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Datasheet for the decision of 4 August 2009

Case Number: T 1583/07 - 3.2.03

Application Number: 97945289.3

Publication Number: 0934448

IPC: E02F 9/22

Language of the proceedings: EN

Title of invention:
Electronic ride control system for off-road vehicles

Patentee:
Case Corporation

Opponent:
Brueninghaus Hydromatik GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 100(c), 123(2), 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Opposition grounds - extension of subject-matter (main request - yes; auxiliary request - no)"
"Amendements - added subject-matter (no)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1583/07 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 4 August 2009

Appellant: (Opponent)
Brueninghaus Hydromatik GmbH
Glockeraustrasse 2
D-89275 Elchingen (DE)

Representative:
Körfer, Thomas
Mitscherlich & Partner
Patent- und Rechtsanwälte
Postfach 33 06 09
D-80066 München (DE)

Respondent: (Patent Proprietor)
Case Corporation
700 State Street
Racine, WI 53404 (US)

Representative:
Feldkamp, Rainer
Patentanwälte
Wallach, Koch, Dr. Haibach, Feldkamp
Postfach 20 20 40
D-80020 München (DE)

Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 16 July 2007 concerning maintenance of European patent No. 0934448 in amended form.

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
K. Garnett

Summary of Facts and Submissions

I. European patent EP-B-0 934 448 concerns a system for controlling the ride of a vehicle, such as a tractor, to which an implement is attached. Grant of the patent was opposed on the grounds of lack of lack of novelty and inventive step (Article 100(a) EPC), insufficiency of disclosure (Article 100(b) RPC) and added subject-matter (Article 100(c) EPC). The Opposition Division decided that the patent could be maintained on the basis of amended claims filed during the opposition proceedings.

II. The above decision was posted on 16 July 2007. The Appellant (Opponent) filed notice of appeal on 14 September 2009, paying the appeal fee on the same day. A statement containing the grounds of appeal was filed on 16 November 2007. Oral proceedings were held on 4 August 2009.

III. Requests

The Appellant requests that the decision be set aside and that the patent be revoked.

The Respondent (Patent Proprietor) requests that the appeal be dismissed, alternatively that the decision under appeal be set aside and the patent be maintained on the basis of claims 1 to 5 and 10 to 14 according to the request filed during the oral proceedings and claims 6 to 9 and 15 to 18 as granted.

IV. Claims

Four sets of claims are of relevance to this decision, namely the claims of the original patent application, the granted set of claims, the claims maintained by the Opposition Division and the set filed by the Respondent during the oral proceedings before the Board.

(a) Claims of the Application

Claim 1 of the patent application as originally filed (WO-A-98/13557) reads as follows:

"1. A control system for a work vehicle (10) of the type including an implement (20) moveable relative to the vehicle, the system comprising:
- a hydraulic fluid source (30);
- a hydraulic actuator (24);
- an electronic valve (40) coupled to the source (30) and the actuator (24) to control the flow of hydraulic fluid applied to the actuator (24) by the source (30);
- a pressure transducer (46) in fluid communication with the hydraulic fluid applied to the actuator (24) to generate a pressure signal related to the pressure in the actuator (24); and
- an electronic controller (58) coupled to the electronic valve (40) and the pressure transducer (46), the controller (58) determining the acceleration of the vehicle (10) based upon the pressure signal, and applying control signals to the electronic valve (40) to control the flow of the hydraulic fluid applied to the actuator (24) to maintain the pressure signal substantially constant."

Claims 2 to 26 of the application are not directly of any significance for this decision.

(b) Granted Claims

Claim 1 of the granted patent is as follows; compared with claim 1 of the application, it was amended by adding text (shown in italics) and deleting text (shown by strikethrough).

"1. A control system for a work vehicle (10) of the type including an implement (20) moveable relative to the vehicle, the system comprising:
- a hydraulic fluid source (30);
- a hydraulic actuator (24) *couplable between the vehicle (10) and the implement (20) to lift the implement (20)*;
- an electronic valve (40) coupled to the source (30) and the actuator (24) to control the flow of hydraulic fluid applied to the actuator (24) by the source (30);
- a pressure transducer (46) in fluid communication with the hydraulic fluid applied to the actuator (24) to generate a pressure signal related to the pressure in the actuator (24);
a position transducer (48) mechanically couplable between the implement (20) and the vehicle (10) to generate a position signal representative of the position of the implement (20) with respect to the vehicle (10);and
- an electronic controller (58) coupled to the electronic valve (40), the pressure transducer (46) *and the position transducer (48), the controller (58) generating valve command signals based upon the pressure signal and the position signal and applying*

the command signals ~~determining the acceleration of the vehicle (10) based upon the pressure signal, and applying control signals~~ to the electronic valve (40) to cause the electronic valve (40) to control the flow of the hydraulic fluid applied to the actuator (24) to maintain the pressure signal substantially constant."

Dependent claims 2 to 9 concern preferred embodiments of the control system of claim 1. Independent claim 10 and dependent claims 11 to 18 are directed to a work vehicle.

Claims 2, 3, 11 and 12 refer to a "position signal error" and claims 4, 5, 13 and 14 refer to a "pressure signal error".

(c) Claims Maintained by Opposition Division

Claim 1 as maintained by the Opposition Division reads as for the granted claim 1, with "couplable" corrected to "coupled" and the electronic valve being defined as follows"

"1. A control system…
- an electronic valve (40) coupled to the source (30) and the actuator (24) to control both the path of flow and the volumetric flow of hydraulic fluid applied either into a first line (42) and out of a second line (44) or out of the first line (42) and into the second line (44) to the actuator (24) by the source 30, depending on the intended direction of travel of the actuator;…"

The dependant claims are as for the granted patent.

(d) Claims of the Auxiliary Request

Compared to claim 1 as maintained by the Opposition Division, claim 1 according to the Respondent's request filed during the oral proceedings redefines the controller (58) as determining the acceleration of the vehicle as well as generating valve command signals.

The expressions "position signal error" and "pressure signal error" in dependent claims 2 to 5 and 11 to 14 are amended to "position error signal" and "pressure error signal". Claims 6 to 9 and 15 to 18 are as granted.

V. Prior Art

The following documents cited during the opposition proceedings are of relevance for this decision:

E1: EP-A-0 378 129
E2: EP-A-0 747 797
E3: US-A-4 953 723
E4: US-A-4 995 517

E16: DE-A-3 346 892
E17: DE-C-3 446 811

VI. Submissions

The arguments presented by the parties are summarised as follows.

Main Request (claims maintained by the Opposition Division)

Article 100(c) EPC:

(a) The dependent claims of the granted patent contain the expressions "position signal error" and "pressure signal error". These are a result of amendments made during examination proceedings based on pages 9 to 11 of the application as originally filed, which refers to "position error signal" and "pressure error signal". The Appellant submits that the amendments introduce a new meaning to the expressions, since in the application the expressions indicate that the errors are with the position or pressure, whereas in the granted claims they concern the signals themselves. The Respondent considers that the expressions both in the application and the granted claims have equivalent meanings, and there is no extension of subject-matter.

(b) The Appellant submits that the amendment of the expression "control signal", as used in the application, to "command signal" in granted claim 1 introduces a new meaning that is not disclosed in the original application. According to the application, the control signal is electronically processed to take into account nonlinear effects and provide a command signal for the valve; there is no disclosure of the controller producing a command signal, since this requires further processing before being sent to the valve. The Respondent argues that for the

skilled person both expressions have the same meaning and are interchangeable.

(c) According to the Appellant, the deletion from claim 1 of the application of the feature, that the controller determines the acceleration of the vehicle based upon the pressure signal, also constitutes a broadening of subject-matter. Throughout the application the determination of acceleration is presented as an essential feature of the invention, and hence there is no support in the application for a control system that does not determine acceleration. The Respondent argues that, despite the deletion of the feature, the system of claim 1 nevertheless indirectly determines acceleration. This is because the controller generates valve command signals based upon the pressure and position signals. Since these are time-variant signals, they provide information about acceleration.

Claims of the Auxiliary Request

(a) Article 100(c) EPC

The Appellant's above objection to the amendment of control signal to command signal applies equally to claim 1 of the auxiliary request.

In the dependant claims of the auxiliary request the expressions "position signal error" and "pressure signal error" have been amended to "position error signal" and "pressure error signal", as used in the original application. The Appellant objected to these

amendments being made late in the proceedings, ie being submitted during oral proceedings before the Board.

(b) Article 123(2) EPC

During the opposition proceedings, the definition of the electronic valve in granted claim 1 was amended from controlling the flow of hydraulic fluid applied to the actuator to controlling both flow and volume of fluid in two lines to the actuator, ie the feature now relates to a double-acting actuator. This, according to the Appellant, leads to a broadening that includes subject-matter not disclosed in the original application.

The Appellant argued firstly that granted claim 1 only concerned an actuator to lift the implement, and not one that can be operated in the opposite direction. Secondly, in the application a double-acting actuator is only disclosed in combination with an operator who determines the intended direction of travel of the actuator, and hence the direction of flow of hydraulic fluid; an operator ultimately decides on the direction even if, as argued by the Opposition Division and Respondent, it is the system that controls the direction. Since the amended feature was originally disclosed in a different context to that defined in claim 1, the amendment does not meet the requirements of Article 123(2) EPC.

In reply the Respondent expressed the view that the expression "to lift an implement" is not limited just to a lifting action, but also includes a lowering action. A double-acting actuator is expressly disclosed

in the original application in the figures and at page 8, lines 12 to 14 of the description.

(c) Inventive Step (Article 56 EPC)

The Appellant alleged that the claimed system lacks an inventive step in light of documents E16 and E17, which disclose systems for controlling the motion of an implement attached to a tractor in order to improve the ride of the vehicle.

The purpose of the system of E16 is to neutralise any acceleration of the implement by moving it relative to the tractor. This is achieved by controlling the actuator on the basis of signals that include a pressure signal related to the pressure in the actuator. E16 requires that the vertical absolute velocity component of the implement is almost zero. According to the Appellant, this inevitably means that the pressure in the actuator is maintained substantially constant, otherwise the implement would be subject to an acceleration.

The claimed system thus differs from that of E16 only in that a double-acting actuator is used instead of the single-acting one shown in Figures 1 and 3.

The Appellant argued that such a difference cannot lead to an inventive step. Firstly, the use of a double-acting actuator has no technical advantage; the skilled person is aware that pitching vibrations of an implement can be detached from the tractor by maintaining a constant pressure in the actuator, regardless of whether the actuator is single or double

acting; E16 is itself an example where constant pressure is achieved in a single-acting actuator. Secondly, double-acting actuators and their advantages are well known in the art (see E1 to E4) and it is not inventive to replace one by the other.

The Respondent argued that any angular movement of the implement in the system of E16 results in a pressure change in the actuator; the purpose of the system of E16 is to maintain the implement in a constant position in relation to the ground, and in order to achieve this, the pressure in the actuator has to be constantly changed. There is no indication in E16 that the pressure must be maintained substantially constant.

The Appellant replied to this submission by saying that the adjustment of pressure in the actuator of E16 is the same as that of the disputed patent, ie any instant change in pressure is immediately reacted to in order to maintain it substantially constant. The significance of the term "substantially" in claim 1 is that neither in the claimed system nor in that of E16 can the pressure be maintained absolutely constant at all times.

Regarding E17, the Appellant submitted that a control system is disclosed that uses signals communicated from position sensors and an actuator pressure sensor. On the basis of these signals the implement is moved relative to the tractor. As with E16, the claimed system differs only in that a double-acting actuator is used, and for the reasons given above, this is an obvious step.

The Respondent argued that E17 fails to disclose that the pressure is maintained substantially constant, and that there is no indication of design of valve and controller as set out in the claims.

Reasons for the Decision

1. The appeal is admissible.

Main Request - Claims as Maintained by the Opposition Division

2. Article 100(c) EPC

Dependent claims 2 to 5 and 11 to 14 of the granted patent and of those maintained by the Opposition Division refer to a "position signal error" and "pressure signal error". These expressions were introduced into the claims during the examination proceedings, and are based on pages 9 to 11 of the original application. However, the application uses the expressions "position error signal" and "pressure error signal". Both the Respondent and the Opposition Division considered that the skilled person would regard these expressions as equivalent, and thus would not lead to broadening of claimed subject-matter.

However, as argued by the Appellant, there is a clear difference in meaning between the expressions. A "pressure error signal" indicates that there is an error in the pressure and the signal is based upon that, whereas a "pressure signal error" means that there is an error in the signal itself. It is clear from the application (pages 9 to 11) that the former meaning is

intended, and since there is no support for the latter meaning in the application, the subject-matter of the claims as maintained by the Opposition Division extends beyond the content of the application as originally filed.

The set of claims as maintained by the Opposition Division thus do not meet the requirements of Article 123(2) EPC.

Auxiliary Request - Claims Filed during the Oral Proceedings

3. Article 100(c) EPC

3.1 "Position signal error, etc"

The expressions "position signal error" and "pressure signal error" in the dependent claims have been replaced by "position error signal" and "pressure error signal", as used on pages 9 to 11 of the application as originally filed; hence the objection under Article 100(c) EPC is no longer applicable.

The Appellant had objected to the amendment at a late stage during appeal proceedings of the meaning of an expression in the dependent claims. The amendment is in response to a ground of opposition (Rule 80 EPC), it is supported by the original application (Article 123(2) EPC), and because it only concerns dependent claims, Article 123(3) EPC is fulfilled. Since the amendment meets the requirements of the EPC, there is no legal basis for objection. In addition, it comes as no surprise to the Board or the Appellant, and hence is admitted into the proceedings.

3.2 Control Signal / Command Signal

The Appellant submits that the amendment of the expression "control signal", as used in the application, to "command signal" in granted claim 1 and claim 1 of the auxiliary request introduces a new meaning that is not disclosed in the original application. In particular, page 12 (beginning of second paragraph) of the application states that a conversion circuit (78) transforms the pressure control signal to a valve command signal which takes into account nonlinear effects of the valve. Consequently, argues the Appellant, there is no disclosure in application of the controller (58) itself generating a command signal.

Firstly, the Board agrees with the view of the Respondent and Opposition Division that both expressions, "command signal" and "control signal" have essentially the same meaning for the skilled person and are interchangeable. For example, the application talks about applying "control signals" to the valve (see page 3, at the end of the second paragraph; page 7, end of second paragraph), whereas if the above convention were followed, these signals would be "command signals". Secondly, the nonlinear converter (78) is actually a part of the controller (58) (see Figure 3), indicating that the signal leaving the controller (58) is nevertheless a command signal.

Consequently, the amendment of "control signal" to "command signal" does not extend the subject-matter of the patent beyond that of the application.

3.3 Determining the acceleration of the vehicle

Claim 1 of the application contained the feature that the controller determines the acceleration of the vehicle based upon the pressure signal. The Appellant argued that this feature had been disclosed in the application as being essential to the invention, and hence had objected to its deletion in granted claim 1 and claim 1 as maintained by the Opposition Division. Claim 1 according to the auxiliary request has reinstated the feature and thus this objection is no longer applicable.

4. Article 123(2) EPC

During the opposition procedure the following feature of granted claim 1:

"…an electronic valve (40) coupled to the source (30) and the actuator (24) to control the flow of hydraulic fluid applied to the actuator (24) by the source (30);"

was amended to define the electronic valve (40) as controlling

"both the path of flow and the volumetric flow of hydraulic fluid applied either into a first line (42) and out of a second line (44) or out of the first line (42) and into the second line (44) to the actuator (24) by the source (30), depending on the direction of travel of the actuator;".

The Appellant submits that the original application only discloses a hydraulic actuator to lift the

implement and there is no mention of a double-acting actuator, hence the amended feature was only disclosed originally in relation to the direction of movement of the actuator as determined by the operator.

Irrespective of the opinion of the Respondent and the Opposition Division, that there is no disclosure in the application of the role of the operator, it is clear from both the text (page 8, lines 1 to 15) and Figure 2 of the original application that the electronic valve controls flow of hydraulic fluid into and out of the actuator via two lines (42 and 44), and that hydraulic fluid drives the piston in both directions, ie the actuator is double-acting.

The amendment therefore does not contravene Article 123(2) EPC, and since it results in a narrowing of the scope of the claim, the requirement of Article 123(3) EPC is also met.

5. Inventive Step (Article 56 EPC)

Document E16

5.1 Document E16 is directed to a tractor with an attached implement, and discloses a system for reducing adverse pitching and oscillation effects when the vehicle is driven at speed or across uneven ground. Since E16 addresses the same problem as set out in the disputed patent, it forms a suitable starting point for the assessment of inventive step.

5.2 Starting from E16, the objective problem to be solved is the improvement of the control system.

5.3 It is clear that E16 does not disclose a double-acting actuator, but whether or not the system maintains the pressure in the actuator substantially constant, as required by claim 1, is disputed by the parties.

According to the "first control system" of E16, the implement is moved in an opposite direction to the movement of the tractor, so that the vertical component of the implement's velocity is almost zero and the position of the implement is kept constant in relation to the ground. The result is that the tractor is disconnected dynamically from the implement, so that it is not affected by forces resulting from the motion of the implement, and the pitching of the tractor is absorbed by the motion of the implement (see page 5, line 26 to page 6 line 2,and page 11, lines 11 to 29).

In order to achieve this, a control signal is sent to the actuator driving the implement. The signal is generated by measuring accelerations picked up either directly by sensors attached to the tractor and the implement, or indirectly by monitoring changes in traction force, lift linkage force or the pressure in the actuator (page 8, lines 15 to 18 and claim 9).

The Appellant thus argues that the control signal of E16 is derived from the pressure in the actuator, and that in order to maintain the absolute velocity of the implement in the vertical direction at zero, there must be a constant pressure in the actuator. On the other hand, the Respondent argues that the pressure in the actuator has to be changed in order to produce the required movement of the implement.

The overall teaching of E16 is, in the view of the Board, to measure the acceleration of the implement by various means, of which measurement of actuator pressure is only one of several possibilities. A control signal is generated to move the implement, with the consequence that the pressure in the actuator may or may not be constant. However this is of lesser importance, as there is no clear indication in E16, in respect of either embodiment described in the document, to base the control system on measurement and adjustment of actuator pressure with the purpose of maintaining the pressure in the actuator constant. The use of a double-acting actuator enables better control of the pressure, and in particular in preventing over-correction; whilst it is accepted that such actuators are well known in the art, there is no indication of them being specifically used to maintain constant actuator pressure in a system for improving the ride characteristics.

5.4 The system defined in claim 1 has the advantage that with a constant pressure in the actuator, the load on the vehicle is also constant and thus predictable.

5.5 Reading E16, and armed with the knowledge of the disputed invention, the solution of maintaining the pressure in the actuator substantially constant becomes apparent. However, without the benefit of such hindsight there is no clear pointer to the solution. The subject-matter of claim 1 thus has an inventive step.

Document E17

5.6 E17 also concerns the motion problems when a tractor connected to an implement travels at speed or across uneven ground. The effect of an oscillating implement is reduced in E17 by a system incorporating a traction sensor, an actuator pressure sensor and a load sensor for the front axle of the vehicle. Acceleration of the implement is measured by at least one of these sensors, and the lift actuator is adjusted accordingly. It is not apparent from E17 how exactly the adjustments are made in order to reduce the oscillations, but in any event there is no disclosure of maintaining constant pressure in the implement actuator.

The system of claim 1 has an inventive step in light of E17 for similar reasons as given above in respect of the disclosure of E16.

5.7 The above conclusions also apply to independent claim 10, which concerns a work vehicle comprising the system features of claim 1. Dependent claims 2 to 9 and 11 to 18 consequently also have an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of:

a) claims 1 to 5 and 10 to 14 according to the request filed during the oral proceedings and claims 6 to 9 and 15 to 18 as granted;
b) the amended description consisting of pages numbered 2 to 7 as filled during the oral proceedings;
c) figures 1 to 4 as granted.

The Registrar: The Chairman:

C. Moser U. Krause