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Bezeichnung der Erfindung: Transmission, in particular for a motor vehicle
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : F16H 57/06, F16H 11/00

ENTSCHEIDUNG / DECISION

vom / of / du 27 February 1989

Anmelder / Applicant / Demandeur : Van Doorne's Transmissie B.V.

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (no) - main idea derivable from the documents - knowledge of the person skilled in the art"

Leitsatz / Headnote / Sommaire

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Case Number : T 84/88 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 27 February 1989

Appellant : Van Doorne's Transmissie B.V.
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Decision under appeal : Decision of Examining Division 117 of the European Patent Office dated 22 September 1987 refusing European patent application No. 83 201 312.2 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : F. Gumbel
Members : F. Brösamle
F. Benussi

Summary of Facts and Submissions

I. European patent application No. 83 201 312.2 filed on 13 September 1983 and published under publication No. 0 103 931, was refused by the decision of the Examining Division dated 22 September 1987. That decision was based on Claims 1 to 3 filed with a letter of 18 March 1986, pages 1 to 7 of the description and drawing sheet 1/1 as originally filed.

The reason given for the refusal was that in the light of the disclosure of GB-A-2 058 251 (D1) and DE-A-2 442 951 (D2) the subject-matter of Claim 1 lacks inventive step. The features of Claim 2 could be seen from D2 and the features of Claim 3 from the combination of D1 and D2.

II. On 21 October 1987 a notice of appeal was filed and the appeal fee was paid on the same day.

The Appellant filed the Statement of Grounds of Appeal on 16 January 1988. He argued that the subject-matter of Claim 1 is not only novel but also based on an inventive step. Although he admitted that the use of a pitot tube is notoriously known in the art of continuously variable transmissions (CVT), he contended that the pitot tube always reflects the rotational speed of the input shaft and not the forward speed of the motor vehicle so that it was not at all obvious to find out that the hydraulic pressure signal of the pitot tube forms a sufficiently reliable measure for the forward speed of the motor vehicle, as this signal depends on the actual transmission ratio of the CVT. Hence, a person skilled in the art would not even consider a pitot tube for solving the problem of the present invention, namely providing a safeguard against shifting of the reversing gear into reverse

position as long as the vehicle is moving forward at a speed exceeding a preset value. The Appellant further argued that the "Regler" of D2 would lead a person skilled in the art away from even considering the application of a pitot tube as a pitot tube does not belong to the same kind of devices as a "Regler", because a pitot tube does not need a pressure to produce its signal. He therefore contends that the teaching of D1 and D2 would not be combined by a skilled person. However, even if the skilled person would try to combine them he would be faced with the problem where to connect the lines "24" and "8" of D2 when using a pitot tube and where to get from a speed driving dependent signal.

He concludes that it is the important merit of the inventor to find out that a pitot tube signal is suited to reflect the vehicle speed and not only the rotational speed of the input shaft and that the prejudice that one needs a "Regler" of a pump-feeded sensor type is overcome by the claimed transmission system which is very simple and efficient.

III. In the oral proceedings held on 27 February 1989 the Appellant requested cancellation of the impugned decision and grant of the patent on the basis of the claims, the description and the drawing underlying the impugned decision. His arguments set forth in these oral proceedings can be summarized as follows:

a. D2 belongs to a technical field apart from that one of the application; only FR-A-2 340 486 (D3) and D1 concern CVT-systems. The problems arising with CVT-systems are different from those in normal automatic transmission systems. Even if D1 and D2 were known to a person skilled in the art they could not be combined

as D1 discloses a pitot tube for another purpose and D2 a "Regler"-type-transmission.

In D2 an abrupt switching process is taught, see its page 9 line 4 from bottom. This is, however, completely unacceptable in CVT-systems as there a smooth and gradual change of the transmission is required to safeguard the transmission's functioning.

b. Even if D1 and D2 were combined, the inventor had to decide which type of "Regler" had to be chosen, he had to break with the prejudice to rely on an external hydraulic pressure and apply a pitot tube as the source for a hydraulic signal, he had further to relate the rotational speed of the input pulley to the vehicle speed though the interrelationship between these speeds is complex, he had to decide what to do with the hydraulic lines of D2 (discharge/exhaust) which are superfluous when applying a pitot tube and as a consequence he had to redesign the hydraulic installation. The items set out above could moreover not be followed chronologically. Hence, the documents available in the present case would lead away from the invention.

c. Moreover the Appellant took the view that the invention is not obvious as it achieves additional effects over the prior art. The subject-matter of Claim 1 would be cheaper and simpler than known systems, it would act only in one direction, need no three-way-valve and no pump and its characteristic would be a soft change of the gears leading to a safer operation of the system. The difference between an automatic gear with several distinct gears and a CVT-system was emphasized by the Appellant and it was pointed out in this context that in a CVT-system not

the slightest slip of the belt vis-à-vis the pulleys can be accepted as this effect would lead to a damage of the pulleys. The teaching of D2, see page 9, line 4 from bottom ("schlagartiger Zusammenbruch ....") could therefore not be followed in a CVT-system as any abrupt changes had to be avoided.

Summarizing, the Appellant comes to the conclusion that the subject-matter of Claim 1 is based on an inventive step.

IV. Claim 1 reads as follows:

"1. A transmission system with an infinitely variable transmission ratio, in particular for a motor vehicle, provided with a V-belt looped over a primary pulley, coupled to an input shaft driven by an engine and over a secondary pulley coupled to an output shaft, the primary pulley being connected to an annular channel at least partially filled with a fluid in which a stationary pitot tube terminates, whereby a pressure can be built up in said tube dependent on the speed of rotation of the primary pulley and provided with a gear system, located between the input shaft and the primary pulley, operated by a first, manually activated hydraulic valve for choosing forward or reverse rotation of the primary pulley, characterized in that the flow of fluid through said valve is governed by a second valve which is controlled by the pressure built up in the pitot tube, the two valves cooperating in such manner that the reversing gear is not put into operation when the primary pulley is rotating with a velocity higher than a predetermined value."

Reasons for the Decision

1. The appeal is admissible.

2. Claim 1 is not open to formal objections under Art. 84, Art.123(2) and Rule 29(1) EPC.

3. Starting point of the invention is D1, see especially Fig. 2, in which figure a transmission system comprising a pitot tube is shown which discloses all the features of the preamble of Claim 1. The characterising features of Claim 1, namely that a second valve is applied, which governs the first, manually activated hydraulic valve, which second valve is controlled by the pressure built up in the pitot tube thereby avoiding that the reversing gear is put into operation when the primary pulley is rotating with a velocity higher than a predetermined value are not known from D1, so that the subject-matter of Claim 1 is clearly novel; novelty was never disputed by the Examining Division or the Board so that no further discussion is necessary insofar.

4. Examination of the question as to whether or not the subject-matter of Claim 1 also involves an inventive step results in the following observations:

4.1 The transmission system laid down in D1 applies a pitot tube, but from this document it cannot be seen that the pitot tube has something to do with the problem underlying the invention, i.e. how a simple and efficacious safeguard against shifting of the reversing gear into reverse position as long as the vehicle is moving forward with a speed exceeding a preset value can be provided.

4.2 The conception of this object as such is certainly not based on an inventive activity, since it is the normal attitude of any practitioner to avoid situations in

transmission systems which could destroy it when the gears are changed, be it intentionally or inadvertently. Morevoer this problem is already discussed in D2 paragraphs 2 of pages 2 and 10, which document exclusively deals with this problem arising specifically with automatic transmission systems.

4.3 Regarding the solution to this problem as claimed in Claim 1 it is to be noted that D2 not only discloses the object of the present application but also a solution, which is based substantially on the same principle as the solution laid down in Claim 1, as in D2 firstly the vehicle speed is continually sensed ("Regler" described but not shown in Figs. 1 and 2) and a pressure signal representing the vehicle speed is used and as in D2 secondly a first valve ("Handschieber" again only described but not shown in Figs. 1 and 2), which could be activated wrongly, that is at too high a vehicle speed, is governed by a second valve "27" respectively "3". The second valve acts thereby as an inhibitor vis-à-vis the first valve so that the gear change takes place only if the vehicle speed is below a preset value.

4.4 The examination of the question whether a person skilled in the art knowing D1 and D2 could derive therefrom the subject-matter of Claim 1 leads to the following result:

Both documents form part of one and the same technical field, namely the field of automatic transmission systems, though the Appellant denies this fact with a hint to the indefinitely varying transmission ratio of the CVT-system. The Board can, however, not share the view that only for that reason a person skilled in the art would not derive from D2 any teaching useful to a transmission system of Claim 1, since the basic problem of avoiding undue setting of the reverse gear exists in both systems.

It has moreover to be observed that whilst it is true that in D2 an external hydraulic system is disclosed using a pump, a three-way-valve, hydraulic lines and so on it clearly emerges however from D2 that its teaching is not restricted to the detailed construction as disclosed therein, see Figs. 1 and 2 and corresponding description, but that in D2 a specific control scheme is realised, see 4.3 above.

For a person skilled in the art seeeking for a solution to a specific technical problem it is normal practice to study the principles which are followed by any prior art solution related to the same problem. The next step to be expected from a person skilled in the art is in the Board's view that this person would maintain the recommended control scheme but would modify the way of its realisation in practice thereby duly considering the actual conditions of the specific case i.e. the requirements of CVT-systems.

Furthermore the person skilled in the art knows that in CVT-systems, see D1, D3 and EP-A-0 027 672 (D4), a tendency prevails to apply a simple pitot tube instead of external hydraulic pressure applying means together with a "Regler" for instance as a means for sensing the rotational speed of the input shaft and simultaneously for producing a hydraulical signal, so that the Board cannot accept the existence of a prejudice against giving up an external hydraulic supply and the "Regler" as brought forward by the Appellant.

4.5 From Claim 1 itself results that the pitot tube is actually linked to the parameter <u>rotational speed of the primary pulley</u>, see characterising clause of it. The

Appellant's argument that the vehicle speed would be the crucial parameter which governs the switching point of the transmission system of Claim 1 is so far not based on the facts. It is the Board's view that for a person skilled in the art the interrelationship between the two parameters "vehicle speed" and "rotational speed of the primary pulley" is perfectly clear, even if as a further parameter the transmission ratio has to be considered in this context.

The Board comes therefore to the conclusion that the interpretation of the pitot tube-signal as being a signal reflecting the vehicle speed forms part of the knowledge of the skilled person.

The subject-matter of Claim 1 may provide additional technical effects but no structural features that are not known from D1 and D2. The additional effect of the claimed invention that there is the smooth and gradual change of the transmission prima facie appears to be contradictory to what is disclosed in D2, see page 9 last paragraph ("schlagartigen Zusammenbruch"). For the Board this abrupt change of the hydraulic pressure does however not necessarily mean that the gears are abruptly changed, as from D2 it is also evident that principally inadvertent changes in the transmission system must be avoided for protecting the automatic gear system, see page 2 first paragraph. It follows therefrom that in this technical field the protection of the gear system is an absolute necessity so that it can be assumed that the change of the transmission even if the pressure in the control line diminishes abruptly does not lead to shocks or damages in the transmission system. It appears therefore logical that the known characteristic of a pitot tube, namely soft changes of the hydraulic pressure/signal would make this type of sensor highly suitable for its application in

combination with CVT-systems which are very sensitive as far as their system pulleys-belt is concerned, as any slip of the belt would destroy the pulleys.

The aspect of a simple and cheap construction possible with a pitot tube does in the Board's view not support inventive activity either, as this advantage is directly linked to the use of a pitot tube, whereby as known from D1, D3 and D4 an external hydraulic supply can be avoided.

4.6 Summarizing the Board comes to the conclusion that the arguments brought forward by the Appellant cannot be accepted as in the Board's view the subject-matter of Claim 1 can be derived from D1, D2 and textbook knowledge of a skilled person in an obvious way as it is not exceeding the skills of a practitioner to modify the transmission system according to D1 in that the pitot tube signal is interpreted as reflecting the vehicle speed, which is correct as long as the transmission ratio is constant, and in that the pitot tube signal is fed to a second valve which, in a known manner, governs the first manually activated valve to avoid shifting the reversing gear into operation at a too high vehicle speed/rotational speed of the primary pulley. The subject-matter of Claim 1 is therefore not based on an inventive step and Claim 1 is not allowable.

5. Dependent Claims 2 and 3 fall likewise as the request to grant a patent has to be dealt with as a whole.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani F. Gumbel

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