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D E C I S I O N
of 17 November 1999

Case Number: T 1167/97 - 3.2.1

Application Number: 89302900.9

Publication Number: 0335588

IPC: B60C 9/22, B60C 9/20

Language of the proceedings: EN

Title of invention:
Radial tyre

Patentee:
Sumitomo Rubber Industries Limited

Opponent:
Compagnie Générale des Etablissements Michelin Michelin Et Cie

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84, 123(2)

Keyword:
"Novelty (yes)"
"Inventive step (yes)"
"Deletion of an example in the description which does not work
in accordance with the claimed invention (allowable under
Article 123(2) EPC)."

Decisions cited:
T 0032/82, T 0002/83, T 0676/94

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 1167/97 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 17 November 1999

Appellant:
(Opponent)
Compagnie Générale des Etablissements
Michelin
Michelin Et Cie
12, Cours Sablon
63040 Clermont Ferrand Cedex (FR)

Representative:
Bauvir, Jacques
Michelin & Cie
Service SGD/LG/PI Ladoux
63040 Clermont-Ferrand Cedex 01 (FR)

Respondent:
(Proprietor of the patent)
Sumitomo Rubber Industries Limited
No. 1-1, Tsutsui-cho 1-chome
Chuo-ku
Kobe-shi
Hyogo 651 (JP)

Representative:
Morgan, James Garnet
Manitz, Finsterwald & Partner
Patentanwälte
Postfach 22 16 11
80506 München (DE)

Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 8 October
1997 concerning maintenance of European patent
No. 0 335 588 in amended form.

Composition of the Board:

Chairman: S. Crane

Members: M. Ceyte
J. Willems

Summary of Facts and Submissions

- I. The Respondent is proprietor of European patent No. 0 335 588 (application No. 89 302 900.9).
- II. The patent was opposed by the appellant (respondent) on the ground of lack of patentability and insufficiency of disclosure:

The following state of the art was inter alia cited:

D1: FR-A-2 402 020,

D2: GB-A-2 064 445,

D3: "Kautschuk + Gummi Kunststoffe" vol. 40, No. 2, February 1987, pages 130 to 135 "Hybrid Tire Cords containing Kevlar Aramid",

D4: FR-A-2 498 639,

D5: US-A-3 667 529.

- III. In its decision of revocation posted on 16 June 1994, the Opposition Division held that the European patent did not disclose the invention in a manner sufficiently clear for it to be carried out by the skilled person (Article 100(b) EPC).

The issue of patentability was left undecided.

- IV. The appellant (opponent) lodged an appeal against this decision. In its decision T 676/94 - 3.2.1 of 6 February 1996 the Board decided to set aside the

decision of revocation and to remit the case to the Opposition Division for further decision on the issue of patentability.

V. In its interlocutory decision posted on 8 October 1997 the Opposition Division held that the claimed subject-matter was patentable over the opposed prior art.

VI. On 3 December 1997 the appellant (opponent) lodged an appeal against this decision with the appeal fee being paid at the same time

In the statement of grounds of appeal filed on 18 February 1998, reference was inter alia made to the further documents

D2 bis: DE-C-3 046 005 (published after the priority date).

D5 bis: FR-A-1 140 534 and its first addition No. 69 111.

VII. Oral proceedings before the Board were held on 17 November 1999.

In the course of the hearing, the appellant filed

D9: a response and new set of claims filed on 15 January 1988 during the examination proceedings of the German patent application corresponding to the United Kingdom patent specification D2, subsequently granted as D2 bis.

The respondent (patent proprietor) requested that the

appeal be dismissed and that the patent be maintained on the basis of the main request or the auxiliary requests 1 to 7 presented at the oral proceedings.

Claim 1 of the main request is as follows

"1. a high speed radial passenger car tyre comprising a pair of bead cores one disposed in each bead of the tyre, a toroidal carcass (5) having at least one ply of cords arranged radially of the tyre and turned up at the ends thereof around said bead cores, a tread (2) disposed radially outside the carcass (5), a belt (6) disposed radially outside the carcass (5) and radially inside the tread (2) and a band (7) disposed radially outside the belt (6) said band (7) comprising a ply composed of at least one cord (12) wound spirally and continuously in the circumferential direction of the tyre at 0 to 3 degrees to the equator of the tyre,

characterised in that

the cord is a hybrid cord (12) comprising a high elastic modulus yarn (10) and a low elastic modulus yarn (11) twisted together, the hybrid cord (12) having a low elastic modulus (EL) in a low elastic modulus zone between zero elongation and a predetermined specific elongation in the range of 2-7 % and a high elastic modulus (EH) in a high elastic modulus zone above said specific elongation of the cord wherein low and high elastic moduli (EL and EH) change at a transitional point (V) derived from the load elongation curve (C) of the hybrid cord (12) being the intersecting point of a line orthogonal to the

elongation axis passing through the intersection (X) of the tangent (S1) to the elongation curve (C) at zero elongation and the tangent (S2) to the elongation curve (C) at the break point."

VII. The appellant requested revocation of the European patent in its entirety.

In support thereof it made essentially the following submissions:

- (i) Claim 1 of the main request differs from granted claim 1 by the indication that the claimed radial tyre is intended for a high speed passenger car. This added feature is unclear as to what is meant by the word "high speed".
- (ii) In the description as originally filed, it is stated that steel can also be used as high elastic modulus yarn. This feature has been deleted from the amended description according to the main request. However, it is required by Article 123(2) that this feature be maintained in the description as otherwise an unallowable change of the description would result, because the disclosure in the amended description would not be the same as in the originally filed description.
- (iii) The subject-matter of amended claim 1 according to the main request lacks novelty over prior art document D2. Although this citation does not expressly disclose the features that

- (a) the claimed tyre is intended for a high speed passenger car,
- (b) the cord of the reinforcement band is an hybrid cord comprising a high elastic modulus yarn and a low elastic modulus yarn twisted together,
- (c) there is a transitional point (V) derived from the load elongation curve (C), these features are not appropriate for providing a novel distinction over the prior art.

It is clear that a patentee may amend his claim by the addition of a limitation, but the statement (a) above referring to "a high speed passenger car" is too vague and thus does not constitute a limitation or a distinguishing feature of the claimed tyre.

Feature (c) above relates to the establishment of the transitional point of the elongation curve. It is neither a structural nor a functional feature of the claimed tyre and as a consequence has nothing to do with the issue of novelty.

Although the case law of the Boards of Appeal is based on a narrow concept of novelty, the inclusion in a claim of an arbitrary feature such as feature (b) above not essential to the invention does not confer novelty: the fact that the cord is a hybrid cord made by combining different yarns together is not essential to the invention; what is essential is solely the

function of this material, that is low and high moduli of elongation. This function is clearly disclosed by cable (B) of document D2 which also has a low elastic modulus in a low elongation zone and a high elastic modulus in the high elongation zone, as recited in claim 1.

It follows that the subject-matter of claim 1 lacks novelty over document D2.

- (iv) Even if the subject-matter of claim 1 can be considered to be novel over document D2, it is still not inventive for the following four reasons:

Firstly, as has been already stated, document D2 teaches the use of a bi-modulus cable (B) having a low elastic modulus in a low elongation zone and a high elastic modulus in the high elongation zone. It is apparent that the object to be achieved by the bi-modulus cable (B) is in essence the same as that of the patent in suit, that is a reinforcing band being able, on the one hand, to adapt to the elongations which necessarily occur during the moulding and vulcanizing steps and, on the other hand, to resist further extension and ply separation during the use of the finished tyre. If this could not be explicitly derived from document D2 itself then there could be no doubt with respect to document (D9), which since it was available by file inspection before the priority date of the contested patent belongs to the state of the art in its own right.

In the prior decision T 676/94 on the case, the Board 3.2.1 held that the average skilled person was aware of the content of the technical periodical D3, so that this citation and more precisely the 3-ply hybrid cords (aramid/aramid/nylon) disclosed therein could be regarded as part of the average knowledge of the skilled person. Thus, the skilled person was aware that the problem underlying the patent in suit could be solved by the bi-modulus cable (B) of document D2 and as a consequence by the bi-modulus hybrid cords of technical periodical D3.

Secondly, aramid cords for reinforcing tyres offer high breaking strength and modulus and outstanding dimensional stability but suffer from the problem that the resistance to stretch is excessively high, so that the green tyre cannot correctly expand into the mould. For the skilled person wanting to use aramid cords in a reinforcement band of a radial tyre without having such a drawback, it would be obvious to combine two aramid yarns with one nylon yarn during the cabling process, as taught by technical periodical D3 for the purpose of arriving at the claimed invention.

Thirdly, document D4 discloses also 3-ply hybrid cords aramid/nylon. It is said that these hybrid cords, due to their elongation, facilitate the moulding of tyres. It is also stated that these hybrid cords can be used as reinforcing cords disposed in the circumferential direction, parallel to the tyre equator. In view of this

teaching it would have been obvious to the skilled person to replace the reinforcing aramid cords by the 3-ply hybrid cords disclosed in document D4.

Finally, as has been already explained the problem to be solved by the claimed reinforcement cord is twofold: on the one hand the cord must be capable to adapt to the elongations which necessarily occur during the moulding and vulcanizing steps and on the other hand, it must be also capable to resist further extension after vulcanization and inflation of the tyre. The skilled person knows that nylon cords are able to solve the first part and steel or aramid cords the second part of the problem above. This twofold problem is in document D2 solved by the bi-modulus metal cable (B). For obvious reasons of weight, the skilled person would be encouraged to choose aramid in place of steel or metal. Technical periodical D3 which illustrates the knowledge of the skilled person shows hybrid cords prepared by combining aramid and nylon cords, which hybrid cords are said to have higher elongation than aramid cords. Thus, it is not inventive to replace the bi-modulus cable of document D2 by the hybrid cords of technical periodical D3.

VIII. The respondent (patent proprietor) rejected in detail the arguments brought forward by the appellant. He submitted that the subject-matter claimed i.a. in claim 1 of the main request was novel and inventive over the opposed prior art. He objected to the

introduction of document D9 into the proceedings at the very last moment since this gave no possibility of verifying whether it belonged to the state of the art.

Reasons for the Decision

1. The appeal is admissible.
2. *Formal matters (main request)*
 - 2.1 Amended claim 1

In the course of the oral proceedings the respondent has amended claim 1 as granted by the addition of the limitation that the claimed radial tyre is a "high speed radial passenger car tyre". This limitation is disclosed in original page 2, lines 1 and 4. The appellant alleged that such amended claim 1 does not meet the requirement of Article 84 EPC since the term "high speed" renders it unclear.

According to Article 84 EPC, the claims shall define the matter for which protection is sought. Thus the issue to be decided is whether or not the notional skilled person is able to distinguish unambiguously a "high speed passenger car tyre" from those which are not. In the Board's view, there are features not explicitly stated but implied by the particular use such as strength, size, weight and ability to withstand high running speeds which clearly distinguish a high speed passenger car tyre from those for e.g. motorbikes, heavy commercial vehicles (including multi-axle trailers), or tractors and from passenger car

tyres only intended to be used at low speeds. There is thus no doubt that the added feature contributes to more precisely define the radial tyre from which protection is sought.

Furthermore, as clearly explained in the introductory part of the description, high speed passenger car tyres running at over 300 km/h have to undergo very high centrifugal forces. This causes the tread of the tyre to swell outwardly and be lifted or displaced in the radial direction. This is known as the lifting phenomenon. The deformation of the tyre caused by this lifting phenomenon promotes vibration of the tyre and furthermore lift-up of the belt especially in the edges induces separation of the belt from the surrounding rubber and the carcass (see page 2, lines 10 to 16 of the European specification). Thus the fact that the claimed radial passenger car tyre is for high speed use means that the structure thereof is chosen so as to cope with the known lifting phenomenon and large vibrations which are generated in rotation of the tyre in high speed running. Therefore, contrary to the appellant's submissions, the term "high speed passenger car" is in the present case a technically meaningful feature.

For the above reasons the Board concludes that amended claim 1 according to the main request complies with the clarity requirement of Article 84 EPC.

2.2 Amended specification (main request)

One essential feature of the invention claimed in claim 1 is the provision of a hybrid cord comprising a

high elastic modulus yarn and a low elastic modulus yarn twisted together, with the hybrid cord having the elongation curve (C) shown in Figure 4, whose transitional point is in the range of 2 to 7% of elongation. The transitional point is defined in claim 1 as the intersecting point of an orthogonal line passing through the intersection of the tangent to the elongation curve (C) at zero elongation and the tangent to the elongation curve (C) at the break point.

In the patent specification as granted it is said that steel can be used as high elastic modulus yarn.

However, the appellant has convincingly demonstrated that in such case a elongation curve is obtained which is not the same as the claimed elongation curve (C) and especially the transitional point of such curve does not fall within the claimed range of 2 to 7%. Expressed in other words it has established that one example given in the patent specification, i.e. with steel as the high elastic modulus yarn, does not work in accordance with the claimed invention.

In the Board's view, the appellant's submissions as to the use of steel in a hybrid cord is an objection of "partial" insufficiency of disclosure (Article 83 EPC), given that the appellant has neither submitted nor demonstrated that the other examples of the description do not work in accordance with the claimed invention.

In such a case, it is the settled practice of the EPO, referred i.a. in the Guidelines D-V, 4.4 to require that the example(s) which does not work be deleted from the description and the relevant claims. Any failure to

rectify this deficiency without good reason is said to result in the patent being revoked. Accordingly the respondent has deleted the part of the description stating that steel can be used as high elastic modulus yarn.

The Board is unable to follow the Appellant's reasoning that the excision of this example of high elastic modulus yarn in the description contravenes the requirement of Article 123(2) EPC: In particular the Board cannot see what change in the information content of the patent specification has been brought about which could possibly comprise "subject-matter" which extends beyond the content of the application as originally filed" within the meaning of this provision of the EPC. There is only one cursory mention of the use of steel for the high elastic modulus yarn in the original application, clearly in the context of a less preferred embodiment. Its deletion makes no significant change to the character of the claimed invention.

3. *Novelty vis-à-vis prior art document D2*

3.1 The appellant submitted the following reasoning: The claimed subject-matter lacks novelty over document D2 if it does not include at least one essential feature which distinguishes it from this citation. The only technical feature of the claimed invention which is not disclosed in document D1 is the provision of an hybrid cord. However, this feature is not essential to the invention and therefore does not confer novelty.

This being said, the claimed invention relates to a passenger car tyre which is to be defined by its

technical features, i.e. its structural or functional features. The provision of "an hybrid cord comprising a high elastic modulus yarn and a low elastic modulus yarn twisted together" is a structural feature which is not disclosed in document D2.

The Board cannot agree with the appellant's submissions that such a structural feature is obviously inessential or subsidiary:

According to e.g. decision T 32/82, OJ EPO 1984, 954, as essential features have to be regarded all features which are necessary to obtain the desired effect or differently expressed, which are necessary to solve the technical problem with which the patent in suit is concerned.

In the present case, the problem to be solved by the patent in suit is in essence the same as that stated in the penultimate paragraph of page 2 of the specification, that is the provision of a pneumatic radial tyre conceived for high speed passenger cars, in which not only high speed running without vibration of the tyre but also good quality vulcanising and moulding are provided for.

In the specification this problem is said to be solved by the features stated in amended claim 1.

On page 3, paragraphs 3 and 4 refer to the claimed hybrid cord formed by twisting a high elastic modulus yarn and a low elastic modulus yarn. It is said that the hybrid cord is reduced in elasticity in comparison with the high elastic modulus yarn alone. The twofold

effect of the hybrid cord is described as follows:

"As a result, in the vulcanizing and moulding steps for the tyre where the vulcanizing mould internal pressure expands and shapes the tyre, the hybrid cord is stretched and the outer circumferential face of the raw tyre can be fully pressed against the inner face of the vulcanizing mould. Thus it becomes easy to vulcanize and to successfully mould the tyre. Also the high elastic modulus yarn provides the stiff hoop effect in the tread portion of the tyre, prevents lifting at high speeds, inhibiting ply separation, and reducing vibration thereby improving high speed durability."

From the foregoing, it is apparent that the claimed hybrid cord is an essential feature - if not the most essential one - necessary to obtain the desired twofold effect or to solve the problem underlying the patent in suit.

3.2 Additionally, the claimed hybrid cords are also characterized by a clearly continuous shape of the elongation curve (C) which is determined by the following twofold requirement:

- (i) a low elastic modulus zone between zero and a predetermined specific elongation and a high elastic modulus zone above said specific elongation of the cord.
- (ii) if the point of intersection is drawn as taught in claim 1, then it lies within the range of 2 to 7%.

The shape of the load-elongation curve (B) in Figure 3 of document D2 is obviously different from that defined in claim 1, and which is depicted in Figure 4 of the patent in suit. In any case, the load-elongation curve (B) does not meet the requirement (ii) above: if a tangent to the load-elongation curve (B) at zero elongation and a tangent to the same elongation curve (B) at the break point are drawn, then the intersection point of these two tangents does not lie within the range of 2 to 7%.

Finally, as has been already explained, the terms "high speed passenger car" in claim 1 is a technically meaningful feature. Document D2 does not disclose this feature; it specifically discloses a tyre for heavy commercial vehicles, in particular for multi-axle semi-trailers, which undergoes very high transverse loading which may cause scrubbing (page 1, second paragraph).

Therefore, in the Board's judgement the subject-matter of claim 1 is novel over document D2.

4. *Inventive step (main request)*

4.1 The claimed radial tyre is a high speed passenger car tyre of the type comprising a belt disposed radially outside the carcass and a band disposed radially outside the belt, said band having a ply composed of at least one cord wound spirally and continuously in the circumferential direction of the tyre. Such a tyre is disclosed in JP-A-6 160 303, mentioned in the description of the patent specification and forming the basis for the preamble of claim 1.

From page 1 penultimate paragraph and page 2 second and third paragraphs of the patent specification, it is apparent that the object to be achieved by the claimed invention is to provide a radial tyre specially conceived for a high speed passenger car,

- (i) in which the so-called lift phenomenon at high speeds is prevented, while inhibiting ply separation and reducing vibration, and
- (ii) which copes with the problem of the need for elongation during moulding and vulcanization steps.

This problem is solved by the use of the claimed hybrid cord comprising a high elastic modulus yarn and a low elastic modulus yarn twisted together, with the hybrid cord having the elongation curve shape defined in claim 1.

- 4.2 Document D2 states on page 1 in lines 9 to 11, that it has been noticed, especially when a low aspect ratio tyre is to be made that after vulcanization and inflation of the cover, "undesirable deformation" of the tyre cross-section has occurred.

According to the appellant's submissions, it would be readily apparent for the skilled reader that this "undesirable deformation" results from the resistance to stretch of the band which is excessively high, so that the tyre cannot correctly expand into the mould. In support of these submissions, the appellant filed in the course of the oral proceedings before the Board a response and a set of claims (D9) presented during the

proceedings for grant of the German patent DE-C-3 046 005 (D2 bis) claiming the same priority as GB-A-2 064 445 (D2). This response was filed after the publication of the corresponding German patent application. This means that a member of the public requesting inspection of the file before the German patent office could in principle have had access to this response.

In the Board's view, a prior art document such as D2 can be construed with the aid of any further relevant document including a response filed during the proceedings for grant only if the skilled person could see this further document, i.e. if it was published or made available to the public before the priority date of the patent in suit.

However, in accordance with the discretion given in Article 114(2) EPC the Board decided to disregard this belatedly filed document D9, because in the first place it was not certain that this document D9 was made available to the public before the priority date of the patent in suit. In this respect the respondent argued that there were considerable delays in the handling of documents at the German Patent Office so that the date of filing a submission was not the same as the date when that submission would become available via a file inspection. The appellant could not refute this.

Furthermore, this document D9 was in fact not highly relevant in the sense that it was necessary for a proper interpretation of the teaching of prior art document D2: Generally speaking, an unclear or ambiguous passage of a prior art document such as that

at page 1, lines 9 to 11 of D2 may be construed with the aid of another document which is made available to the public. However, more importantly, the passage in question should be interpreted in the context of the whole document D2. This means that the teaching of prior art document D2 is not confined to this passage or to the bi-modulus metal cable (B) of Figure 3 but embraces any information in the claims and the description enabling the skilled person to determine what had been really taught by this citation.

In this respect the following is to be observed:

The invention disclosed in document D2 is said to relate to a pneumatic radial tyre with a reinforcing breaker-ply, intended in particular but not exclusively, for heavy commercial vehicles (page 1, line 2) and comprising a radial carcass with a low aspect ratio (page 1, line 3), with the desire being to cope with a problem arising with multi-axle semi-trailers (page 1, lines 6 to 9) in which the tyres owing to their location, can undergo very high transverse loading which frequently may cause scrubbing, resulting in premature failure to ply separation at the edges of the breaker.

The object to be achieved is said to be an "improvement in the reinforcing belt particularly with respect to non-separation of the edges of the breaker ply, and a tyre casing having an inflated transverse section of satisfactory shape, free from the undesirable deformation of the section existing in the earlier technology (page 1, lines 29 to 32 of document D2).

This object is accomplished according to document D2 by the provision of a reinforcing band comprising longitudinally extending reinforcement members made up of high modulus reinforcement elements (page 1, lines 13 to 15 and claim 1). These high modulus reinforcement elements may be metal elements having a large initial elongation (claim 3) or elements of aromatic polyamide (claim 4).

The specification of D2 describes the invention with reference to seven figures. This part of the description is completely in line with the teaching above:

It discloses four cables A, B, C and D of which curve (A) (Figures 3) relates to a normal metal cable (page 2, line 13). Curve (B) also shows a metal cable of "high elongation" (page 2, line 16). Curve (C) relates to 3 x 1650 dtex aromatic polyamide cables (page 2, line 21) and curve (D) relates to a 2 x 1400 dtex cable in nylon fibres.

The table of page 2 gives the elongation at rupture, the necessary force for elongation at rupture as well as the ply modulus. It is stated that one of the requirements of the invention is that the modulus M of the cables must sufficiently high and that under these circumstances "it can be seen that only cables A, B and C, with an appropriate density in the ply allow a sufficiently high modulus to be obtained". In other words cables A, B and C, that is a metal cable having a high modulus, a metal cable having a having a high modulus and a large initial elongation and aromatic polyamide cable, fall within the teaching of

document D2 but not nylon cable (cable D).

Thus what document D2 really teaches is the provision of metal cables having a sufficiently high modulus preferably comprising a large initial elongation as well as aromatic polyamide cables for use in a reinforcement band essentially for the purpose of improving the tyre resistance to scrubbing without exhibiting separation of the ply edges since the suggested aromatic polyamide cables and the high modulus metal cables save those having a large initial elongation are not capable - due to their high resistance to stretch - to adapt to the elongations which occur during the moulding and vulcanizing steps.

- 4.3 It is also apparent that the teaching above has nothing to do with the teaching of claim 1 according to the main request, that is the provision of a hybrid cord for a reinforcement band comprising a high elastic modulus yarn such as aromatic polyamide and a low elastic modulus yarn such as nylon twisted together, in order to cope with (i) the lifting phenomenon in high speed running sometimes in excess of 300 km/h and (ii) the need for elongation during moulding and vulcanization steps. This also means that according to the teaching of the claimed invention neither aromatic polyamide yarn nor metal cable with preferably high initial elongation are appropriate for use in a reinforcement band for a high speed passenger car tyre.

Therefore without retrospective knowledge of the invention it was not possible for a skilled person with the aid of the teaching given in document D2 and common general knowledge to arrive at the claimed teaching of

the patent in suit.

- 4.4 Figure 7 of technical periodical D3 shows the elongation curves (A), (B), (C) and (D) of four hybrid cords having two plies of aramid and one ply of nylon. The appellant correctly points out that the shape of these elongation curves is essentially the same as that of the claimed load-elongation curve (C): the transitional point of these curves also falls within the claimed range of 2 to 7%.

However, this citation does not give any information concerning as to how such hybrid cords could be beneficially embodied in a band arranged around a belt or a breaker of a radial tyre. As already stated, technical periodical D3 fails to suggest using hybrid cords of the kind described there in the specific context envisaged by the present invention, i.e. wound spirally around the belt of a high speed passenger car tyre. It is noted in this respect that this citation raises another problem that some synthetic materials give rise to shrinkage during tyre vulcanization and shrinkage is opposite of the result which is to be achieved by the present invention, namely the elongation during moulding and vulcanization steps.

- 4.5 As has been already explained document D2 teaches the use of aramid cords (aromatic polyamide) or metal cables having a high modulus in the reinforcing band of a tyre in order to cope with very high transverse loading. In view of this teaching the skilled person would have no reason to replace the aramid cords by the hybrid cords disclosed in technical periodical D3, having two plies of aramid and one ply of nylon. In

document D2 high modulus metal cables with high initial elongation are said to be preferred, but this preference is evidently made in comparison with metal cables having a high modulus not with aramid cords.

Thus, the proper question in this regard is not whether the skilled person **could** have replaced aramid cords of document D2 by the hybrid cords of technical publication D3 but whether he **would** have done so in the expectation of solving the technical problem addressed to (see e.g. decision T 2/83, OJ EPO 1984, 265). In this respect the Board is unable to find in these two documents any hint at employing hybrid cords in a radial tyre for high speed passenger cars.

- 4.6 Document D4 discloses a cord having a core around which at least one high tenacity, substantially extensible yarn is wrapped spirally. This is quite different from the hybrids cords of the claimed invention where, as specified in the characterising part of claim 1, the cord is an hybrid cord comprising a high elastic modulus yarn and a low elastic modulus yarn **twisted** together. This citation does not show an hybrid cord but rather a cord where a high tenacity yarn is twisted around a core. Moreover this core has an extremely high elongation; for example column 2 of the US equivalent 4 343 343 specifies that the elongation before break of the core should be at least 200%.

This citation is wholly silent as to the shape of the load-elongation curve of the disclosed cords. In particular, the appellant has not demonstrated that these elongation curves comprise a transitional point which is in the range of 2 to 7% of elongation. There

is also no suggestion or disclosure that the cords of that document when used in a reinforcing band may solve the problem of lifting in high speed running.

4.7 The elongation curves of document D1 relate to a 3-ply hybrid cord aramid/nylon/nylon not to a 3-ply hybrid cord aramid/aramid/nylon which meets the conditions defined in claim 1. The respondent (patent proprietor) has determined the transitional point for the 3-ply hybrid cord aramid/nylon/nylon of Figure 2 of document D1. It was found that the transitional point was at 1% elongation, that is clearly outside the claimed range.

4.8 Documents D5 and D5 bis disclose a plural-layer ply structure with cords orientated at 0° to the circumferential direction. This plural-ply structure is a conventional band consisting of layers of full width tyre cord fabric, i.e. a band of the tyre described in the discussion of the prior art in the introduction of the patent in suit. In contrast the reinforcing band according to the invention is formed from one hybrid cord or a strip of several hybrid cords wound continuously around the outside of the belt at 0 to 3° to the tyre equator. Such a spirally wound hybrid cord forms a band having no overlap or joint part and improves tyre uniformity and reduces vibration as set forth in the granted specification.

It is true that the cords of the plural-layer ply structure according to D5 bis may have the advantage of being able to adapt to the elongations which occur during the moulding and vulcanizing steps, by the use of a structure where the cords are not straight but

exhibit undulations which allow the elongation of the structure which they form during the moulding and vulcanization operations.

However these citations simply show that the skilled person knew another way of coping with the problem of the need for elongation during moulding and vulcanization steps. They by no means teach the use of **hybrid cords** in the reinforcing band of a radial tyre, in order to cope not only with the need for elongation during the moulding and vulcanization steps but also with the lifting phenomenon during the use of the finished tyre in high speed running.

- 4.9 Therefore, in the Board's judgement the subject-matter of claim 1 according to the main request also involves an inventive step.
5. Dependent claims 2 to 5 concern particular embodiments of the invention claimed in claim 1 and are likewise allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent with the following documents:

Claims: 1 to 5 according to the main request filed during the oral proceedings before the Board.

Description: pages 2 to 7 as filed during the oral proceedings before the Board.

Drawings: as granted.

The Registrar:

The Chairman:

S. Fabiani

S. Crane