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**Datasheet for the decision
of 21 October 2016**

Case Number: T 1870/13 - 3.2.01

Application Number: 03783018.9

Publication Number: 1581418

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B60W30/18

Language of the proceedings: EN

Title of invention:
METHOD AND DEVICE FOR HILL START

Patent Proprietor:
VOLVO LASTVAGNAR AB

Opponent:
Scania CV AB

Headword:

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

Keyword:
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 1870/13 - 3.2.01

**D E C I S I O N
of Technical Board of Appeal 3.2.01
of 21 October 2016**

Appellant: Scania CV AB
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BF14100, M1.7
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 18 July 2013 rejecting the opposition filed against European patent No. 1581418 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman G. Pricolo
Members: H. Geuss
O. Loizou

Summary of Facts and Submissions

I. The appeal is directed against the decision of the Opposition Division of the European Patent Office posted on 18 July 2013 rejecting the opposition filed against European patent No. 1581418 pursuant to Article 101(2) EPC.

II. During oral proceedings held on 21 October 2016 the appellant (opponent) requested that the decision under appeal be set aside and the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed.

III. The opposition was based in particular on the following documents:

US 4802563	(E1);
US 6416441B1	(E2);
US 6370466B1	(E3);
WO 01/58714A1	(E4);
US 6253144B1	(E5);
US 6260934B1	(E6);
DE 10065589A1	(E7);
WO 02/090158A1	(E8);
WO 02/090159A1	(E9);
EP 0781946A1	(E10);
US 6439675B1	(E11);
US 6244402B1	(E12);
US 6411881B1	(E13);
WO 99/20922	(E14).

IV. Claim 1 of the patent as granted reads as follows:

A method for facilitating hill-starting of a stationary motor vehicle, characterized by the following steps:

a) at least one braking device is applied using a brake pedal, characterized by :

b) a control unit (30) estimates the traveling resistance of the vehicle,

c) the control unit (30) determines a starting gear, a minimum torque transmitted by the clutch and a minimum engine speed in order to overcome said estimated traveling resistance,

d) when the driver lets the brake pedal up, the control unit (30) will keep the braking device applied so that the vehicle remains stationary,

e) the driver operates an accelerator pedal to a position at least corresponding to said minimum torque transmitted by the clutch,

f) a clutch device (2) for transmitting the engine torque from the engine of the vehicle to the gearbox (3) of the vehicle is activated by the control unit (30),

g) the control unit (30) releases the braking device in parallel with the clutch device being applied so that the brake torque of the braking device decreases as a function of the increase in the engine torque transmitted by the clutch device.

V. Claim 21 of the patent as granted reads as follows:

A device for facilitating hill-starting of a stationary motorvehicle, comprising at least one braking device and a brake pedal, an accelerator pedal, a control unit (30) for controlling said braking device, engine speed and a clutch device (2) for a gearbox (3), and at least one sensor for measuring the state of at least one of the devices indicated above, characterized in that the braking device is arranged so as to be applied by the driver and to be released proportionally to the increase in the transmitted, driving torque of the clutch when the speed of the engine reaches a minimum speed (NE) which is estimated by the control unit (30) and is a function of the total weight of the vehicle and the gradient of the hill.

VI. The appellant's submissions may be summarized as follows:

Document E3 is considered as the closest prior art document. Since this document does not disclose a gearbox with a starting gear according to feature c) but a CVT (Continuously Variable Transmission), lack of novelty is no longer objected.

However, the method of claim 1 lacks inventive step.

Document E3 discloses a so called "certain value" corresponding to a driving force which is necessary to avoid unintentional backward movement of a vehicle on a slope, cf. E3, column 2, lines 14 et seq. This passage explains that the "certain value" is a driving force value sufficient to retain the vehicle (cf. lines 14 et seq). Afterwards, from line 18 ff., it is stated that the driving force value is determined based on the

slope angle for stationary retaining the vehicle with the brake pedal released. This method step corresponds therefore exactly to the method step according to feature b) of claim 1 estimating a traveling resistance, whereby the driving force value is determined on the basis of the slope angle.

It is a matter of normal practice for a skilled person to adapt the construction of a CVT according to E3 to a conventional gearbox. E3 discloses that the control unit controls the transmission gear ratio (cf. column 10, lines 50 et seq.) which relates to the starting gear according to feature c) of claim 1. Therefore feature c) is obvious for the person skilled in the art. In addition, it is clear that the output torque of a combustion engine is in a fixed relation to its revolution speed.

For these reasons figure 3 of E3 depicts a method with the steps of claim 1 of the contested patent. In particular in E3, step S103, the driving force is increased to a half of the strong creep value, which corresponds to the "certain value" according to column 2, lines 14 et seq. (cf. column 18, lines 53 to 56). This means that in step S104 the brakes are released not until the driving resistance has been overcome by the driving force. However this situation is the same as in the steps of features e), f) and g) according to claim 1. Feature e) recites that the driver operates the accelerator pedal to a position where a minimum (predetermined) torque is transmitted by the clutch. This wording specifies clearly that the clutch is already about to close and transmitting driving torque. Hence, feature e) is disclosed in document E3.

The situation for the device claim 21 is rather

different since there is no sequence of steps specified in the claim, in contrast to claim 1. In particular it is not defined in claim 21 that first a minimum revolution speed must be obtained before the clutch is closed and the brake is released. The claim merely requires that the braking force be released proportionally to the increase in the transmitted driving torque. Thus, the subject-matter of claim 21 is not based on inventive step taking document E3 in combination with the knowledge of a skilled person.

In any case, the subject-matter of claim 21 is not novel over document E2. In particular, E2 discloses a brake system having a service brake, a gas pedal, an influencing device and a controller for controlling the brake system, the engine speed and the clutch (cf. E2, column 8, lines 31 to 63). Therefore features a) to c) are disclosed. Further E2 discloses a sensor for the engine speed and how an external generated torque can be determined.

In addition the subject-matter of claims 1 and 21 is rendered obvious by documents E1, E2, E6, E4, E5 and E7.

E1 shows a pneumatic control unit whereby the pressure to hold the vehicle is dependent on the grade of the hill and the weight of the vehicle (cf. E1, column 8, lines 31 to 34). Therefore, step b) is known from E1.

E6 discloses a gradient sensor and a load sensor which is the basis for feature b).

E2 refers in detail to the determination of the torque acting externally on the vehicle, i.e. the traveling resistance.

E4 describes the determination of a grade resistance as well as E5, in which an estimation section estimates a hill climbing resistance.

E7 discloses a minimum braking force to hold the vehicle on the slope, which corresponds to the minimum torque according to feature b) of claim 1.

VII. The respondent's rebuttal was essentially the following:

The method as defined in claim 1 is novel and based on inventive step.

Document E3 is considered as being the closest prior art. This document does not disclose the estimation of a traveling resistance (feature b). E3 merely describes a fixed value ("certain value") corresponding to a driving force value sufficient to retain the vehicle on a slope without depressing the brake pedal, the slope being set in the embodiment of E3 to 5 degrees. This value is the basis for adjusting the minimum torque which is applied to the engine (cf. figure 11). The driver activates the gas pedal, at the same time the clutch is proportionally closed, and when the driving force value is half of the strong creep value (S103), then the brakes are released (S104). It is noted that the strong creep value corresponds to the so called "certain value" as mentioned above. However, this means that feature e) of claim 1 does not correspond to steps S103 and S104 of figure 11 (E3). According to feature e) the accelerator pedal is operated until a predetermined engine speed is reached corresponding to a predetermined engine torque. The clutch is not activated before the engine torque corresponds to the torque required for overcoming the traveling resistance

as estimated in features b) and c) (feature f).

These features solve the problem of preventing an unintentional backward movement of a vehicle in a hill-start situation, while reducing the load in the clutch, cf. description of the patent, paragraph [0008].

However, none of the documents E1 to E7 discloses the combination of features b) and c), which is the *a priori* estimation of the minimum torque to overcome the traveling resistance, due to the hill slope and the weight of the vehicle. In addition, feature e) is not disclosed in documents E1 to E7. In all of these documents the clutch is closed simultaneously with the increase of engine speed. In contrast thereto, according to the invention, closing of the clutch does not start until the engine provides sufficient torque to overcome the traveling resistance and thereby bring the vehicle in motion. This results in a lower load of the clutch.

Similar considerations apply to claim 21 which should be understood as implying the same sequence of steps as defined in the method of claim 1. In particular, the feature of the characterizing part requires that the brake is released simultaneously and proportionally to the increase in the driving torque transmitted by the clutch when the speed of the engine reaches the predetermined speed, which is the speed necessary for providing a torque that overcomes the traveling resistance. The term "when" of this feature implies a condition that has to be fulfilled before the brake and the clutch are released and activated, respectively.

Reasons for the Decision

1. The appeal is admissible.
2. The invention as defined in claim 1 as granted is considered as involving an inventive step, Article 56 EPC.
 - 2.1 Document E3 constitutes the closest prior art. This finding is acknowledged by both parties.
 - 2.2 The difference between the invention according to claim 1 and the hill-starting method according to E3 is seen in the features
 - b) a control unit (30) estimates the traveling resistance of the vehicle;
 - c) the control unit (30) determines a starting gear, a minimum torque transmitted by the clutch and a minimum speed engine in order to overcome said estimated traveling resistance;
 - e) the driver operates an accelerator pedal to a position at least corresponding to said minimum torque transmitted by the clutch.
 - 2.3 The appellant states that the "certain value" which is described in E3 corresponds to the traveling resistance according to feature b) of claim 1. The "certain value" is defined as a driving force value sufficient to retain the vehicle on a slope only by engine force without depressing the brake pedal. The "certain value" is further adapted to the actual situation since E3 states that the driving force value may be obtained by measuring driving torque or torque transmission of the

clutch.

2.4 The Board does not agree.

The "certain value" as disclosed in E3 is a fixed value which corresponds to the driving force value for stationarily retaining the vehicle on a slope of 5 degrees (cf. column 2, lines 14 et seq.). The "certain value" is stored in the control unit and corresponds to the value of the driving force in the strong creep condition (column 9, lines 61 to 66 and column 18, lines 53 et seq.). This strong creep value is used as a reference value for determining when the braking force is to be reduced, cf. figure 11, steps S103 and S104. There is no disclosure in E3 that the "certain value" depends on actual environment conditions, as for example the gradient of the hill or the actual weight of the vehicle. In a hill-start situation, the actual driving force is measured and compared with the strong creep value (cf. step S103 in figure 11).

Therefore the main difference between the traveling resistance according to claim 1 and the "certain value" is to be seen in that the traveling resistance is estimated before each hill-start procedure based on actual environment conditions, whereby the control unit according to E3 merely retrieves a stored value (no unintentional backward movement at a hill slope of 5 degrees).

The Board understands an *estimation* of the traveling resistance in the context of this invention to be a calculation or a determination of the traveling resistance on the basis of actual (environment) conditions.

3. It is beyond contest between the parties that E3 does not disclose a conventional gearbox but a CVT, a Continuously Variable Transmission. That means that instead of a starting gear according to feature c) E3 discloses a transmission gear ratio (cf. col 10, lines 50).
It is further not disputed by the parties that in a given combustion engine the output torque corresponds directly to the number of revolutions of the engine.

4. With respect to feature e) ("the driver operates an accelerator pedal to a position at least corresponding to said minimum torque transmitted by the clutch") the appellant argues that the method as disclosed in figure 11 of E3 is the same as in figure 3 of the contested patent: while the engine rotation number rises, the clutch closes and the braking force decreases proportionally.
In particular the appellant states that in feature e) the expression "minimum torque transmitted by the clutch" means that the clutch is already partially closed, e.g. a torque is already transmitted by the clutch.

5. The Board notes that according to claim 1, feature e), the accelerator pedal is operated by the driver whereby the clutch is not released until the condition of feature e) ("at least corresponding to said minimum torque") is fulfilled. Only then the clutch is activated according to feature f) of claim 1.

The wording of feature e) is clear and understandable in this respect. The wording "said minimum torque transmitted by the clutch" can only be understood as referring to the definition of feature c) where "a minimum torque transmitted by the clutch" is mentioned

for the first time (the undefined article being thus used).

Accordingly, the Board holds that feature e) refers to the minimum torque value to be transmitted by the clutch, e.g. the torque is not transmitted until the minimum value has been reached.

Thus, feature e) defines a precondition which has to be achieved in order to perform feature f), that is activating the clutch.

6. In the Board's view features b) and e) in combination contribute to inventive step:

As discussed above, according to feature e) the engine is brought to a revolution speed corresponding to a predetermined torque value which is able to overcome the traveling resistance in an actual hill-start situation, estimated in feature b). Only then the clutch is closed according to feature f) and the brakes are released.

7. The invention according to claim 1 solves the problem of unintentional backward movement in a hill-start situation while reducing the load in the clutch, cf. description of the patent, paragraph [0008].

8. The implementation of this feature is based on inventive step, since, starting from E3, no document in the state of the art discloses or suggests determining a minimum torque for overcoming the traveling resistance which traveling resistance is estimated on the basis of actual environment conditions by the control unit.

The sequence of features e) and f) (respectively g) assures that the necessary torque to overcome the

starting resistance of the vehicle is present before the clutch is activated. This results in a short time for the closing-process of the clutch and as a consequence, a low load for the clutch.

- 8.1 The appellant further attacks the subject-matter of claim 1 with E1, E6, E2, E4, E5, E7 and combinations of them.

In this respect the Board follows the decision of the opposition division, that none of the documents E1 to E14 disclose the feature of determining a minimum torque in order to overcome a traveling resistance estimated by a control unit, cf. decision of the opposition division, page 5, 2.2.1. Hence, none of the documents E1 to E14 is able to challenge the novelty of the invention of claim 1.

Since E3 is the closest prior art document (as also admitted by the appellant) none of the documents E1, E6, E2, E4, E5, E7 is suitable for questioning inventiveness of the underlying invention, since, also, they do not suggest the above-mentioned feature. The Board follows in this respect the decision of the opposition division, cf. pages 12 et seq.

9. The device as claimed in claim 21, which is directed to a device for facilitating hill-starting, is based on inventive step since its subject-matter is not obvious for the same reasons given for claim 1, see above.

The appellant submits that the wording of claim 21 does not imply the sequence of subsequent steps as discussed for the method according to claim 1. It is alleged that claim 21 does not define a first step setting the revolution speed of the engine to a minimum speed and

subsequently - as a further step - activating the clutch and releasing the brake.

The Board does not agree. The characterizing portion of claim 21 states clearly that the braking device is to be released proportionally to the increase in the transmitted driving torque of the clutch when the speed of the engine reaches a minimum speed. This expression ("when") implies a conditional relationship between the engine speed and the procedure of releasing the brake and activating the clutch. It has to be understood as ***once the engine speed reaches a predetermined minimum speed then the clutch is activated and the brakes are released proportionally.*** It clearly implies, for the device itself, technical features (possibly in terms of software features) that allow the functions of clutch activation and brake release to be performed once the specific condition of engine speed reaching a predetermined minimum speed is met.

Further, claim 21 defines the feature of estimating a minimum engine speed based on the total weight of the vehicle and the gradient of the hill, which is also a technical feature of the device.

Thus the Board holds that claim 21 defines features corresponding to the technical features recited in claim 1 and which are regarded as contributing to inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



A. Vottner

G. Pricolo

Decision electronically authenticated