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D E C I S I O N
of 27 July 2004

Case Number: T 0072/03 - 3.2.1

Application Number: 95916066.4

Publication Number: 0764246

IPC: F16H 3/093, B60K 17/08

Language of the proceedings: EN

Title of invention:
Motor vehicle gearbox

Patentee:
Volvo Car Corporation

Opponent:
VOLKSWAGEN AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0072/03 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 27 July 2004

Appellant: VOLKSWAGEN AG
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Respondent: Volvo Car Corporation
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 13 November 2002
rejecting the opposition filed against European
patent No. 0764246 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
S. U. Hoffmann

Summary of Facts and Submissions

- I. The appeal is directed against the decision of the Opposition Division posted 13 November 2002 to reject the opposition against European patent No. 0 764 246.
- II. The opposition was based *inter alia* on the ground that the subject-matter of the patent did not involve an inventive step (Article 100(a) EPC).
- III. The following prior art played a role during appeal:
- D2: EP-A-0 560 202
- D3: EP-A-0 239 553
- D8: GB-A-2 074 669.
- IV. During oral proceedings on 27 July 2004 the appellant requested that the decision under appeal be set aside and that the patent be revoked. The respondent requested that the appeal be dismissed and that the patent be maintained as granted.
- V. The patent as granted contains a single independent claim which reads as follows:
- "1. Motor vehicle gearbox comprising a housing with an input shaft and two countershafts lying in a plane offset from the input shaft and having gears in engagement with gears on the input shaft, at least one gear of each pair of mutually engaging gears on said shafts being disengageable from its shaft, one of said disengageable gears being mounted on one countershaft

and being disposed to transmit torque in the first gear speed to a differential, the input shaft (2) having at least five gears (7-11) in engagement with gears (15,16,17-20) on the countershafts (3,4) for transferring torque with at least five different forward gear ratios, each countershaft having a gear non-rotatably joined to the shaft and engaging the crown wheel of the differential, characterized in that the disengageable gear (17) for transmitting torque in the first gear speed engages an additional gear (23), which is disengageably carried on a fourth shaft (5), the fourth shaft (5) having a gear non-rotatably joined to the shaft and engaging the crown wheel of the differential to transmit reversing torque to the differential (28)."

The patent specification additionally contains claims 2 and 3 which define features additional to those in claim 1.

VI. The submissions of the appellant can be summarised as follows:

The closest prior art is disclosed in D8 which discloses the features of the preamble of claim 1. It moreover discloses the characterising feature of an additional gear on a shaft. D2 discloses all of the characterising features of claim 1 including the features of non-rotatably and disengageably carried gears on an additional shaft. The skilled person would realise that the objective problem to be solved in D2 is to reduce the length of the gearbox. He would be aware that this is achieved by the provision of a separate shaft for the reverse gear but that the

additional change according to D2, to reduce the number of shafts, would not contribute towards solving the objective problem. Moreover, D2 indicates that the arrangement of the reverse gear train is not limited to gearboxes having only two main shafts. The skilled person therefore would select those features of D2 which contribute to solving the problem to which the present patent relates and apply them to D8, thereby arriving at the subject-matter of claim 1 in an obvious manner.

VII. The respondent rebutted the appellant's arguments essentially as follows:

The present patent begins from the prior art known from D3 and solves the problem of reducing the length of the gearbox. D8 forms the prior art from which both D3 and D2 begin and relates to a gearbox having three main shafts, as does present claim 1. D2, on the other hand, explicitly sets out to delete one of the three main shafts and so teaches a different gearbox arrangement to that presently claimed. There is no suggestion in D2 that it could solve the problem of reducing the length of the gearbox.

Reasons for the Decision

1. The only matter to be considered in this case is inventive step of the subject-matter of claim 1. Claim 1 concerns a gearbox being having two countershafts which are equipped with gears non-rotatably mounted thereon which engage with the crown wheel of a differential. Such an arrangement is

typically fitted on the end of a transversely mounted engine in the front of a motor car where there is limited space available. Two of the documents relied on by the appellant, D3 and D8 disclose such a gearbox and it is undisputed amongst the parties that both disclose all features of the preamble.

1.1 In the gearbox according to D8 the first speed gear train comprises a first gear wheel non-rotatably mounted on the input shaft in engagement with a further gear wheel disengageably mounted on a countershaft. Engagement of the further gear wheel with the countershaft by means of an engagement sleeve allows rotation of the input shaft to be passed through the countershaft carrying a gearwheel meshing with the crown wheel. The reverse gear train comprises a second gear wheel non-rotatably mounted on the input shaft which meshes with an idler gear on a fourth shaft. The idler gear in turn meshes with a ring gear mounted on the engagement sleeve, whereby reverse direction rotation may be passed to the countershaft. The aim of the invention according to D8 is to provide a gearbox of reduced length in order to enable its fitment on the end of a transversely mounted engine.

1.2 D3 begins from D8 as closest prior art and has the aim of achieving a more compact design by deleting the fourth shaft. The first gear train is similar to that in D8 and comprises a gear wheel non-rotatably mounted on the input shaft meshing with a further gear wheel disengageably mounted on a first countershaft. This further gear wheel carries a reverse gear wheel solidly joined thereto and meshing with a gear mounted on a

second countershaft by means of which rotation is transmitted to the crown wheel.

1.3 In the gearbox according to D8 the input shaft includes a gear wheel provided solely for reverse drive.

Although in the gearbox according to D3 the reverse gear train has no dedicated gear wheel on the input shaft longitudinal space must be provided for the meshing gear wheels on the countershafts. It follows that in both of these prior art gearboxes the reverse gear train limits the extent to which the length of the gearbox housing can be reduced. By comparison, the features of the characterising portion of present claim 1 have the effect that the reverse gear train uses the first two gear wheels of the first gear train, thereby permitting a reduction in the length of the input shaft, whilst the remainder of the reverse gear train is mounted on a further shaft. The corresponding problem to be solved by the present invention is to provide a gearbox having a given number of forward gears in which the housing may be reduced in length.

2. The disclosure of D2 begins by acknowledging the disclosure of D8 and observes that that prior art gearbox employs two countershafts and that the arrangement of the reverse gear train requires a fourth, idler shaft. A further acknowledgment of the state of the art at that time concerns a gearbox having a single countershaft together with an idler shaft for the reverse gear train but in which the latter shares gear wheels with an intermediate speed gear train. It is explained that this arrangement restricts design freedom in changing intermediate gear ratios and that the arrangement of two disengageably mounted gear

wheels on the idler shaft demands more space. The stated aim of D2 is to provide a combination of the earlier designs of gearbox having one and two countershafts respectively.

2.1 In the gearbox according to D2 the first and second speed gear trains each comprise a gear wheel non-rotatably mounted on the input shaft meshing with a further gear wheel disengageably mounted on the first countershaft. Engagement of the further gear wheel with the countershaft allows rotation of the input shaft to be passed through the countershaft carrying a gear wheel meshing with the crown wheel. A second countershaft provided only for the reverse gear train carries a disengageably mounted gear wheel and a non-rotatably mounted gear meshing with the crown wheel. The disengageably mounted gear wheel of the reverse gear train meshes with, and so is rotated by, the disengageably mounted gear wheel of the first gear train. It follows that the arrangement for providing a reverse gear disclosed in D2 corresponds in principle to what is defined in the characterising portion of present claim 1. D2 explains that the proposed layout of the gear trains has the benefit that the gear wheels for the reverse gear train, which are subjected to particularly high torque loads, are located at the stiff, front end of the gearbox.

2.2 The teaching of D2 comprises two modifications, one relating to the number of shafts and the other relating to the layout of the gear trains. The appellant argues that these modifications are merely aggregated, that the skilled person would recognise this, that the layout of the reverse gear train permits the gearbox to

be made shorter and that he would incorporate this layout in a gearbox according to D3 or D8, thereby arriving at the subject-matter of claim 1. In the Board's view the appellant's approach is the result of an *ex post* consideration of D2. There is no explicit indication in D2 that the layout of the reverse gear train would result in a shorter gearbox. Moreover, as set out below, the skilled person would not contemplate applying the teaching of D2 to either of the gearboxes according to D3 or D8.

- 2.2.1 Although the teaching according to D2 aims to improve on that of D8 the advantage is not said to be a reduction in the length of the gearbox but a reduction in the general bulk, achieved by reducing the number of shafts. It would be illogical for the skilled person aware of D2, whose teaching is in itself presented as an improvement on the gearbox of D8, to attempt to improve the latter by ignoring part of the teaching of D2. Moreover, the reverse gear train layout is not presented as an isolated feature. It is closely associated with the layouts of the first and second speed gear trains and in this respect applying the teaching of D2 to the D8 gearbox in order to achieve the improved stiffness taught by D2 would involve a substantial redesign, placing the gear wheels for both the first and second speeds at the front of the gearbox. By comparison, in one embodiment of D8 the non-rotatably mounted gear wheel for the first speed is separated from the front end of the input shaft by the corresponding gear wheel for the third speed and that for the second speed is positioned towards the rear of the shaft whilst in the second embodiment the gear wheel for the first speed is placed close to the rear

end of the input shaft. The skilled person would have no motivation to modify the gearbox of D8 in preference to simply adopting the teaching of D2 in its entirety.

2.2.2 The above comments regarding the teaching of D2 in respect of the reverse gear train layout apply equally to D3. Moreover, in the Board's view the skilled person would be even less likely to modify the gearbox of D3 in accordance with the teaching of D2 because the former, starting from D8, had the particular aim of avoiding a separate countershaft for reverse gear, which is contrary to the teaching of D2.

2.2.3 The Board also cannot accept the appellant's argument that D2 itself indicates that the reverse gear train layout may be applied to gearboxes having a different number of shafts. The appellant refers in this respect to column 2, lines 55 to 58. The teaching of that text is based on the previous paragraph which indicates that the reverse gear train layout may be applied to gearboxes having between four and six forward speeds. The paragraph referred to by the appellant states that the reverse gear train layout thus is independent of the number of gears and therefore may be used with all gearboxes having the same or similar basic construction. However, an essential feature of the basic construction according to D2 is a gearbox having two main shafts and so there is no suggestion here that the reverse gear train layout may be applicable to a gearbox having three main shafts.

3. In the light of the foregoing the Board comes to the conclusion that the subject-matter of present claim 1 is not rendered obvious by the prior art relied on by

the appellant. Since claims 2 and 3 contain all features of claim 1 this conclusion applies equally to those claims.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Kiehl

S. Crane