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D E C I S I O N
of 19 December 2000

Case Number: T 0967/98 - 3.2.1

Application Number: 92916651.0

Publication Number: 0596001

IPC: F16H 48/20

Language of the proceedings: EN

Title of invention:

End-thrust design for parallel-axis differential

Patentee:

ZEXEL TORSEN INC.

Opponent:

Zenichiro SAITO

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 106, 111, 123(2)

Keyword:

"Ground for opposition abandoned (no)"

"Extension of subject-matter by a new combination of features
(yes)"

"Inventive step (yes, after amendment)"

Decisions cited:

T 0118/95, T 0274/95

Catchword:

-



Case Number: T 0967/98 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 19 December 2000

Appellant: Zenichiro SAITO
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 22 July 1998
concerning maintenance of European patent
No. 0 596 001 in amended form.

Composition of the Board:

Chairman: F. A. Gumbel
Members: J. Osborne
J. H. P. Willems

Summary of Facts and Submissions

- I. The opponent's appeal is against the interlocutory decision of the Opposition Division that the European patent No. 0 596 001 when amended according to an auxiliary request, and the invention to which it related, satisfied the requirements of the EPC.
- II. The patent had been opposed on the grounds that the subject-matter of the claims lacked inventive step (Article 100(a) EPC) and that, in respect of Claim 3, the patent failed to disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC) and the patent contained subject-matter which extended beyond the content of the application as originally filed (Article 100(c) EPC). The following evidence was taken into account during the opposition proceedings:
- D1: FR-A-899 549
- D2: JP-A-59 97346 (and D2', a translation of D2 into English)
- D3: FR-A-2 615 262
- D4: US-A-3 706 239
- D5: US-A-4 751 853
- D6: US-A-4 365 524.
- III. The decision of the Opposition Division was posted on 22 July 1998. Notice of appeal together with payment of the appeal fee was received on 30 September 1998 and

the reasons for the appeal were received on 1 December 1998. The appellant additionally referred to:

D7: US-A-3 292 456.

IV. In oral proceedings held on 19 December 2000 the appellant requested that the decision of the Opposition Division be set aside and that the patent be revoked in its entirety. The appellant referred to an additional document:

D8: "New viscous couplings - aimed at both high performance and low cost", Nikkei Mechanical 1993.4.19 (translation into English).

The respondent requested that the appeal be deemed inadmissible in as far as it related to the ground for opposition according to Article 100(c) EPC and that the patent be maintained in an amended form according to main and first auxiliary requests filed during the oral proceedings.

V. Claim 1 according to the respondent's main request reads as follows, whereby amendments made in comparison with the claim as granted are indicated in bold text:

"A gear differential for proportioning the torque between a pair of relatively rotating axles at a predetermined torque bias, said differential having:

a housing that is rotatable about a pair of axle shafts (10, 12) which share a common axis;

a pair of sun gears (50, 52) adapted to receive the respective ends of said axle shafts for rotation within

said housing; and

at least one pair of planetary combination gears (54, 56) mounted for rotation within said housing on respective axes which are parallel to said common axis, each combination gear having a first toothed portion (62, 64) in meshing engagement with a respective one of said sun gears and having a second toothed portion (58, 60) in meshing engagement with its paired combination gear, the meshing engagement of said sun and combination gears interconnecting said respective axle ends in a mutual driving relationship;

each sun gear (50, 52) having helical teeth **of respectively opposite hand** and being positioned within said housing;

each combination gear (54, 56) of each pair having said first **and second** toothed portion (62, 64, **58, 60**) with helical teeth and being mounted within said housing for axial movement:

- (a) in relation to, and for contact with, at least one respective **end thrust** bearing surface, and
- (b) in relation to its paired combination gear;

said sun and combination gears having said helical teeth of predetermined hand selected to develop axial-thrust forces on said sun and combination gears so that frictional resistance is created between said combination gears and said respective bearing surfaces for controlling the torque bias of the differential assembly; and said differential being characterized by:

said first and second toothed portions (64, 60) of a first one of said combination gears (56) of each said pair being separated by a non-meshing portion that straddles the sun gear (50) that is in mesh with its paired combination gear **and by the sun gears (50, 52) being axially thrust against each other to increase frictional resistance between them, when said axles are driven in a forward direction.**"

Dependent Claim 3 reads as follows:

"The gear differential of claim 1 wherein:

the first toothed portion (62, 64) of said combination gears of each pair have, respectively, teeth of opposite-handed helical angles; and

said separated first and second toothed portions (64, 60) of said first combination gear (56) have helical teeth of the same hand."

VI. The patent according to the respondent's auxiliary request contains, in addition to Claim 1, which is identical to that according to the main request, dependent Claims 2 to 11 which define preferred embodiments of the subject-matter of Claim 1. The claims essentially differ from those according to the respondent's main request only by the deletion of Claim 3.

VII. The arguments of the appellant (opponent) can be summarised as follows:

As regards the aspect of admissibility in appeal of the ground for opposition according to Article 100(c) EPC,

this had been raised from the beginning of the opposition and was never withdrawn. Withdrawal of a ground for opposition would require a clear statement.

In respect of the substance of the objection under Article 100(c) EPC in respect of the main request, the application as originally filed presents the invention as relating to a torque-proportioning differential in which the frictional losses are an accumulation of those resulting from end thrust loads at the combination gears and end thrust loads at the sun gears. This is partly achieved according to the original disclosure in that first and second portions of each combination gear are oppositely handed such that the respective end thrust loads from the first and second portions are additive. In the arrangement according to Figures 3a, 4a the helices of each combination gear are of the same hand such that the respective end thrust loads from the first and second portions cancel each other and the original disclosure teaches that the invention modifies this arrangement. Claim 3 of the main request introduces as a result of its dependency from Claim 1 the teaching of a combination gear which is handed according to Figures 3a, 4a but which nevertheless develops end thrust. Similar reasoning supports objection under Article 100(b) EPC in respect of Claim 3 of the main request.

In respect of inventive step the closest prior art is that known from D1 which discloses the features of the preamble of Claim 1 and sun gears which exhibit an axial thrust towards each other. The characterising features relating to the non-meshing ("straddle") portion and to the axial thrusting of the sun gears

against each other relate to separate problems of compactness and stability and of increased frictional resistance respectively. D2 discloses the "straddle" feature as leading to improved stability and to increased compactness by virtue of the adjacency of the sun gears. Although D2 does not disclose that the sun gears are thrust against each other, this would be the result of incorporating the "straddle" feature in D1.

In the alternative the closest prior art is known from D4 which discloses all features of the preamble of Claim 1. Additionally, the sun gears are disclosed as being thrust towards each other, thereby achieving the same result of frictional resistance as does Claim 1. D2 discloses the "straddle" feature as a means of improving stability and D8 shows that this is a problem which motivated the respondent.

VIII. The respondent (patent proprietor) essentially rebutted the objections of the appellant and in respect of the admissibility of the objection under Article 100(c) EPC essentially argued as follows:

The Opposition Division made no decision on the matter of Article 100(c) EPC because this no longer formed the basis of an objection at the time of the oral proceedings, as derivable from Paragraph 3 of the minutes. The reference in Point 3 of the decision to "extension" is merely an *obiter dictum* and the Board has the capacity to review only a decision which has been taken. In the event that the Board should decide to consider the matter of Article 100(c) EPC, the file should be remitted to the first instance.

Reasons for the Decision

1. *Admissibility of the appeal and remittal to consider objection under Article 100(c) EPC*
 - 1.1 The minutes of the oral proceedings indicate under Paragraph 1 that the request of the opponent was "revocation... based on article 100(a)... and 100(b)...". However, abandonment of a ground for opposition would require a clear statement to this effect and in the opinion of the Board the statement in the minutes of the appellant's request cannot be construed as such a clear indication that the ground for opposition according to Article 100(c) EPC had been abandoned. The situation differs from that which existed in T 0118/95 which was cited by the respondent because in that case a clear statement had been made that no objection was upheld and the opponent therefore was not adversely affected by the decision (Points 3, 4 of the reasons). Moreover, in the opinion of the Board the written decision of the Opposition Division indicates that the ground for opposition according to Article 100(c) EPC did form part of the basis of the decision (Point 3 of the reasons "sees neither a problem of extension..."). Aside from the fact that in the opinion of the Board an appeal cannot be deemed to be inadmissible only in part, the Board therefore considers that there is no aspect related to the ground for opposition under Article 100(c) EPC which puts the admissibility of the appeal into question. Moreover, even if the ground for opposition according to Article 100(c) EPC would have been abandoned, the Board nevertheless would have been fully empowered to examine the ground for opposition under Article 100(c) EPC during appeal (T 0274/95, OJ EPO 1997, 99).

- 1.2 Since also the other requirements for admissibility are fulfilled the Board finds the appeal to be admissible.
- 1.3 The appellant named Article 100(c) EPC in the Notice of Opposition (Form 2300.2) and substantiated the objection in respect of Claim 3 in the third-to-last paragraph of page 6 of the facts and arguments annexed to the Notice of Opposition. In response to this objection the respondent gave counter arguments under Paragraph 4.3 of a letter dated 18 July 1997 and the Opposition Division issued a preliminary opinion on the matter in a communication issued on 16 April 1998 (Point 3.4). The minutes of the oral proceedings before the Opposition Division include no indication of a discussion of the matter and this together with the exchange of opinions during the preceding written procedure indicate that there can be no doubt that the objection had been considered by all sides and that the matter had been discussed to the extent desired by the appellant who is the party adversely affected by the decision of the Opposition Division. The Board therefore considers that there is no justification for remitting the case to the first instance to consider this matter further.

Main request

2. *Claim 3 (Article 100(c) EPC)*
- 2.1 According to the application as originally filed a significant proportion of the torque bias created in orthogonal-axis differentials results from the frictional resistance developed by the cumulative end thrust developed by the sun gears and by the planetary combination gears whereas such cumulative end thrust

had not previously been a significant contributor to the torque bias in parallel-axis differentials (page 3, final paragraph). The application explains this lack of cumulative end thrust with reference to prior art designs. One prior art design of parallel-axis differential which is discussed (US-A-2 000 223) employs helical sun gears of opposing hands and combination gears having helical portions at each end of equal hand. Whilst the sun gears develop end thrust, the axial forces created by the teeth engagement at each end of the combination gear are in opposition and as a result "no significant end thrust" is developed by the combination gears (page 4, first paragraph). A subsequent explanation of this prior art design is given in respect of Figures 1a, 2a. A further design of parallel-axis differential (e.g. US-A-3 095 761) is also discussed, in which the sun gears and the corresponding meshing portions of the combination gears have spur teeth, and so develop no end thrust, whilst the mutually engaging portions of the combination gears have helical teeth, resulting in a net end thrust being developed by the combination gears (page 4, second paragraph). A subsequent explanation of this prior art design is given in respect of Figures 1b, 2b. These prior art differentials therefore share the characteristic that "none utilises cumulative end thrust developed by both sun and planetary gears" (page 4, first sentence).

- 2.2 The differential according to the invention, on the other hand, is said to have helical first portions of the combination gears meshing with (implicitly) helical sun gears and second portions of the combination gears which either have helical teeth of opposite hand to the first portion or have spur teeth (page 5, second full

paragraph). The description places emphasis on this feature of the second portion when it states that "the second engagement portion... is specifically designed with gear teeth which develop no end thrust in a direction opposite to the end thrust developed by the gear's first engagement portion" (page 6, first full sentence). In the detailed description Figures 1a, 1b, 2a, 2b concern the previously discussed prior art whilst Figures 1c, 1d, 2c, 2d show differentials "modified according to the invention" (page 8, first and second full paragraphs). With reference to Figures 2c, 2d it is explained that there are no opposing forces created by the teeth of each combination gear (sentence bridging pages 13, 14; page 14, second full paragraph).

2.3 The description includes developments of the invention, according to which the combination gear may have a straddle portion which divides the first and second portions (page 7, first full paragraph). The description includes "two embodiments of the invention" with straddle type combination gears and in each "the second... portions of each combination gear have tooth designs which either result in no end thrust or in developing end thrust that is in the same direction as the end thrust developed by the... first... portion". In the detailed description these two embodiments are included in Figures 3b, 3c, 4b, 4c and the helical teeth of the combination gears are handed such that each helical gear is subjected to significant end thrust (page 17, first full paragraph to page 18, first paragraph).

2.4 A further parallel-axis differential is described with reference to Figures 3a, 4a, which represents internal

prior art and which has the straddle feature but has helical first and second portions of equal hand on each combination gear, which create axial thrust in opposing directions such that "little, if any, end thrust is developed over either of the combination gears" (page 16, final paragraph). The differentials of Figures 3b, 3c, 4b, 4c, are stated to be modifications of that of Figures 3a, 4a "in accordance with the invention" (page 17, first sentence of each full paragraph).

- 2.5 The description of the final embodiment of the invention in the application as originally filed, illustrated in Figure 5, clearly distinguishes in respect of the combination gears between "gearing selected according to the invention" and "conventional gearing (such as that shown in... Figs. 1a)", which has first and second portions of equal hand (page 22, second full paragraph). Although the embodiment of Figure 5 does not fall within the scope of present Claim 1 because of the lack of the straddle feature, it does form part of the disclosure of the application as originally filed in respect of the creation of frictional resistance by the combination gears.

2.6 The claims as originally filed define the subject-matter to be protected in various ways. Claim 1 corresponds in its final feature (b) to the definition in the description at page 6, first full sentence (see point 2.2 above). Independent Claims 3, 11 relate to an arrangement in which the combination gears have helical first portions and in which the first and second portions have teeth designed so that the end-thrust exerted by the combination gears is at least half of the cumulative value in as far as it is at least equal to (Claim 3) or greater than (Claim 11) the end thrust exerted by helical sun gears. Independent Claim 5 relates to an arrangement in which both first and second portions of the combination gears develop end thrust in the same direction. No dependent claim defines an arrangement in which both portions of the combination gears have teeth of the same hand.

2.7 As set out above, the application as originally filed is clear in its teaching that it relates to differentials in which the cumulative resistance is achieved by selection not of the angles but of the hands of the helical combination gearing. Although during the examination of the application the emphasis of the invention changed from the cumulative resistance to the straddle feature, the achievement and control of cumulative resistance by selection of the hands of the helical combination gearing remains in Claim 1. It is general technical knowledge of the skilled person that the end thrust developed by helical gearing having different portions of the same hand may be varied by using differing helix angles in each portion and that the subject-matter of Claim 3 therefore may develop some end thrust. Indeed, this is confirmed by the application as originally filed in respect of the

respective differentials known from US-A-2 000 223 (see point 2.1 above) and described in Figures 3a, 4a. However, Claim 3 according to the main request defines by virtue of its dependency from Claim 1 that first and second portions of the combination gear having "helical teeth of the same hand" (Claim 3, final section) are of a "hand selected to develop axial thrust forces... so that frictional resistance is created between said combination gears and... bearing surfaces for controlling the torque bias" (Claim 1 preamble, final section). The skilled person learns from this combination of features that selection of the same hand of gear in each portion will result in an end thrust of sufficient magnitude that the combination gears will control the torque bias of the differential, which was not disclosed in the application as originally filed.

- 2.8 It follows that Claim 3 according to the main request extends the subject-matter beyond the content of the application as originally filed (Article 123(2) EPC) and the main request therefore is rejected (Article 100(c) EPC). Consideration of the objection under Article 100(b) EPC therefore is not necessary.

Auxiliary request

3. *Amendments*

- 3.1 Basis for the amendments to Claim 1 in comparison with its version as granted is found in the application as originally filed (and the published patent specification) as follows:

- opposite handing of the sun gears, see page 17, final paragraph, second sentence (specification

page 6, lines 26, 27) and Figures 3c, 4c;

- combination gear second toothed portion having helical teeth, see page 17 final paragraph, third sentence (specification page 6, lines 28, 29) and Figures 3c, 4c;
- combination gear end thrust bearing surface, see the sentence bridging pages 17, 18 (specification page 6, lines 29 to 34) with reference to Figure 4c;
- the sun gears being axially thrust against each other to increase frictional resistance between them, when the axles are driven in a forward direction, see the sentence bridging pages 17, 18 (specification page 6, lines 29 to 34) with reference to Figure 4c and page 16, final sentence (specification page 6, lines 14, 15) which refers to Figure 4a but implicitly applies equally to Figure 4c.

3.2 The amendments to Claim 1 serve only to restrict the scope of the claim. The description has been modified only for consistency with the claims.

3.3 The Board therefore finds that the requirements of Articles 123(2), (3) and 84 EPC are satisfied.

4. *Evidence*

4.1 D7 and D8 were both filed after expiry of the nine month period for opposition, although no amendment made by the respondent rendered them more relevant than at the time of filing the opposition and so they are late-

filed. Since the Board finds D7 and D8 no more relevant than evidence which was cited within the time limit for opposition they are disregarded (Article 114(2) EPC).

5. *Interpretation of Claim 1*

5.1 Claim 1 defines that the combination gears are "mounted for rotation within said housing on respective axes which are parallel to said common axis". The term "axis" has the normal meaning of "a real or imaginary line about which a body... can rotate..." (Collins Dictionary of the English Language). However, the wording "mounted... on axes" raises the question of whether the combination gears of the claim are mounted on axles (or shafts) or whether they are mounted merely for rotation about axes.

5.2 Both arrangements are known in the art (see D1, D2). However, in those arrangements in which the combination gears are not mounted on shafts the combination gear can float radially and frictional resistance is created between the periphery of the combination gears and the interior surface of a pocket in the housing (D2' page 4, first full paragraph). Claim 1 of the patent-in-suit, on the other hand, refers exclusively to frictional resistance created by end thrust. Furthermore, the radial float which arises in differentials having combination gears which are not mounted on shafts means that parallelism of the axes of the combination gears with the common axis is not a constructional feature but one which is dependent on the manner of transfer of radial loads by intermeshing gears (see D2' page 4, third full paragraph and D4 column 3, lines 5 to 9). Also according to the description of the patent-in-suit, which according to

the jurisprudence of the Boards of Appeal at the EPO may be used to interpret the claims, the invention relates only to differentials having combination gears mounted on shafts and creating frictional resistance by end thrust. The Board therefore interprets the wording "mounted... on axes" as meaning mounted on axles or shafts.

6. *Novelty*

6.1 No cited document discloses all of the characterising features of Claim 1 in combination and the subject-matter of the claim therefore is to be regarded as being novel (Article 54 EPC).

7. *Inventive step*

7.1 D1 discloses a gear differential for proportioning the torque between a pair of relatively rotating axles at a predetermined torque bias. A differential housing c is rotatable about a pair of axle shafts 6,7 which share a common axis and a pair of sun gears 8, 9 are adapted to receive the respective ends of the axle shafts for rotation within the housing. At least one pair of planetary combination gears 1, 4, 2, 5 is mounted for rotation within the housing on respective axes which are parallel to the common axis, each combination gear having a first toothed portion 4, 5 in meshing engagement with a respective one of the sun gears and having a second toothed portion 1, 3 in meshing engagement with its paired combination gear, the meshing engagement of the sun and combination gears interconnecting the respective axle ends in a mutual driving relationship. Each sun gear has helical teeth of respectively opposite hand (Page 2, Lines 52 to 54)

and is positioned within the housing. Each combination gear of each pair has helical teeth in both the first and second toothed portions (Page 2, Lines 41, 42, 52 to 54) and is mounted within the housing for axial movement relative to a frusto-conical friction surface formed in the differential housing c (Page 3, Lines 24 to 32). The combination gears are linked for movement together by a housing 3 which contains the respective second toothed portions 1, 3 and movement of the combination gears in either axial direction brings a conical friction member 10, 11 mounted on the respective combination gear shafts into contact with its respective friction surface. The sun and combination gears have the helical teeth of predetermined hand selected to develop axial-thrust forces on (implicitly) the sun gears and on the combination gears so that frictional resistance is created between the friction members and the respective friction surfaces for controlling the torque bias of the differential assembly. D1 is silent concerning the reaction of the end thrust created by the sun gears. Whilst it is implicit that this end thrust must be reacted by bearing elements, there is no disclosure of their form and whether they are designed to minimise or maximise friction between the sun gears and the differential housing c. The ends of the axle shafts 6, 7 are shown as being adjacent but not touching whilst the sun gears are shown separated. However, it is implicit from the small angle of the cone shown in Figures 1, 2 that the frusto-conical friction surfaces would in themselves create a high degree of frictional resistance, to such an extent that the skilled person would not consider an additional source of frictional resistance to be necessary. The Board therefore considers that there is no disclosure of the creation

of a significant frictional resistance by the sun gears.

7.1.1 It follows that the subject-matter of Claim 1 differs from that of D1 in that:

- each combination gear is mounted within the housing for axial movement in relation to its paired combination gear;
- each combination gear is mounted within the housing for contact with at least one respective end thrust bearing surface so that frictional resistance is created between the combination gears and the respective bearing surfaces;
- the first and second toothed portions of a first one of the combination gears of each pair are separated by a non-meshing portion that straddles the sun gear that is in mesh with its paired combination gear; and
- the sun gears are axially thrust against each other to increase frictional resistance between them when the axles are driven in a forward direction.

7.2 D2 relates to a torque proportioning parallel axis differential in which all gearing on both the sun gears 3, 4 and on the combination gears 1, 2 has spur teeth (Figure 1). The combination gears are not mounted on axle shafts but are floatingly mounted in cylindrical pockets 6a, 6b in the housing and frictional resistance is created between the gear teeth tips and the cylindrical pockets in which they are located (D2'

page 4, first full paragraph). The combination gears comprise two portions 24, 25 separated by a non-meshing portion which straddles the sun gear that is in mesh with the paired combination gear (see Figure 3). The straddling arrangement permits the combination gears to be supported in a balanced way such that they remain parallel to the common axis without the need for axle shafts (D2' page 4, third full paragraph). Although the sun gears are shown located adjacent to each other, in the absence of helical gearing no significant end-thrust would be created between them. D2 includes a statement that the combination gears are "stopped by the covers 5, 7 along the thrusting direction" (D2' page 2, penultimate sentence). In the opinion of the Board this statement alone is insufficient to establish the disclosure by D2 of significant end thrust developed by the combination gears since there is no further mention of frictional resistance developed by end thrust.

- 7.2.1 In the opinion of the Board the teaching of D2 concerning the improved distribution of load transferred to the combination gears achievable by use of the straddle feature is disadvantageous to the function of D1. Due to the existence in D1 of the housing 3 which contains the respective second toothed portions 1, 2, each combination gear is cantilevered from a support bearing outboard of the friction surface in the differential housing . As is derivable from Figure 1, radial forces from the sun gears are transferred to the combination gears at a position which is as close as possible to the supporting bearing, thereby minimising the tendency for the resultant moment to create misalignment in the bearing. The transfer of a proportion of the radial forces to

the end of the combination gear positioned remote from the bearing, as would result from the introduction of the straddle feature from D2, would increase the moment about the bearing and as a result increase the tendency for misalignment. Moreover, even if the skilled person were to combine the teachings of D1 and D2 the features of the sun gears being thrust against each other still would not result from the combination. A combination of D1 with D2 therefore does not lead in an obvious way to the subject-matter of Claim 1.

- 7.3 D4 relates to a gear differential for proportioning the torque between a pair of relatively rotating axles at a predetermined torque bias. The differential has a housing 14, 18 that is rotatable about a pair of axle shafts which share a common axis and a pair of sun gears 30, 42 are adapted to receive the respective ends of the axle shafts for rotation within the housing. At least one pair of planetary combination gears 28, 40 is mounted for rotation within the housing, each combination gear having a first toothed portion in meshing engagement with a respective one of the sun gears and having a second toothed portion in meshing engagement with its paired combination gear, the meshing engagement of the sun and combination gears interconnecting the respective axle ends in a mutual driving relationship. Each sun gear has helical teeth of respectively opposite hand (see Figures 5, 7) and is positioned within the housing and is axially thrust towards the other to increase frictional resistance between them when the axles are driven in a forward direction (column 5, lines 26 to 28). Each combination gear of each pair has helical first and second toothed portions and is mounted within the housing for axial movement in relation to, and for contact with, at least

one respective end thrust bearing surface (column 5, lines 21 to 26), and in relation to its paired combination gear. The sun and combination gears have helical teeth of predetermined hand selected to develop axial-thrust forces on the sun and combination gears so that frictional resistance is created between the combination gears and the respective bearing surfaces for controlling the torque bias of the differential assembly. The combination gears are housed in pockets in the differential housing and frictional resistance is created not only by end thrust forcing the combination gears against end thrust bearing surfaces but also by radial loads forcing the addenda of the gear teeth against the periphery of the pockets (column 2, lines 33 to 36). This circumferential frictional resistance on the combination gears is increased by misalignment between the combination gears and the axes of the pockets (column 3, lines 5 to 13 and 31 to 37). The sun gears are separated by a spacer 48 which reacts the oppositely directed end thrust produced by the sun gears.

7.3.1 It follows that the subject-matter of Claim 1 differs from that of D4 in that:

- the combination gears are mounted on respective axes which are parallel to the common axis;
- the first and second toothed portions of a first one of the combination gears of each pair are separated by a non-meshing portion that straddles the sun gear that is in mesh with its paired combination gear; and
- the sun gears are axially thrust against each other.

- 7.4 As discussed under Point 7.2 above, the straddle feature in D2 solves the problem of improving the balance of load transfer to the combination gears in order better to maintain parallelism with the common axis. However, D4 specifically makes use of misalignment ("cocking") between the combination gears and the common axis in order to maximise the frictional resistance created by the combination gears, this misalignment resulting both from the longitudinal imbalance of load transfer to the combination gears and from the axial forces produced by the helical gear teeth (column 3, lines 5 to 13 and 31 to 37). In the opinion of the Board it cannot be considered as obvious for the skilled person to choose to combine two items of prior art which are mutually contradictory. Moreover, even if the skilled person were to combine the teachings of D4 and D2, the feature that the sun gears are axially thrust against each other would not result from the combination. It follows that the subject-matter of Claim 1 is not obvious in the light of D4 and D2.
- 7.5 The remaining documents cited by the appellant but no longer relied upon at the oral proceedings are no more relevant than D1, D2 and D4 and so need not be considered in detail.
- 7.6 The Board therefore comes to the conclusion that the subject-matter of Claim 1 and therefore also of dependent Claims 2 to 11 according to the respondent's auxiliary request does not result in an obvious manner from the cited prior art and so is considered to involve an inventive step (Article 56).

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 11 according to the auxiliary request filed during the oral proceedings on 19 December 2000;

Description: pages 3, 4 as filed during the oral proceedings on 19 December 2000 and pages 2, 5 to 7 as filed during the oral proceedings before the first instance on 8 July 1998;

Drawings: as granted.

The Registrar:

The Chairman:

S. Fabiani

F. Gumbel