|_{50}$-values in Examples 1 and 2 of the patent in suit. Accordingly, the Opposition Division had to ask what problem remained to be solved and identified it as "being to have a <u>balance</u> between rolling resistance and braking". It could, however, find no effect upon this balance which was due to the T_g, and came to the conclusion that there had been no inventive step (comments: page 5, last two paragraphs).

(3) The Respondent continued that there had been no experimental results showing that the assertion of the Patent Proprietor "selecting the correct values of T_g can produce a better balance between rolling resistance and braking properties (presumably meaning that both are increased)" was correct (page 6, paragraph 2).

(4) In any case, Example 4 of D1 was, according to the Respondent, closer to the claimed subject-matter than either of Comparative Example 2 and 5, because Example 4 had shown the correct value of 4.8X-Y and a bimodal distribution. Moreover, its ΔT-value was to be ≤ 10°C, and, as argued in the opposition proceedings, its tan $\delta|_{50}$-value fell within Claim 1. The poor performance in the two comparative examples of the patent in suit appeared "to be nothing to do with T_g. These examples do not demonstrate that the T_g selected solves any problem." (page 6, paragraph 6).

(5) In summary, the Respondent expressed the view that the conclusions in the decision under appeal had not clearly been based upon errors and misinterpretations. If any, they did not affect the conclusion reached.

VI. The Appellant disputed the above arguments of the Respondent in a further letter dated 18 February 2004.

(1) Thus, it emphasised that the Respondent had never shown that SBR-D of D1 satisfied all the features required in the patent in suit (such as the Tg and the ΔT-value in Example 4 of D1). The Declaration filed by the Respondent did not describe a repetition of that example, because it was based on SBR differing from SBR-D of D1 in its styrene and 1,2-bond contents.

(2) Nor had the Opponent/Respondent ever proved that the rubber composition of Example 4 in D1 showed a balance between rolling resistance and wet grip characteristics as good as the claimed rubber composition (page 6, paragraph 1). The measured grip and roll resistance values in the patent in suit and in D1 were based on different reference compositions, ie in the patent in suit on Comparative Example 5, in D1 on Comparative Example 1 (letter: page 4, paragraph 3) and could not, therefore, be compared with one another.

(3) The Respondent's assertion on the basis of individual parameter values in examples of D1 and of the patent in suit, that the technical problem had already been solved in D1, was disputed by the Appellant, who asserted inconsistencies between measured values provided in Table 2 of D1 and the

content of Figure 1 of this document and pointed out that the amounts of carbon black in those compositions had been different and that tan $\delta|_{50}$-values would be higher than tan $\delta|_{60}$-values (page 5).

(4) The decision under appeal was, in the Appellant's opinion, wrong, because D1 did not provide any guidance to test "similar" rubbers (section III, above, last paragraph). D1 referred not only to SBR-D, but also to SBR-C and SBR-E, all of which met the requirements of D1 and were used in its Examples 1 (see Appendix II, above). However, neither SBR-C nor SBR-E fulfilled the "equation", contrary to the comparative rubbers SBR-F and SBR-G mentioned in D1. These latter SB-rubbers even yielded compositions having bimodal tan δ-temperature curves, but lacking sufficient wet skid resistance. Moreover, rather than suggesting to the skilled person that the T_g would have any significance, D1 did not even mention the T_g of the SBR (page 6, paragraph 4).

In the Appellant's view, the patent in suit related to a solution, quite different from that of D1, of the technical problem of achieving sufficient wet skid resistance and adequate fuel saving. This difference was demonstrated by SBR-B as used in Examples 5 and 6 of the patent in suit. This rubber had a 1,2-bond content outside the range of from 60 to 73% required in D1, but solved the problem underlying the patent in suit (page 6, last line and page 7).

VII. In further letters dated 7 May 2004 and 22 September 2005, the Respondent reiterated its objection raised under Article 100(b) EPC.

Moreover, the Respondent relied again on D5, according to which it would be possible to calculate that the T_g of -25°C or less corresponded to the case where the ratio of 1,4-trans to 1,4-cis was 1.9:1 or less than 1.9:1. On the balance of probabilities, the ratio of 1,4-trans to 1,4-cis-butadiene would fall inside this range and, consequently, the T_g would also fall within the range defined in Claim 1. If, however, the above ratio were above 1.9:1 the calculation would give a higher T_g. "It appears to be beyond doubt that the glass transition temperature of SBRD of D1 will have a glass transition temperature which either falls within the claimed range of -25°C to -50°C or is above it." (last letter: page 2, lines 5 to 7).

VIII. Oral proceedings were held on 25 October 2005 in the presence of both parties. The essentials of the hearing and additional arguments can be summarised as follows:

(1) With regard to the meaningfulness of the T_g as used in the patent in suit and the disputed connection between the "equation" and the ΔT-value, the parties maintained their respective views.

(2) Thus, the Appellant argued that the T_g was often used for the characterisation of rubbers and well-known in this art. This was demonstrated eg by Claim 1 of the Respondent's own D3, requiring a polymer rubber to have a T_g of not lower than -50°C, without any indication of how the T_g was determined. However, the skilled person would know that this parameter was to be understood as being the result of the ASTM method. Whilst D4 referred to the measurement of T_g of a broad range of amorphous and crystalline materials in general, the ASTM-method

of Exhibit A was specifically designed for polymers, and from its item 10.2.2 the temperature program to be used was known. From item 10.2.7 and Figure 1, it was also clear that the extrapolated onset temperature T_f was more meaningful for most applications and "may be designated as the T_g temperature in place of the midpoint of the T_g curve". This was also confirmed by Exhibit B [page 440, chapter II.A.: "DTA and DSC provide identical information ..." and "DSC has become the preferred technique for elastomer studies"; page 444, below Table III: "T_{E0} is the extrapolated onset value obtained by ... (see Figure 2). T_{E0} is the most often quoted value for T_g and is generally reproducible ..."; NB.: T_{E0} corresponds to T_f in Exhibit A]. Moreover, Exhibits C and D gave the T_g-values of those commercially available SB-rubbers mentioned in the patent in suit, these values (indicated as being determined in accordance with ASTM) tallied well with the values in Table 1 of the patent in suit, and Exhibit E provided details (including a DSC curve measured on 5 July 2002) of the determination of the T_g of SBR 1500 as used in reference Comparative Example 5 of the patent in suit. Hence, T_g (in terms of a ASTM-measurement) was common general knowledge and the specification gave enough information in this respect.

As regards D5, the Appellant pointed out that the T_g was determined by dilatometry using an ethanol-water mixture (page 1582). It did not know whether the results of different methods of determination were in agreement with one another. Hence, Figure 4 on page 1586 of the document could not serve to support the Respondent's position that the G-T-equation of D5, would allow to reliably calculate the T_g of the SBR-D of Example 4 in D1. Rather, the Appellant argued that the T_g of butadiene-styrene copolymers was primarily a function of butadiene microstructure and of the amount and distribution of styrene in the polymer (page 1585, last paragraph). Neither the microstructure nor the distribution of the styrene were, however, known from D1. In the absence of this information, the G-T-equation could not, however, be used for the determination of the T_g.

(3) The Respondent stated, that it did not raise any further detailed objection with regard to T_g, and informed the Board, that no data were available to the Opponent about the relation between the results of the different experimental methods for the determination of the T_g. Nevertheless, in its view, the G-T-equation was a good model for the determination of the T_g, although the microstructure must be known when using it for the calculation of the T_g. In the further discussion, the Respondent conceded, however, not to have any information that the dilatometric method of D5 would be preferred for determining the T_g, and finally stated that it did not maintain an objection under Article 100(b) EPC with regard to T_g.

(4) With respect to the further feature of the claimed composition missing from D1, the Appellant referred to the "repetition" of Example 4 of D1 as submitted by the Opponent (section II (7), above) and argued that, although the composition in this "repetition" differed from the recipe used in the examples in the patent in suit by the SBR used (SBR-A of the patent in suit instead of SBR-D of D1), by the ratio of the two

rubbers used, by the use of a different carbon black in a different amount and by omission of antioxidant, a ΔT-value had been achieved as required by the claim. Nor had the Respondent submitted that it had suffered repeated failures when carrying out a multitude of such experiments. Hence, it was evident that the patent in suit contained enough information for carrying out the claimed subject-matter in the sense of Article 83 EPC.

(5) The Respondent reiterated its initial argument concerning the ΔT-value (see section II (4), above), that the only guidance of how to obtain the required ΔT-value would be found on page 3, lines 14 to 30 of the patent in suit. Moreover, there would be an inconsistency between the information in this passage of the description, that of paragraph [0014] and the results in Table 2 of the patent in suit. The Respondent also doubted that 20 to 30 parts by weight of the SBR in the composition would work.

(6) The Appellant, however, put emphasis on the argument that the effects achieved by the claimed subject-matter could not be attributed to a single feature of a single component, but that it was the whole rubber composition (optionally inclusive of any additives), which gave the desired result. Moreover, both requirements of the SBR must be fulfilled.

(7) Having regard to the issue of novelty vis-à-vis D1, the Appellant disputed that the SBR-D in Example 4 of D1 clearly and unambiguously had a T_g of $\leq$ -25°C. Nor could D5, in its opinion, provide the necessary information, since the microstructure of the rubber, namely the ratio of 1,4-trans- to 1,4- cis-bonds, was

unknown. The Respondent, however, had only argued on the basis of assumptions, this way of argument was not, however, appropriate for the assessment of novelty.

(8) The question of whether it knew, that the ratio of trans- to cis-configuration had been 1.9:1 or less in the SBR-D of D1 (cf. section VII, above, last paragraph), was answered by the Respondent in the negative. Nor could D6, which had additionally been mentioned by the Respondent to fill this gap, provide the missing information. It was withdrawn by the Respondent with regard to novelty.

(9) With reference to inconsistencies between the data in Example 1 and Figure 1 of D1, the Appellant denied that the tan $\delta|_{50}$-value could be unambiguously derived from a tan $\delta|_{60}$-value as provided in Table 2 of D1.

Whilst disputing that Figure 1 of D1 would allow to plot back to the facts in Example 4 of the document and maintaining that the tan $\delta|_{50-70}$-values would not be significantly different, the Respondent then argued on the basis of the values given for tan $\delta|_{0}$ and tan $\delta|_{60}$ in Table 2 of D1 that the tan $\delta|_{50}$-value in Example 4 would have, in any case, fulfilled the requirement of Claim 1, ie it would have been between 0.08 and 0.20. To this end, the Respondent presented a calculation of the tan $\delta|_{50}$-value on the basis of a straight line provided by the two data 0.475 (at 0°C) and 0.145 (at 60°C). This calculated value of 0.20 would in any case be higher than the real tan $\delta|_{50}$-value. This result was, however, disputed by the Appellant who criticised that too few data had been available.

(10) In D1 and the patent in suit, different measuring conditions had been used in the determination of the loss factors (D1: strain: 10±2%, frequency: 20 Hz, temperatures: 0°C and 60°C; patent in suit: strain 10±1.00%, frequency: 10 Hz, temperature: 50°C). It was not disputed by the parties that this had some influence of the results, but, according to the Appellant, the influence of the exact composition on the curve was higher. However, no reliable data were available in this respect to either party.

(11) Then neither party wished to comment further on novelty.

(12) Like the decision under appeal, both parties considered D1, in particular its Example 4, as representing the closest state of the art. However, the conclusions drawn by the Opposition Division, that no improvements had been achieved with regard to this document, was disputed by the Appellant, whilst the Respondent concurred therewith.

(13) In particular, the Appellant pointed out that a direct comparison between the results in Example 1 of the patent in suit with those in Example 4 of D1 was not possible due to different compositions (60 and 50 parts by weight of carbon black, respectively, and different measuring conditions). These differences were, according to the Appellant, decisive for the $\tan \delta|_{50}$-value.

Moreover, the results of the determinations of the rolling resistance and of the wet grip characteristics tested in these examples had been given as index values relative to measurements of these features at tread rubber compositions in Comparative Example 1 in D1 and Comparative Example 5 in the patent in suit. Due to these different reference compositions, no reliable conclusions would be possible. Hence, the decision under appeal was wrong in this respect.

The relevant technical problem was seen by the Appellant in the provision of a tread rubber composition showing a rolling resistance as low as possible together with, at the same time, an excellent wet grip characteristic. This problem would have been solved by the composition fulfilling all the features as defined in Claim 1 in combination.

In D1, ranges of the styrene and 1,2-bond contents in the SBR had been defined without any hint on the importance of the relation between these features. This was confirmed, in the Appellant's view, by the examples of D1. Thus, SBR-C, SBR-D and SBR-E in its Table 1 complied with the teaching of D1. Table 2 of D1 did not, however, indicate that the use of SBR-D, the only SBR meeting the requirements of the patent in suit, would provide better results than SBR-C or SBR-E (cf. section VI (4), above). Hence, D1 did not put special emphasis on SBR-D, nor did it suggest to use SB-rubbers having a particular T_g, let alone one within the range of between -25 and -50°C. Consequently, D1 itself could not, in the Appellant's view, make the subject-matter of the patent in suit obvious.

Like D1, D2 contained no hint either that the relation between styrene and 1,2-bond contents of the SBR used in those compositions would have any importance. D2 required only that the SBR (ie a "high vinyl amorphous butadiene-styrene copolymeric rubber") contained not less than 60 % by weight of 1,2-bond in the butadiene unit and 3 to 30 % by weight of styrene (D2: Claim 1) and recommended the T_g of this SBR to be -35 to 0°C (D2: column 3, lines 22 to 24).

Amongst those individual SB-rubbers (denoted A to E) in Table 1 of D2 which fulfilled the above requirements and also the T_g requirement of the claims at issue (-25°C to -50°C), only SBR-E also complied with the "equation". Example 5 in Table 3 of the document, being the only example wherein this SBR was used in combination with a diene rubber, however, showed no advantages over any other examples. Moreover, according to D2, the high vinyl amorphous SB-rubbers described therein were compatible with natural or synthetic polyisoprene rubbers (D2: column 3, line 53; column 4, lines 26 to 30). This meant, as explained in D1, that all the examples (D2: Table 2) contained compatible blends, which failed, however, fully to produce the beneficial effect of improving the tyre grip (D1: column 1, lines 45 to 59). The Appellant concluded therefrom that D1 and D2 presented diverging solutions and provided no incentive to combine their teachings.

As in the passage of D1, mentioned in the previous paragraph, the use of high vinyl amorphous SBR, which was also addressed in D3 (page 2, line 24 *et seq.*), did not yet provide sufficiently "low values recently required for the rolling resistance" (D3: page 2, line 31). The solution for achieving a combination of good wet grip and low rolling resistance found in D3 was the addition of 10 to 150 parts by weight (pbw) of a silica filler, 0 to 150 pbw of carbon black, and 0.2 to 10 pbw of at least one silane coupling agent of a specific chemical formula to 100 pbw of a polymer rubber having a T_g of not lower than -50°C obtained by polymerisation of 1,3-butadiene or copolymerisation of 1,3-butadiene and styrene with an organic alkali metal initiator, or a rubber blend of $\geq$30 pbw of such a rubber and $\leq$70 pbw of another diene series rubber (Claim 1). In a further alternative, the above butadiene or butadiene-styrene rubber was itself further modified by terminal silane groups. No reference was, however, made in D3 to the relation between the styrene and 1,2-bond contents. This led the Appellant to argue that the document would have guided the skilled reader to orientate itself in a completely different direction. Nor would a combination of D1 and D3, in any case, have led the skilled person to the claimed subject-matter.

(14) The Respondent saw three "candidate distinctions" between D1 and the patent in suit: the T_g and the ΔT- and tan $\delta|_{50}$-values. The slight deviation of the T_g of the SBR used in Comparative Example 2 (-23°C instead of $\leq$-25°C) did not, in the Respondent's view, convincingly demonstrate that the T_g would have an effect, because the value of -23°C lay, according to Exhibit A, within the error margin of -25°C. Nevertheless, this comparative example was not accepted by the Respondent as a valid comparison to Examples 1 or 5, due to a different amount of oil (24 pbw instead of 18 or 16 pbw used in those examples).

As regards the technical problem solved by the feature ΔT-value, the Respondent argued that Example 4 of D1 was closer to the claimed subject-matter than Comparative Example 1 of the patent in suit, because its ΔT-value would not have been in the range of 20°C, even if its SBR would have had a T_g (as calculated by means of D5) slightly higher than -25°C. According to page 3, line 14 *et seq.* of the patent in suit, it could rather be expected that the ΔT-value in Example 4 of D1 was below 10°C.

Concerning the third candidate distinction, the Respondent set out that it had been common general knowledge to reduce the carbon black content and, by doing so, the tan $\delta|_{50}$ in order to avoid a high rolling resistance. Therefore, the comparison of Comparative Example 6 and Example 1 of the patent in suit confirmed only common general knowledge.

In summary, the Respondent concluded that Claim 1 did not solve any technical problem with regard to D1.

Moreover, the Respondent took the view that the teaching of Claim 1 did not exclude ΔT-values close or equal to 0°C, thus, giving rise to the question of whether there was only one peak or a couple of peaks and, thus, making the discussion about compatibility and incompatibility moot.

(15) The Appellant pointed out that the features of Claim 1 must not be considered separately, because it was their combination which led to the solution of the technical problem. The examples in the patent in suit demonstrated that their results had been clearly better than those achieved in the comparative examples.

With regard to the number of peaks in the loss factor-temperature dispersion curve of the claimed composition, the Appellant referred to the fact that Claim 1 required it to be bimodal ("having two peaks").

Finally, it took the view that the Respondent as the opponent had not discharged its burden of proof to demonstrate that its allegation had been true that no technical problem had been solved.

Then the discussion was closed, since both parties had indicated that did not want to further comment on inventive step.

IX. The Appellant requested that the decision under appeal be set aside and that the patent be maintained as granted (Main Request) or in the alternative on the basis of one of the Auxiliary Requests 1 to 3 as filed with letter of 16 August 2002.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Interpretation of the claims*

Before turning to the substantive matters, it appears to the Board to be necessary to interpret Claim 1 as such, in particular with regard to the meaning of the individual features defined in this claim, namely in view of objections, interpretations and statements of the parties and in the decision under appeal (cf. the decision under appeal: No. 3.2ai.3 of the reasons; sections II (1), VIII (5), (14) and (15), above).

2.1 The claim relates to a tread rubber composition for tyres comprising rubber components and optionally, according to the description, further additives (paragraph [0016]; see also the table before paragraph [0020]). The rubber components, assumed to be 100 parts by weight (pbw), consist of 20 to 80 pbw of a diene rubber and 80 to 20 pbw of one or more SB-rubbers.

Subsequently, the claimed subject-matter is further explained in Claim 1 in terms of parameters and properties, some of which are those of the SBR, whilst the others clearly concern the composition as a whole.

2.1.1 Thus, the SBR component is characterised by the T_g and the relation between the styrene (X) and 1,2-bond (Y) contents required to satisfy the equation $4.8X - Y \geq 32$ and ≥ 70, respectively (sections I and II (11), above).

2.1.2 One requirement for the composition as a whole is the tan δ-temperature dispersion curve having two peaks, another one is the $\tan \delta|_{50}$ being from 0.08 to 0.20. Furthermore, the temperature difference (ΔT-value) between (i) the peak at the highest temperature on the above dispersion curve (ie the curve of the rubber composition as claimed) and (ii) the single peak on the corresponding curve of a rubber composition differing from the above composition (as in (i)) only in that it contains the same SBR *as the sole rubber component* must not exceed 10°C (section II (3), above; patent in suit: paragraph [0010]).

2.2 Hence, an interpretation of the passage relating to the ΔT-value in the decision under appeal (No. 3.2ai.3 of the reasons) reading "It was explained that D1 discloses two peaks of tan δ over temperature. However, there is no explicit disclosure in D1 of the temperature difference between the peaks." as meaning different peaks on the curve of one composition has no basis in the claim.

2.3 In order to support its objection of lack of novelty with regard to Example 4 of D1 (which discloses neither of the parameters, below), the Respondent assumed that, according to the patent in suit, (i) a T_g below -25°C was "required to give the tan δ in the range 50°C to 70°C" and that (ii) meeting the requirement concerning the "equation" would automatically mean that the ΔT-value was within 10°C (Notice of Opposition, reasons for lack of novelty vis-à-vis D1: page 3, paragraph 8 and page 4, penultimate paragraph; sections II (2) to (4), above).

This interpretation of the two passages in the description by the Respondent requires, however, that there is, in each of the two cases, a 1:1 correlation between one feature of the SBR and one particular property of the composition prepared therewith, irrespective of other features and properties.

The above interpretation of the two passages of the description, mentioned above, by the Respondent is, however, not convincing for the following reasons:

2.3.1 On the one hand, Example 1 and Comparative Example 6 of the patent in suit show the influence of a change of the amounts of carbon black and oil (ie additives in the sense of paragraph [0016], cf. section 2.1, above) on the tan $\delta|_{50}$ in otherwise identical compositions. In a different context, the Respondent itself argued that the skilled person had been aware of such an influence of further components on the properties of the compositions, when it criticised Comparative Example 2 as being without merit as a comparison to Examples 1 and 5, because of the different amounts of oil (section VIII (14), above).

2.3.2 Moreover, according to D1 (column 2, lines 42 to 60), the tan δ-peak on the high-temperature side of SBR having "too much 1,2-bond" (ie more than 73%, cf. lines 44/45) "tends to shift toward a low-temperature side" and to give a monomodal curve, as opposed to a blend "of an incompatible nature taking advantage of a high-temperature peak of SBR" on the grip properties. These statements in the prior art are clearly contrary to the above assumption of the Respondent concerning the ΔT-value.

2.3.3 On the other hand, however helpful it might have been in view of the above statements in the prior art, no evidence, which unambiguously supported its above assumptions, has been submitted by the Respondent, on whom the onus of proof for its allegations had lain. This burden has, however, not been discharged by the Respondent.

2.3.4 Consequently, the above interpretation, by the Respondent, of the two passages of the description cannot be taken by the Board for granted.

2.4 Nor can the Board concur with the initial suggestion of the Opponent (section II (1), above) to disregard the T_g of the SBR, because it is, as demonstrated by the Appellant (section VIII (2), above) and by D2 (Claims 1 and 2; column 3, line 22 *et seq.*), a parameter which is well-known to the person skilled in this art and often used to characterise rubbers, even without identifying the method of its determination, as confirmed by the Respondent's own document D3 (D3: Claim 1 and page 5, lines 17 to 19).

This point of view is also supported by the fact that the T_g-data of the commercial SB-rubbers in Exhibits C, D and E tally well with the T_g-data of the same rubbers given in the patent in suit, thus confirming the arguments of the Appellant in this respect. According to these arguments, additionally supported by Exhibits A and B (section II (10), above), the ASTM method has been the usual method of determination of the T_g in this art. The arguments of the Appellant in this respect (section VIII (2), above) are accepted by the Board.

Apart from this finding, the Board concurs with the acknowledgement in the Notice of Opposition, that this objection referred to clarity, which is not a ground for opposition (Article 100 EPC).

3. *Problem and solution*

The patent in suit concerns tread rubber compositions comprising blends of diene rubber and SBR and having two peaks on their tan δ-temperature dispersion curve.

3.1 Document D1 discloses such a composition of "an incompatible nature" comprising (a) natural rubber or synthetic polyisoprene rubber or both having a cis content of not less than 80% and (b) SBR having a styrene content of from 5% to 50% and a 1,2-bond content in the range of 60% to 73%, the SBR resulting from solution polymerisation in the presence of an organic lithium compound. The known composition has a bimodal loss factor-temperature curve as determined by dynamic viscoelasticity (Claim 1; column 2, lines 3 to 14 and 58 to 60). The importance of the 1,2-bond content on this curve and on the tyre properties have already been addressed in section 2.3.2, above.

3.1.1 The document aims at the provision of a rubber composition suitable for tread formation which excels in skid resistance on dry and wet roads and also in fuel economy by providing a good balance of loss factors, higher tan δ at about 0°C and lower tan δ at from 50 to 70°C, at from 10 to 30 Hz (D1: column 1, line 66 to column 2, line 2 in conjunction with column 1, lines 32 to 37 and column 2, lines 56 to 68).

3.1.2 In its examples and comparative examples, seven different SB-rubbers were used, denoted SBR-A to SBR-G. All these SB-rubbers had a styrene content within the above range of 5 to 50%; however, only SBR-C, SBR-D, and SBR-E fulfilled the other requirement of D1 of 60 to 73% of 1,2-bond content:

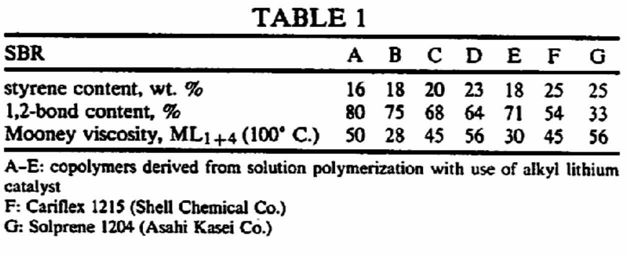


TABLE 1

SBR	A	B	C	D	E	F	G
styrene content, wt. %	16	18	20	23	18	25	25
1,2-bond content, %	80	75	68	64	71	54	33
Mooney viscosity, ML_{1+4} (100° C.)	50	28	45	56	30	45	56

A-E: copolymers derived from solution polymerization with use of alkyl lithium catalyst
F: Cariflex 1215 (Shell Chemical Co.)
G: Solprene 1204 (Asahi Kasei Co.)

Consequently, Examples 1 to 7 of D1 were based on the use of these SB-rubbers (see Table 2, below). However, from Table 1, it can furthermore be derived, but only in the knowledge of the patent in suit, that the condition of the "equation" was only fulfilled by SBR-D (46.4), and *comparative* rubbers SBR-F (66.0) and SBR-G (87.0).

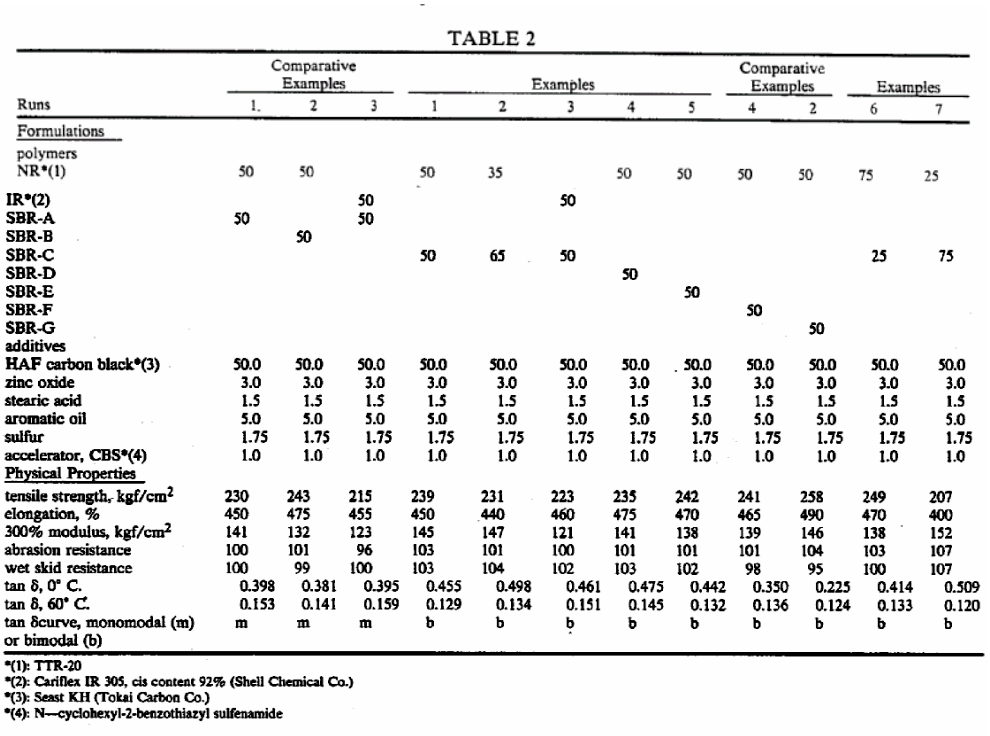


TABLE 2

	Comparative Examples			Examples					Comparative Examples		Examples	
Runs	1.	2	3	1	2	3	4	5	4	2	6	7
Formulations												
polymers												
NR*(1)	50	50		50	35		50	50	50	50	75	25
IR*(2)			50			50						
SBR-A	50		50									
SBR-B		50										
SBR-C				50	65	50					25	75
SBR-D							50					
SBR-E								50				
SBR-F									50			
SBR-G										50		
additives												
HAF carbon black*(3)	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
zinc oxide	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
stearic acid	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
aromatic oil	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
sulfur	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
accelerator, CBS*(4)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Physical Properties												
tensile strength, kgf/cm^2	230	243	215	239	231	223	235	242	241	258	249	207
elongation, %	450	475	455	450	440	460	475	470	465	490	470	400
300% modulus, kgf/cm^2	141	132	123	145	147	121	141	138	139	146	138	152
abrasion resistance	100	101	96	103	101	100	101	101	101	104	103	107
wet skid resistance	100	99	100	103	104	102	103	102	98	95	100	107
tan δ, 0° C.	0.398	0.381	0.395	0.455	0.498	0.461	0.475	0.442	0.350	0.225	0.414	0.509
tan δ, 60° C.	0.153	0.141	0.159	0.129	0.134	0.151	0.145	0.132	0.136	0.124	0.133	0.120
tan δcurve, monomodal (m) or bimodal (b)	m	m	m	b	b	b	b	b	b	b	b	b

*(1): TTR-20
*(2): Cariflex IR 305, cis content 92% (Shell Chemical Co.)
*(3): Seast KH (Tokai Carbon Co.)
*(4): N—cyclohexyl-2-benzothiazyl sulfenamide

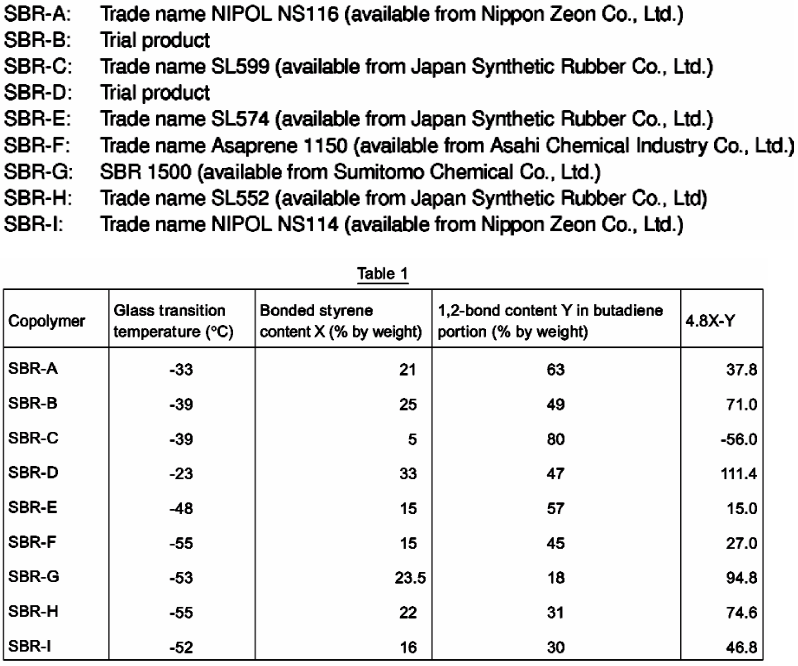
The wet skid and abrasion resistances in the table were evaluated relative to the composition of Comparative Example 1, wherein the reference values for these two properties had been set to "100" and whereby, in the examples and all the other comparative examples, a higher value represented a better result, and *vice versa*.

Further details of the examples are not disclosed in D1. Nor has it been disputed between the parties, that in D1 no mention is made at all of the T_g and of the requirement, that the ΔT-value must not exceed 10°C. The issue of whether the tan $\delta|_{60}$-values in the table can validly substitute the tan $\delta|_{50}$-value required in Claim 1 will be dealt with below.

3.2 According to paragraph [0008] of the patent in suit, the technical problem to be solved by the patent in suit may be seen in the provision of a tread rubber composition for tyres enabling the rolling resistance to be decreased without lowering the grip characteristics of the tyre on the wet road surface, whilst, up to then, it had not yet been possible to obtain a "tread rubber both lowering the rolling resistance and enhancing the grip characteristics on the wet road surface" at the same time (patent in suit: paragraphs [0003] to [0007]). In the oral proceedings before the Board, the Appellant saw the technical problem in the provision of rubber composition for tyre treads showing, at the same time, (i) a rolling resistance being as low as possible and (ii) an excellent wet grip characteristic.

3.2.1 As mentioned in section III (3), above, the technical problem underlying the claimed subject-matter had been reformulated in the decision under appeal as relating to the provision of further rubber compositions, because, according to the decision, no convincing evidence had been provided to show that a superior balance between rolling resistance and braking had, in fact, been achieved. Moreover, the Respondent even disputed that that there had been a technical problem at all, which had been solved by any one of the features which it addressed in the oral proceedings as "three candidates for a distinction", ie the T_g, the ΔT- and the $\tan \delta|_{50}$-values. Rather, in its opinion, even better $\tan \delta|_{50}$ results had been obtained in D1 than in the examples of the patent in suit.

3.2.2 In the patent in suit, the experiments (the results of which are shown in Table 2, below) had been based on SB-rubbers which had the following particulars:



SBR-A:	Trade name NIPOL NS116 (available from Nippon Zeon Co., Ltd.)
SBR-B:	Trial product
SBR-C:	Trade name SL599 (available from Japan Synthetic Rubber Co., Ltd.)
SBR-D:	Trial product
SBR-E:	Trade name SL574 (available from Japan Synthetic Rubber Co., Ltd.)
SBR-F:	Trade name Asaprene 1150 (available from Asahi Chemical Industry Co., Ltd.)
SBR-G:	SBR 1500 (available from Sumitomo Chemical Co., Ltd.)
SBR-H:	Trade name SL552 (available from Japan Synthetic Rubber Co., Ltd)
SBR-I:	Trade name NIPOL NS114 (available from Nippon Zeon Co., Ltd.)

Table 1

Copolymer	Glass transition temperature (°C)	Bonded styrene content X (% by weight)	1,2-bond content Y in butadiene portion (% by weight)	4.8X-Y
SBR-A	-33	21	63	37.8
SBR-B	-39	25	49	71.0
SBR-C	-39	5	80	-56.0
SBR-D	-23	33	47	111.4
SBR-E	-48	15	57	15.0
SBR-F	-55	15	45	27.0
SBR-G	-53	23.5	18	94.8
SBR-H	-55	22	31	74.6
SBR-I	-52	16	30	46.8

(This version of Table 1, which differs from the version in the printed patent specification only by the headings of the last two columns, was taken from the application as published, in order to avoid the printer's error in the printed patent specification.)

The further ingredients of the compositions exemplified in the examples and comparative examples of the patent in suit were natural rubber, carbon black and aromatic oil in amounts indicated in Table 2, below, and the following amounts of further additives in terms of parts by weight: stearic acid 2, ZnO 3, antioxidant 1, accelerator (CBS as in D1, above) 1 and sulphur 1.75 (patent in suit: the table at the top of page 4).

The indices of the "Characteristics of tire" in Table 2 are based on the reference value, set to 100 for each of the grip property and the rolling resistance in Comparative Example 5. A higher value represents a better result, and *vice versa*.

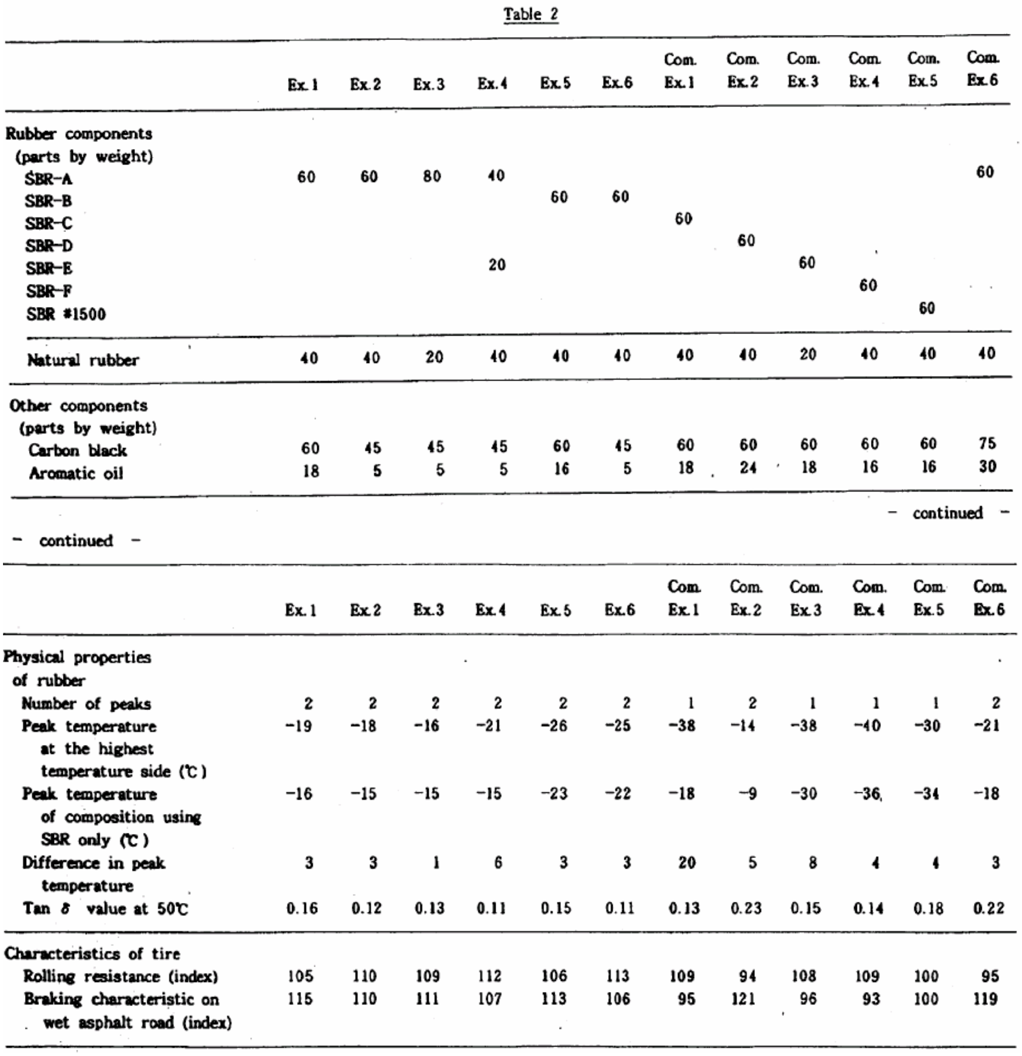


Table 2

	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6	Com. Ex.1	Com. Ex.2	Com. Ex.3	Com. Ex.4	Com. Ex.5	Com. Ex.6
Rubber components (parts by weight)												
SBR-A	60	60	80	40								60
SBR-B					60	60						
SBR-C							60					
SBR-D								60				
SBR-E				20					60			
SBR-F										60		
SBR #1500											60	
Natural rubber	40	40	20	40	40	40	40	40	20	40	40	40
Other components (parts by weight)												
Carbon black	60	45	45	45	60	45	60	60	60	60	60	75
Aromatic oil	18	5	5	5	16	5	18	24	18	16	16	30
Physical properties of rubber												
Number of peaks	2	2	2	2	2	2	1	2	1	1	1	2
Peak temperature at the highest temperature side (℃)	-19	-18	-16	-21	-26	-25	-38	-14	-38	-40	-30	-21
Peak temperature of composition using SBR only (℃)	-16	-15	-15	-15	-23	-22	-18	-9	-30	-36,	-34	-18
Difference in peak temperature	3	3	1	6	3	3	20	5	8	4	4	3
Tan δ value at 50℃	0.16	0.12	0.13	0.11	0.15	0.11	0.13	0.23	0.15	0.14	0.18	0.22
Characteristics of tire												
Rolling resistance (index)	105	110	109	112	106	113	109	94	108	109	100	95
Braking characteristic on wet asphalt road (index)	115	110	111	107	113	106	95	121	96	93	100	119

3.2.3 This means, however, that different compositions were used as reference for the evaluation in the experimental results in the respective Tables 1 and 2 of D1 and the patent in suit (sections VI (2), 3.1.2 and 3.2.2, above). Additionally, the Appellant underlined that the experimental results in D1 and the patent in suit could not be compared, because of the different amounts of carbon black having a significant effect on the properties of the respective compositions, namely higher tan $\delta|_{50}$-values (and higher rolling resistance) resulting from higher contents of carbon black. Neither of these facts (different reference, different contents of carbon black) has been disputed by the Respondent.

Consequently, comparing an index value of a given relevant characteristic in Table 2 of D1 with an index value in Table 2 of the patent in suit cannot give a meaningful result. This becomes even clearer when comparing the SB-rubbers in both reference examples, ie SBR type "A" of D1, which was a copolymer "derived from solution polymerization with use of alkyl lithium catalyst", for which X- and Y-values and the Mooney viscosity are given, but no T_g, and "SBR 1500" (SBR-G) in the patent in suit. As very clearly shown in the Opponent's Appendix II (section II, above), these SB-rubbers are significantly different from each other.

3.2.4 Furthermore, the compositions used in the examples of D1, namely in its Example 4 to which particular reference had been made by the Respondent, differ from those in the examples in the patent in suit not only by the amount of carbon black (section 3.2.3, above), but also by the absence of an antioxidant in D1. Nor does D1 provide any information as to the T_g of the SB-rubbers used therein (sections 3.1.2 and 3.2.2, above).

3.2.5 Therefore, the discussion between the parties of whether Figure 1 of D1, as argued by the Appellant, indicated that the determination of the tan δ of such compositions at 60°C tended to result in lower tan δ-values than the corresponding tan $\delta|_{50}$-values or, in the end, whether tan $\delta|_{50}$- and tan $\delta|_{60}$-values can directly be compared with each other is moot.

Even though the amount of the carbon black in the composition, according to the Appellant, has a greater effect on the resulting tan $\delta|_{50}$-values, this assessment is further complicated by the fact that the measurements of the loss factor in D1 and the patent in suit were furthermore carried out not only at different temperatures, but also at different frequencies and with different strain (section VIII (10), above; patent in suit: paragraph [0025]; and D1: column 4, lines 19 to 23).

3.2.6 In view of these facts, arguments and findings, the Board takes the view, that there is no common ground between the experiments in D1 and in the patent in suit which would have allowed to compare the data of the tyre characteristics as given in both Tables 2, above.

3.2.7 In view of this lack of comparability of the above experimental results, the argument of the Respondent that no technical problem was solved by the patent in suit, because the desired results had already been obtained in D1, is not convincing and, consequently, cannot be accepted by the Board.

Nor, in view of all the differences mentioned above, can the Board accept that Example 4 of D1 would allow to draw any conclusions to the effect that the relevant technical problem as considered in the patent in suit (section 3.2, above) was not solved by the subject-matter of Claim 1 of the patent in suit.

3.2.8 On the contrary, the patent in suit itself contains comparative examples which can be compared with its examples and which demonstrate the influence of the features defined in Claim 1. Thus, the SB-rubbers used in Comparative examples 1, 3 and 4 did not fulfil the "equation", those used in Comparative examples 2, 4 and 5 had a T_g outside the required range. Comparative example 6, although based on the same constituents as Example 1 gave too high a tan $\delta|_{50}$-value due to the higher contents of carbon black and aromatic oil. In each of these comparative examples the results were inferior to those in the examples of the patent in suit.

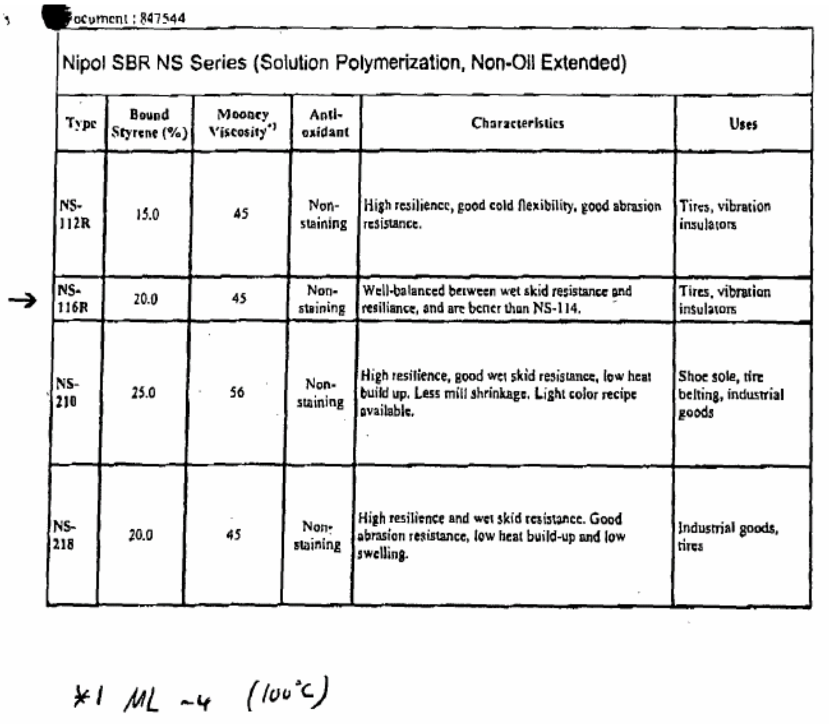
Moreover, at least Comparative Example 5 can be seen as a comparison to the usual prior art tyres on the basis of commercial SBR (see paragraph [0031] of the patent in suit).

Therefore, the Board cannot concur with the Opposition Division and the Respondent that no evidence for the solution of the technical problem as suggested by the Appellant and by the patent in suit had been provided.

3.2.9 Rather the Board takes the view that it would have been the Respondent who, as the Opponent, should have demonstrated, eg by providing data comparable with each other, that no improvement had been achieved by the claimed subject-matter over the properties of D1.

However, this burden of proof has not been discharged by this party.

3.2.10 Thus, the experimental report (Declaration of Mr Nakamura; section II (7), above) submitted by this party "In order to test the formulation of Example 4 of E1" (= D1) was not based on the SBR-D as defined in D1 (section 3.1.2, above, Table 1), but on the "commercially available material Nipol NS116 available from NIPPON ZEON Co LTD", see page 2, items A.6 and B.1 of the "WRITTEN SUBMISSIONS …" accompanying the report and the copy of "Document: 847544" also filed therewith and mentioned in item 6 of the Declaration:



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Nipol SBR NS Series (Solution Polymerization, Non-Oil Extended)

Type	Bound Styrene (%)	Mooney Viscosity^{*1}	Anti-oxidant	Characteristics	Uses
NS-112R	15.0	45	Non-staining	High resilience, good cold flexibility, good abrasion resistance.	Tires, vibration insulators
→ NS-116R	20.0	45	Non-staining	Well-balanced between wet skid resistance and resiliance, and are better than NS-114.	Tires, vibration insulators
NS-210	25.0	56	Non-staining	High resilience, good wet skid resistance, low heat build up. Less mill shrinkage. Light color recipe available.	Shoe sole, tire belting, industrial goods
NS-218	20.0	45	Non-staining	High resilience and wet skid resistance. Good abrasion resistance, low heat build-up and low swelling.	Industrial goods, tires

*1 ML -4 (100°C)

In view of the inconsistencies concerning (i) the nomenclature of the SBR used in the Declaration (ie items 4 and 5: NS116; item 6: NS-116R, respectively) and (ii) the T_g-values reported, on the one hand, for NS-116R in this document (-25°C) and, on the other hand, for NS116 in the patent in suit (-33°C) (section 3.2.2, above), the Board can, at most, assume that the SBR used in the experiment of the Declaration was identical to SBR-A as identified in the patent in suit. This assumed identity has not been disputed by either party. From the additions made by the Opponent (on the basis of Table 1 of D1) in Appendix II (section II, above) to the Figure 8 of the patent in suit (which was based on Table 1 of the patent in suit), it is, however, evident that SBR-A of the patent in suit was clearly different from SBR-D used in Example 4 of D1 (cf. section 3.2.3 and both Tables 1 in sections 3.1.2 and 3.2.2, all as above).

3.2.11 Consequently, the experiment in the Declaration cannot provide any features to remedy the deficiency of Example 4 of D1 in respect of missing data relative to the compositions as defined in the patent in suit (*viz.* the T_g of the SBR-D used therein), let alone support the Respondent's view that the claimed subject-matter would not solve any technical problem which had not yet been overcome by D1 (sections 3.2.1 and 3.2.7, above).

3.3 In view of these facts and findings, the Board has, therefore, come to the conclusion that the technical problem as suggested by the Appellant has credibly been solved by a composition as defined in Claim 1 of the patent in suit. Consequently, the relevant technical problem to be considered in the assessment of inventive step is the one, mentioned in section 3.2, above.

Main Request

4. *Novelty*

4.1 Although having raised novelty objections in the Notice of Opposition with regard to D1, D2 and D3, the Respondent neither commented on the findings in the decision under appeal that neither D2 nor D3 anticipated the claimed subject-matter, nor did it maintain the novelty objections with respect to D2 and D3 in reply of a question to this end in the oral proceedings before the Board. The Board does not see any reason to take a different view with regard to D2 and D3 either.

4.2 The objection of lack of novelty with regard to D1 was, however, further pursued by the Respondent, who additionally referred to the G-T-equation of D5 (section VII, above, paragraph 2), in order to remedy one of the deficiencies of D1, as mentioned in the decision under appeal (section III (2), above,) ie the missing disclosure of the T_g-value. In view of the arguments of the parties in sections VIII (2) and (3), above, and of the Respondent's own statements in section VII, above, paragraph 2, the G-T-equation does not, however, provide, on the basis of the available data in D1, the information, that the T_g-requirement of Claim 1 would clearly and unambiguously be met by the compositions of D1.

Rather, the Respondent has never shown that any one of the SB-rubbers in D1, in particular SBR-D in its Example 4, fulfilled all the requirements of Claim 1 under consideration (cf. section VI (1), above).

Nor has evidence been presented by the Respondent, who as the Opponent had the burden of proof for its assertions, that the requirement of ΔT being $< 10°C$ in Claim 1 was inevitably fulfilled by a tread rubber composition comprising SBR in compliance with the "equation". Any such statement would, anyway, be contrary to statements in D1 (see section 2.3.1, above).

Nor has the Respondent disputed that SBR-A, as used in some examples of the patent in suit and as a substitute for "SBR-D" of Example 4 of D1 in the Declaration to provide the above missing features, is different from SBR-D (sections II (7) and 3.2.10, above). This finding alone renders the declaration useless for the purpose of proving lack of novelty by Example 4 of D1.

Consequently, neither D1 as a whole nor its Example 4, in particular, anticipates the subject-matter of Claim 1 of the patent in suit.

4.3 In view of these findings, in combination with those in section 4.1, above, it follows, therefore, that the subject-matter of Claim 1 meets the requirements of Article 54 EPC. By the same token, this is also valid for the elaborations as defined in the dependent claims.

5. *Inventive step*

It remains to be decided whether the solution of this problem, as claimed, derives in an obvious way from cited documents.

5.1 Like the parties and the Opposition Division, the Board also considers D1 as representing the closest state of the art. In particular, both parties relied on Example 4 of the document, because it was the only passage describing a tread rubber composition having a bimodal loss factor-temperature curve and including SBR fulfilling the condition of the "equation".

5.1.1 Besides SBR, a second rubber component, which is natural and/or synthetic polyisoprene rubber, is required to be present in the composition as defined in Claim 1 of the document. The specific requirements to be met by this known composition are the second rubber component to have a cis content of not less than 80%, and the composition as a whole to have a bimodal loss factor-temperature curve as determined by dynamic viscoelasticity (as opposed to a monomodal curve meaning "a curve designating a compatible rubber blend"; D1: column 2, lines 47/48). As already pointed out in the decision under appeal and not disputed by the parties, D1 is, however, absolutely silent about the T_g, the ΔT- and the $\tan \delta|_{50}$-values.

Moreover, as shown in sections 3.2.3 to 3.2.6, above, the compositions of Example 4 in D1 and of Example 1 in the patent in suit were also different and, in each of the patent in suit and D1, the values used to demonstrate the wet grip characteristic and rolling resistance of the subject-matter in accordance with the respective claims were given as index values relative to different reference examples. Hence, there has been no common ground for a direct and meaningful comparison of the experimental results in the patent in suit and in D1 (cf. also the Appellant's comments in section VIII (13), above).

5.1.2 On the basis of these findings, the Board has come to the conclusion that there was neither a basis for replacing the technical problem as suggested in paragraph [0008] of the patent in suit (section 3.2, above) by the less ambitious version as used in the decision under appeal (section III (3), above), nor a basis for the assumption that the relevant technical problem had not been solved (sections 3.2 to 3.3, above).

5.1.3 The Respondent approached the question of inventive step on the basis of an analysis of features, identifying "three candidate distinctions" between D1 and the patent in suit (section VIII (14), above). Such an approach is, however, clearly based on inappropriate hindsight.

5.1.4 Moreover, D1 provides no suggestion that, by modification of certain features of its composition, a solution to the relevant problem might be found, let alone is any hint derivable therefrom as to which of the features of the known composition could or should be modified for this purpose.

In particular, nowhere in D1, can the slightest hint be found that a T_g of the SBR within a particular range and in combination with the further properties required by Claim 1, *viz.* a particular ratio between the styrene and 1,2-bond contents in accordance with the "equation", thereby avoiding a ΔT-value of >10°C, would be essential for the solution of the relevant technical problem. Nor does Example 4 of D1 provide additional information to this end (cf. sections VIII (4), (5) and (8), above). For the reasons given in sections 3.2.7 and 3.2.8, above, it provides, in the Board's view, even less information than the comparative examples of the patent in suit.

Hence the Respondent's argument that this example would be closer to the claimed subject-matter than any one of the comparative examples in the patent in suit is neither convincing, nor does it change the situation that certain features essential to the claimed subject-matter are clearly missing from D1. Nor are these features foreshadowed in or by this document.

5.1.5 Therefore, D1 itself does not render the solution of Claim 1 obvious.

5.2 As argued by the Appellant (section VIII (13), above), D2 does not disclose, either, that the relation between the styrene and 1,2-bond contents of the SBR might be important for the solution of the relevant technical problem.

5.2.1 Apart from the additional presence of dienic rubber having a T_g <-60°C, D2 requires the SBR to contain styrene in amounts of from 3 to 30, preferably not more than 10 % by weight (X) and not less than 60, preferably more than 80 to 95 % by weight of 1,2-bonds (Y). When considering these preferred ranges, it becomes clear that this document points in a specific direction, namely to the use of "high vinyl" SBR. More particularly, D2 teaches clearly away from the solution of the patent in suit, because the requirement of the "equation" requiring a certain *minimum* X-value for each Y-value or, *vice versa*, a *maximum* Y-value for each X-value, cannot be derived from the document.

5.2.2 Such high vinyl or vinyl-rich SBR is referred to in D1 as suffering from deficiencies in respect of the rolling resistance and wet grip, *viz.* "because too much 1,2-bond renders the rubber blend compatible" (D1: column 1, lines 45 to 59; section 2.3.1, paragraph 2). Such blends give monomodal loss factor-temperature curves and reduced grip expressed in terms of a reduced $\tan \delta|_0$ (D1: column 2, lines 46 to 55). Reference can be made in this context to the patent in suit (page 3, lines 14 to 20).

5.2.3 In these circumstances, the Board cannot see any convincing argument for why it should follow plainly and logically from D2 that and how the teaching of D1 should/could be modified in order to solve the relevant technical problem, let alone for achieving this goal by means of something falling within the terms of Claim 1.

5.2.4 The above finding in respect of D2 is further supported by D3 which, like D1, discourages to use vinyl-rich SB-rubbers for this purpose (page 2, lines 24 to 31).

5.3 Instead, D3 suggests a solution completely different from the one in Claim 1 of the patent in suit for obtaining tread rubber compositions having good rolling and wet grip properties.

5.3.1 As referred to by the Appellant and undisputed by the Respondent, its solution was based on the mandatory use of particular amounts of specific additives in combination with one or two rubbers having a T_g not lower than -50°C (see last paragraph of section VIII (13), above). The rubber(s) *may comprise* an (furthermore optionally silane-modified) SBR (page 3, lines 12 to 19), which was not required to have a T_g within the range of the patent in suit, nor was the composition required to fulfil the requirements of the "equation", of the ΔT- and of the tan $\delta|_{50}$- values as defined in the patent in suit (cf. the tables of its examples).

5.3.2 In view of this teaching, the Board cannot see which features of D3 should be used in isolation from the other mandatory features of its claimed subject-matter and contrary to its teaching to modify the teaching of D1. It follows therefrom, that this document does not provide any incentive either to modify the composition of D1 in a particular way in order to solve the relevant problem and so to arrive plainly and logically at something within the terms of Claim 1 of the patent in suit.

5.4 No arguments on the basis of the other documents D4 to D6 have been provided by the parties with regard to inventive step. Nor does the Board see any reason why any one of these documents should be relevant in this respect.

5.5 In view of the above facts, arguments and findings, the Board has, therefore, come to the conclusion that the subject-matter of Claim 1 is based on an inventive step.

By the same token, this is also valid for the elaborations in the dependent claims.

5.6 Consequently, the requirements of Articles 52, 54 and 56 EPC are met by the Main Request.

6. *Article 100(b) EPC*

As mentioned in sections II (4) to (6), above, the basis for this ground for opposition are conditional objections of the Respondent in support of its novelty objection to the effect that, if it was found that tan δ depended not only on the T_g and if it was not accepted the ΔT-value is the inevitable result of the compliance with the "equation", then there was insufficient disclosure.

These arguments relate to the meaning of explanations given in the description of the patent in suit (which has already been dealt with in sections 2 to 2.3.4, above), rather than to the practicability of the claimed subject-matter.

Moreover, the Declaration (sections II (7) and VIII (4), above) confirms, in the Board's view, that the patent in suit provided ample information to carry out the claimed subject-matter, because it shows that the Respondent did not have any difficulties in carrying out an experiment in accordance with the teaching of the patent in suit.

This ground for opposition is, therefore, rejected.

7. *Auxiliary Requests*

Since the Main Request of the Appellant is successful, there is no need to consider the Auxiliary Requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar:	The Chairman:
E. Görgmaier	R. Young