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Datasheet for the decision of 15 October 2024

Case Number: T 1441/22 - 3.2.01

Application Number: 15797070.8

Publication Number: 3221170

IPC: B60K6/48, B60K6/28, B60K6/38, B60K17/356, B60W10/02, B60W20/00, F16H61/14

Language of the proceedings: EN

Title of invention:
POWERTRAIN FOR A VEHICLE

Patent Proprietor:
Alpraaz AB

Opponent:
Yang, Tai-Her

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 1441/22 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 15 October 2024

Appellant: (Opponent)	Yang, Tai-Her No. 59 Jhongsing 8th St. Dzan-Hwa Si-Hu Town (TW)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Respondent: (Patent Proprietor)	Alpraaz AB Kelliehousevägen 73 262 74 Ängelholm (SE)
Representative:	Brann AB P.O. Box 3690 Sveavägen 63 103 59 Stockholm (SE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 6 April 2022 rejecting the opposition filed against European patent No. 3221170 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	G. Pricolo
Members:	C. Narcisi
	M. Millet

Summary of Facts and Submissions

I. The opposition was rejected and European patent No. 3 221 170 was maintained as granted by the decision of the Opposition Division posted on 6 April 2022. Against this decision an appeal was lodged by the Opponent in due form and in due time pursuant to Article 108 EPC.

II. The following documents are cited in this decision:

WO-A (designating the published patent application of the contested patent);
EP-B (designating the publication of the contested patent);
D1 (EP-A2-1 588 885);
D2 (US-A1-2013/0270052);
D3 (US-A-2 466 721);
D4 (US-A1-2010/0081544);
D5 (Textbook "Dubbel", 1990);
D6 ("Hybridfahrzeuge", Dr. Ing. Burghard Voss, Expert Verlag, 2005);
D7 ("Acausal Powertrain Modelling", ISBN : 978-3-639-71276-6).

III. Oral proceedings were held on 15 October 2024. The Appellant (Opponent) requested that the appealed decision be set aside and that the European patent be revoked.
The Respondent (Patent Proprietor) requested that the appeal be dismissed and that the patent be maintained as granted (main request) or, in the alternative, according to one of auxiliary requests 1 to 5 (filed on

21 December 2022 with the reply to the statement of grounds of appeal).
The Respondent further requested that -if the main request was not found inventive in the Board's preliminary view- the case should be remitted to the first instance department, because D1 was not a suitable starting point for assessing inventive step, what had already been argued in first instance, but was not addressed in the decision of the Opposition Division.

IV. Granted claim 1 reads as follows:

"A power train (12) for supplying torque to a drive wheel (16) and an additional drive wheel (18) of a road vehicle, wherein the powertrain (12) comprises:
(i)a combustion engine (24) having an output (26) for supplying torque, wherein the combustion engine (24) is a reciprocating internal combustion engine;
(ii)a drivetrain (14) for conveying torque from the combustion engine (24) to the drive wheel (16), wherein the drivetrain (14) comprises:
(b)a torque converter (32) having an input (34) coupled to the output (26) of the combustion engine (24) for receiving torque therefrom and an input (36) for supplying torque, wherein the torque converter (32) has a first state of operation and a second state of operation, the torque converter is configured (34) to provide a mechanical coupling between the input (34) and output (36) of the torque converter (32) in the first state of operation and a fluid coupling between the input (34) and output (36) of the torque converter (32) in the second state of operation, and torque supplied to the input (34) of the torque converter (32) is conveyed to the output (36) of the torque converter (32) in the first state of operation and in the second

state of operation, wherein in the first state of operation the input (34) of the torque converter (32) is locked to the output (36) of the torque converter (32) for avoiding slippage there between, and in the second state of operation the input (34) of the torque converter (32) is not locked to the output (36) of the torque converter (32) for allowing slippage therebetween, and
(b)a final drive (44) having an input (46) coupled to the output (36) of the torque converter (32) for receiving torque therefrom and an output (48) for supplying torque to the drive wheel (16) and an additional output (50) for supplying torque to the additional drive wheel (18), wherein the input (46) of the final drive (44) is coupled to the output (36) of the torque converter (32) at a fixed gear ratio, and wherein the final drive (44) comprises a bevel gear (54) and a differential (52) for allowing the drive wheel (16) and the additional drive wheel (18) to rotate at different speeds;
and the powertrain (12) further comprises:
(iii)a first electric motor (28) configured to supply torque to the drivetrain (14) between the final drive (44) and the drive wheel (16), and a second electric motor (30) configured to supply torque to the drive train (14) between the final drive (44) and the additional drive wheel (18).”

V. The Appellant’s (Opponent) arguments may be summarized as follows:

The subject-matter of claim 1 (main request) is not inventive over D1 in conjunction with each one of

documents D2, D3 or D4, or in conjunction with common general knowledge as exemplified in D5, D6 or D7.

D1 (see figure 132 and related parts of the description) discloses all of the features of claim 1 except for feature 3a ("a torque converter (32) having an input (34) coupled to the output (26) of the combustion engine (24) for receiving torque therefrom and an input (36) for supplying torque, wherein the torque converter (32) has a first state of operation and a second state of operation, the torque converter is configured (34) to provide a mechanical coupling between the input (34) and output (36) of the torque converter (32) in the first state of operation and a fluid coupling between the input (34) and output (36) of the torque converter (32) in the second state of operation, and torque supplied to the input (34) of the torque converter (32) is conveyed to the output (36) of the torque converter (32) in the first state of operation and in the second state of operation, wherein in the first state of operation the input (34) of the torque converter (32) is locked to the output (36) of the torque converter (32) for avoiding slippage there between, and in the second state of operation the input (34) of the torque converter (32) is not locked to the to the output (36) of the torque converter (32) for allowing slippage therebetween, and"), given that a "torque converter" is not disclosed in D1.

However, a torque converter is defined in claim 1 and in EP-B (see paragraph [0019]) solely as being capable of converting torque (i.e. implying a decrease or increase in torque) and not necessarily only of increasing (i.e. multiplying) torque. Therefore, the objective technical problem merely consists in increasing comfort, since this is the technical effect

achieved by avoiding step gears and implementing only a continuous drive (see EP-B, paragraph [0014]), no enhanced acceleration being necessarily obtained by a torque converter as defined and implied by claim 1 and the disclosure of EP-B.

The skilled person would solve said technical problem through the obvious combination of D1 and D2, which discloses a torque converter transmitting or converting torque (i.e. reducing torque according to D2), having two operating states as defined in said feature 3a of claim 1, transmitting torque in both said operating states and allowing slippage in the second operating state. Thus, the skilled person would replace the clutch 112 in the embodiment of figure 132 in D1 with said torque converter known from D2, thereby reducing abrupt increases in torque and transmitting only part of the available torque in order to increase driving comfort and improve response to driver input.

Finally, said replacement of clutch 112 would not impair or prevent proper operation of the series-combined and parallel-combined functions in D1, since the engine 100 (see D1, figure 132) operates as a generator for the electric unit 103 without directly engaging the loads 120 when clutch 1120 is disengaged (series-combined operation), whereas the combined action of the electric motor 103 and the engine 100 directly acts on and transfers torque to the loads 120 (parallel-combined) mode) when the clutch 1120 is engaged (the torque converter (replacing clutch 112) being of course constantly engaged).
Consequently, the skilled person would arrive in an obvious manner to the subject-matter of claim 1.

Similar arguments as above apply when D3 is considered instead of D2, D3 likewise disclosing a torque converter as defined in disputed claim 1 (having two operating modes transmitting torque in both said modes as indicated in claim 1) and in EP-B (see above), given D3 disclosing that it is possible "to achieve extremely pleasing operation and feeling of the vehicle" (D3, column 4, lines 39-41) by using a clutch working with fluid coupling allowing slippage and being also able to operate in an engaged state without slip.

Moreover, the combination of D1 and D4 would also be obvious for the skilled person, D4 disclosing a torque converter actually acting as a torque multiplier and capable of improving acceleration of the vehicle. Therefore, even based on the (erroneous) assumption that the objective technical problem resides in improving acceleration (as considered in the appealed decision), the skilled person would arrive in an obvious manner at the subject-matter of claim 1 (particularly implying said feature 3a) by replacing said clutch 112 in the embodiment of figure 132 in D1 with a torque converter as known from D4.

Moreover, in analogous manner as already stated above (in relation to D2 and D3), replacing the disengageable clutch 112 with a torque converter would still allow all the functions and operating modes disclosed in D1 (see e.g. D1, claim 7) to be performed without impairments or technical difficulties (as discussed during oral proceedings).

The same conclusions as hereinabove (see D1 in conjunction with D4) apply if the obvious combination of D1 with the skilled person's common general knowledge is considered, torque converters acting as

torque multipliers being well known in the art, as demonstrated by documents D5, D6 or D7.

VI. The Respondent's (Patentee) arguments may be summarized as follows:

The subject-matter of granted claim 1 (main request) is inventive over D1 in view of D2, D3 or D4, or in view of common general knowledge as exemplified by D5, D6 and D7. Further, documents D5, D6 and D7 being late filed, and without valid reasons or justifications, should not be admitted into the appeal proceedings.

The appealed decision is based on the assumption that the claimed subject-matter differs from D1 (at least) by said feature 3a, regardless of whether or not the other disputed features are actually (implicitly) known from D1. Consequently, in the event that (based on these assumptions) the Board's preliminary view on the question of inventive step deviates from the appealed decision, remittal of the case to the first instance department is requested, to deal with the question whether the choice of the embodiment in figure 132 in D1 as closest prior art involves an inventive selection and to determine which claimed features are to be (explicitly or implicitly) inferred from said embodiment and which features are not disclosed in D1 (besides feature 3a).

The torque converter according to claim 1 and to the disclosure of EP-B is to be construed as clearly and necessarily implying torque multiplying (i.e. increasing torque), in agreement with the definition of torque converter as known from common general knowledge, otherwise the main object of the invention

consisting in improving acceleration would not be achieved (see EP-B, paragraph [0007], [0019]). Documents D2 and D3 do not disclose torque converters and their combination with D1 would not lead the skilled person to the subject-matter of claim 1.

Furthermore, the skilled person would not combine D1 with D2, D3 or with D4 or with common general knowledge represented by D5, D6, D7 in the way suggested by the Appellant. Indeed, the powertrains disclosed in D1 and particularly in figure 132 are hybrid power drive systems, operating both as a series-combined power system and as a parallel-combined power system. In order to perform these functions clutch 112 is essential and crucial, since in the series-combined operating mode clutch 112 is disengaged whereas in the parallel-combined operating mode clutch 112 is engaged.

The skilled person would therefore not replace clutch 112 with a torque converter (or with any of the clutches D2 or D3), for a torque converter (as well as the clutches disclosed in D2 and D3) provides a permanent and constant engagement or connection between its drive input and its drive output, no disengaged status being any more available to enact the series-combined operating mode as required by D1. In addition other functions performed by the power train of D1 would be similarly impaired.
Hence the skilled person would not implement in an obvious manner the modification suggested by the Appellant.

Reasons for the Decision

1. The appeal is admissible.

2. The subject-matter of claim 1 is not rendered obvious for the skilled person starting from D1 in view of D2 or D3, or in view of D4 or common general knowledge as exemplified by D5, D6 or D7 (Article 56 EPC).

The Board notes that claim 1 and particularly feature 3a (see above) explicitly includes a "torque converter", which is defined according to common general knowledge not merely or generally by torque conversion but specifically by torque multiplication, as can be inferred e.g. from prior art documents D5 and D7 (cited by the Appellant, both documents explicitly disclosing torque converters as torque multipliers) representing common general knowledge. This is confirmed by the description of EP-B, defining as the object of the invention "to improve the acceleration of a vehicle" (EP-B, paragraph [0007]) and stating that the "the torque converter may be configured for supplying a torque from its output that is greater than a torque received to its input in the second state of operation. This has the advantage that a higher torque can be supplied to the drive wheel at low or zero rotational speeds of the drive wheel, which contributes to an improved acceleration" (EP-B, paragraph [0019]).

In addition, since claim 1 defines a powertrain essentially implying a single gear ratio (i.e. without a gearbox) (as emphasized by the Respondent: see wording "wherein the input (46) of the final drive (44) is coupled to the output (36) of the of the torque converter (32) at a fixed gear ratio") the torque converter necessarily has to provide torque

multiplication in order to be able at all to effectively transfer engine torque from the engine to the final drive (44) and to the drive wheels.

Consequently, the Board considers (in agreement with the appealed decision) that the objective technical problem derived from said distinguishing feature 3a (see above) consists correctly in improving the acceleration of the vehicle and that the torque converter claimed as (part of the) solution to said technical problem necessarily has to act as torque multiplier.

From the above discussion it ensues that the skilled person would have no reason to combine D1 with D2 or D3, since these documents do not disclose a torque converter contributing to increasing torque and acceleration, and moreover, even combining these documents, the skilled person would not arrive at the claimed subject-matter.

The skilled person would similarly not combine D1 with D4 or with common general knowledge (derivable from D5, D6 or D7) in the way suggested by the Appellant, given that replacing the clutch 112 (see D1, figure 132) with a (continuously operating and engaged) torque converter would mean that an essential function provided by said clutch 112 would not be available any more in the same way as before, since the disengaged status of the clutch is necessary for the proper functioning of the series-combined mode, wherein use is made of “the power from the engine to drive a primary dynamo-electric unit for functioning as a generator to drive a secondary dynamo electric unit for functioning as a motor to output rotation kinetics to drive the load in case of a light load” (see D1, e.g. see paragraph [0005]).

Indeed, in the embodiment of figure 132 in D1 the clutch 112 is the main and principal clutch component which is implemented and illustrated in literally all embodiments and corresponding figures (see figures 1 to 140) of D1, whereas clutch 1120 is merely disclosed as optional in the embodiment of figure 132 (see D1, paragraph [0148); clutch 1120 illustrated also with dashed lines in figure 132), therefore clutch 112 including engaged and disengaged operating states is central and pivotal to literally all the embodiments and corresponding functions of the powertrain of D1. Thus, the skilled person would not replace the clutch 112 by a torque converter since this would be tantamount to actually inverting (and running counter to) the technical teaching of D1, i.e. considering (contrary to D1's technical teaching) clutch 112 as optional and being replaced by a permanent connection, and considering clutch 1120 as performing the main clutch function.
It ensues that even only for this reason said modification would not be obvious for the skilled person.

In addition, said modification would imply that several functions of the powertrain of D1 would be seriously impaired and hampered, such as for instance the series-combined operation (see hereinabove), wherein the combustion engine 100 would be constantly engaging and driving the torque converter (contrary to the disengaged status of clutch 112 in the series-combined operation (see above)), hence permanently driving not only the torque converter but also the differential 109 and part of the disengaged clutch 1120 as well (see figure 132), and consequently wasting and dissipating

considerable amount of energy in idle rotation of said various components.

The same would occur (as also discussed during oral proceedings) when starting the engine 100 (see D1, e.g. claim 7), wherein the torque converter would be constantly engaged (contrary to the disengaged status of clutch 112 required for said operation in claim 7) such that the rechargeable device 106 driving the primary dynamo electric unit 101 functioning as a motor for starting the engine 100 (serving as the main rotation power source) would waste and dissipate a considerable energy amount in idle rotation of said torque converter, of said differential 109 and of part of said disengaged clutch 1120.

Thus, all in all, also on the grounds of energy efficiency the skilled person would not contemplate or envisage replacing the clutch 112 with the permanently engaged torque converter disclosed in D4 (or according to common general knowledge as derivable e.g. from D5, D6, D7), as well as with the permanently engaged clutch-like devices disclosed in D2 and D3 (for the same reasons as for said the torque converter), given that various important and essential functions or operating modes disclosed in D1 would thereby be seriously impaired and hampered in view of considerable energy dissipation and losses.

Finally and last but not least, in said series-combined mode (i.e. electric power provided by rechargeable battery and by engine-powered electric dynamo) the differential gear 109 would not be available for operation during driving, given the clutch(es) 1120 being necessarily disengaged in this operating mode (as the torque converter is permanently engaged). The same

applies if the clutch 112 in D1 is replaced with permanently engaged clutch-like devices disclosed in D2 and D3.

Similarly (see further operating mode indicated in claim 7), when the torque converter replacing clutch 112 is constantly engaged (contrary to the disengaged status of clutch 112 for this operating mode as indicated in claim 7) while the power from the rechargeable device 106 controls the speed, torque and orientation of the secondary dynamo electric unit 103 (purely electric operating mode using power from rechargeable device 106) to function as a motor for outputting to the drive load (wheels), the clutch 1120 (see figure 132) has necessarily to be disengaged (as also submitted by the Appellant).
Therefore, as for the series-combined mode, the differential gear 109 would not be available for operation during driving, given the clutch(es) 1120 being necessarily disengaged (as the torque converter is permanently engaged). The same applies if the clutch 112 in D1 is replaced with permanently engaged clutch-like devices disclosed in D2 and D3.

Consequently, said two operating and driving modes discussed hereinbefore as disclosed in D1 (see e.g. claim 7) would be seriously impaired, due to the differential gear 109 being effectively disactivated and not operating.

From the above discussion it ensues that contrary to the Appellant’s view the skilled person would not combine in an obvious manner the powertrain of D1 with the technical teaching of D2, D3, D4 or as derivable from common general knowledge (see e.g. D5, D6, D7) in the manner suggested by the Appellant.

3. The Board notes that in conclusion it was not necessary to decide on the admissibility objections raised by the Respondent (particularly in relation to the lines of argument taking into account D5, D6 and D7) since the further Appellant's lines of argument contested on the grounds of admissibility by the Respondent already fail on substantive grounds.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Schalow G. Pricolo

Decision electronically authenticated