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D E C I S I O N
of 20 September 1999

Case Number: T 0380/97 - 3.2.4

Application Number: 90117815.2

Publication Number: 0419984

IPC: F04B 49/06

Language of the proceedings: EN

Title of invention:
Electrohydraulic control of a hydraulic machine

Patentee:
Vickers Incorporated

Opponent:
Linde Aktiengesellschaft, Wiesbaden

Headword:
-

Relevant legal provisions:
EPC Art. 56, 108
EPC R. 64(b)

Keyword:
"Admissibility of the appeal - yes"
"Inventive step - yes"

Decisions cited:
T 0007/81, T 0001/88, T 0194/90, T 0632/91, T 0925/91

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0380/97 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 20 September 1999

Appellant: (Proprietor of the patent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 10 February 1997 revoking European patent No. 0 419 984 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: C. A. J. Andries
Members: M. G. Hatherly
M. K. S. Aúz Castro

Summary of Facts and Submissions

I. European patent No. 0 419 984 was revoked by the opposition division's decision dispatched on 10 February 1997.

The proprietor filed an appeal on 8 April 1997 which included the request "to set aside the decision of the opposition division and grant the patent with amended papers to be sent", he paid the appeal fee on 9 April 1997 and filed the statement of grounds on 10 June 1997.

II. The following prior art documents played a role in the appeal proceedings:

E1 US-A-4 823 552

E2 US-A-4 744 218

E3 Brochure entitled "50 Jahre HERION. 50 Jahre Schrittmacher der Automation." Herion-Informationen 1/1988, 27. Jahrgang, 1988 Heft 1, Herion-Werke KG, 7502215.05.05.88, pages 66 to 70 and 81 to 83

E4 US-A-4 757 747

E5 US-A-4 655 689

III. Oral proceedings took place on 20 September 1999 in the presence of the parties.

In the appeal proceedings the respondent (opponent)

argued that the appeal was not admissible in view of Rule 64(b) EPC because the extent to which the impugned decision should be amended was not clear, and that the claimed subject-matter was obvious when starting from E1 or E2 and using the teachings of E3.

In the appeal proceedings the appellant (proprietor) maintained that the appeal was admissible and that the claimed subject-matter was inventive over the prior art.

IV. During the oral proceedings the appellant filed a new set of patent documents of which claim 1 reads as follows:

"A variable displacement rotary hydraulic machine comprising:
a housing (60, 62) which comprises a case (60) and a valve block (62) mounted together to include an internal cavity (64) in which a shaft (66), cylinder means (70), piston means (74) and displacement-varying means (48) are positioned, said shaft (66) mounted within said housing (60, 62) for rotation about a shaft axis;
said cylinder means (70) having a cylinder cavity (76) within said housing;
said piston means (74) being disposed in said cylinder cavity, one of said piston means and said cylinder means being coupled to said shaft;
valve means (62, 88) including a valve plate (88) and said valve block (62) forming fluid inlet and outlet ports (92/98, 94/100) in said housing and means (96) for selectively connecting said cavity (76) to said fluid inlet and outlet ports (92/98, 94/100);

said displacement varying means (48) being coupled to one of said piston means and said cylinder means within said housing for varying displacement of said piston means (74) within said cylinder cavity as said shaft (66) rotates about said axis; and
sensor means (50, 52, 54) for sensing operating conditions of said machine and providing electronic sensor signals as functions thereof;
microprocessor-based electronic control means (42) including means (220) for receiving and storing said electronic sensor signals from said sensor means (50, 52, 54) and electronic control signals from an external source (34), and displacement control means (44) responsive to control signals from said microprocessor based electronic control means (42) for controlling the position of said displacement-varying means (48) within said housing (60, 62),
characterized in that
both the electronic control means (42) together with said means (220) for receiving and storing electronic control signals and the sensor means (50, 52, 54) are mounted on walls of said valve block (62) so as to form a unitary assembly with the machine."

V. The appellant requested that the decision under appeal be set aside and the patent maintained in amended form on the basis of claims 1 to 30 filed in the oral proceedings, amended columns 1 to 6 of the description also filed in the oral proceedings and columns 7 to 15 of the description as well as the figures as granted.

The respondent requested that the appeal be rejected as inadmissible and by way of auxiliary request that it be dismissed.

Reasons for the Decision

1. *Admissibility of the appeal*

Pursuant to Rule 64(b) EPC "The notice of appeal shall contain ... a statement identifying the decision which is impugned and the extent to which amendment or cancellation of the decision is requested." In the present case it is true that the appellant's request does not explicitly state the extent to which the impugned decision should be amended or cancelled.

The long standing and consistent case law of the boards of appeal has interpreted the provision under discussion such that the extent of the appeal is sufficiently identified if the notice of appeal states that the appeal is being lodged against the first instance's decision in its entirety. In such a case it can initially be assumed that the appellant maintains the submission on which the impugned decision was based (see decisions T 7/81, OJ EPO 1983, 98; T 1/88; T 194/90; T 632/91; and T 925/91, OJ EPO 1995, 469).

The respondent has argued that this interpretation of Rule 64(b) EPC does not apply in the present case because the appellant explicitly stated that the patent should be maintained "with amended papers to be sent", thus making it clear that the appellant specifically did not wish to maintain the submissions made to the first instance.

The board cannot agree with this argument. At the time of filing, the appellant lodged an appeal against the

impugned decision, that means against the decision as a whole, without any limitations. He did not formulate a concrete request with regard to a specific extent. The request was a mere statement of intent which might or might not be carried out in the future. This situation can be compared to that of an appellant who later amends his original request in the notice of appeal.

Therefore the board concludes that the case law cited above applies also to this case and that consequently the appeal has to be considered admissible.

2. *Amendments*

2.1 The present claim 1

- defines the housing 60, 62 of the granted claim 1 (column 15, line 30 of the patent specification) more precisely, using the wording of the granted claim 7;

- specifies that the control signals to which the displacement control means 44 is responsive (see column 15, lines 55 and 56 of the patent specification) are control signals from the microprocessor based electronic control means 42, this being derivable from claim 3 and Figure 9 as granted; and

- stresses in the characterising portion of the claim that also the means 220 for receiving and storing electronic control signals is mounted on walls of the valve block 62, information that was already derivable from the granted claim since the

electronic control means 42 is mounted on walls of the valve block (see the characterising portion of the granted claim) and this electronic control means 42 includes the means 220 for receiving and storing electronic control signals (see column 15, lines 51 to 56 of the patent specification).

Thus the present claim 1 neither extends the content of the application as filed (Article 123(2) EPC) nor extends the protection beyond that of the granted patent (Article 123(3) EPC).

2.2 The dependent claims are those as granted except that claim 7 has been deleted and the subsequent claims and their appendances renumbered.

2.3 The granted description has been amended to delete arrangements that do not fall within the scope of the claims (lines 12 and 13 of column 1 and lines 26 to 28 of column 4), to briefly acknowledge E3 (in column 3 between lines 36 and 37) and to make it clear in columns 5 and 6 that certain arrangements are not inventions covered in their own right by the present patent.

2.4 The remainder of the description and the drawings are as granted.

2.5 Thus the present version of the patent does not contravene Article 123 EPC. Moreover the respondent has made no objections under this Article.

3. *Novelty - claim 1*

After examination of the prior art documents on file, the board is satisfied that none of them discloses a variable displacement rotary hydraulic machine with all the features of claim 1. Moreover the respondent accepts the novelty of the subject-matter of claim 1.

The subject-matter of claim 1 is thus considered novel within the meaning of Article 54 EPC.

4. *Closest prior art*

4.1 The board and the parties agree that the closest prior art for the invention is E1.

4.2 Column 4, line 13 to column 5, line 5 of E1 explains that Figure 1 shows an electrohydraulic control system for a variable displacement rotary hydraulic pump 12 whose output is determined by the position of a pump yoke 18. Pump conditions are determined by pressure, flow, pump speed and yoke angle sensors 22, 24, 26 and 28 respectively. A microprocessor-based electronic control computer 34 receives and stores electronic signals from the sensors and electronic control signals from a master controller 46. Yoke actuator piston 16 is fed via solenoid valve 58 which is responsive to control signals from the microprocessor-based electronic control computer 34.

4.3 Except for a piston, a valve and a sensor shown in Figures 2, 3 and 8 respectively, and a brief mention in column 6, line 48 of a pump housing, E1 contains very little information as to how the pump is constructed. Variable displacement rotary hydraulic pumps are however well known and one typical example is shown in

Figure 2 of E5 with a housing comprising a case 12 mounted on a valve block (at the extreme right) to define an internal cavity in which the pump shaft 16, cylinders, pistons and yoke 20 are situated.

4.4 Thus E1 discloses explicitly or implicitly essentially the features of the pre-characterising portion of claim 1. This has been accepted by the appellant.

4.5 E2 contains similar information to that presented by E1 and so there is no need to further consider E2.

5. *Differences over the prior art, problem and solution*

5.1 E1 contains no information on where its microprocessor-based electronic control computer 34 and its sensors 22, 24, 26 and 28 are located.

5.2 The present claim 1, on the other hand, specifies that the electronic control means 42 (including the means 220 for receiving and storing electronic control signals) and the sensor means 50, 52 and 54 are mounted on walls of said valve block 62 so as to form a unitary assembly with the machine.

These features are shown in Figures 2 to 7 of the patent and are described in column 8, line 47 to column 9, line 50. Figure 2 shows the electronic control means 42 beneath a cover 132 and Figure 4 shows that this cover abuts the valve block 62. Figures 4 and 6 show a magnetic sensor 168 in the valve block 62 for the pump speed sensor 54. Figures 2 and 3 show a pressure sensor 52 in the valve block 62. Figure 5 shows a valve position sensor 50 in the valve block 62.

5.3 The term "valve block" when applied to a variable displacement rotary hydraulic machine of the kind disclosed by the present patent has a precise and restricted meaning. The valve block referred to in claim 1 is not merely the body of any valve (e.g. it is not part of the servo valve 44 shown on Figures 1 and 8 which feeds the yoke position actuator 48) but the block numbered 62 in Figure 4 of the patent. This block is a substantially constructed base by means of which the machine is mounted on site, which stays behind with the pump inlet and outlet piping when the case is removed, and which - with the valve plate 88 - routes the hydraulic fluid between this piping and the cylinders of the rotating cylinder block. The valve block is also shown to the extreme right in Figure 2 of E5.

5.4 However, while the term valve block has a precise and restricted meaning, it is clear that the wording "mounted on walls of said valve block" in claim 1 cannot be taken too literally. The electronic control means 42 is mounted **on** one wall of the valve block but the sensors (see especially sensor 50 on Figure 5) are mounted **in** the valve block (and the rod 138 of sensor 50 could be said to be **carried by** the valve block). It is clear that the features of the characterising portion are attached to the valve block and supported thereby, instead of being mounted perhaps remotely or, as shown in Figure 2 of E5 for the swash plate angle sensor 25 and speed sensor 60, mounted on the case.

5.5 Mounting the electronic control means 42 and the sensor means 50, 52 and 54) as defined in the characterising portion of claim 1 provides a variable displacement

rotary hydraulic machine which is in one piece. This simplifies on-site installation in an electrohydraulic system (see column 2, lines 46 to 51 of the patent). Moreover although external electrical wiring (e.g. to the master controller 34 shown in Figure 1 of the patent) is still required, there is an overall simplification of the wiring because the wiring from the sensors to the control means is local i.e. staying at the machine. Still further, if the case is removed from the machine for maintenance or diagnosis then there is the minimum of disturbance to the components in the internal cavity (e.g. the yoke position sensor 50 shown on Figure 5 can stay in place, compare Figure 2 of E5 where the yoke sensor 25 must be removed with the case 12).

5.6 Thus the problem, starting from E1, of providing an improved variable displacement rotary hydraulic machine is solved by the features of the present claim 1, and in particular by the features of the characterising portion.

6. *Inventive step*

6.1 It has been stated in the above section 5.1 that E1 contains no information on where its microprocessor-based electronic control computer 34 and its sensors 22, 24, 26 and 28 are physically located. Of the other prior art documents in the appeal proceedings it is only E5 that discloses a variable displacement pump in any mechanical detail. However in this document, see Figure 2, the sensors are mounted not on the valve block but on the case 12. Moreover there is no microprocessor-based electronic control means and the

cables leaving the sensors 25 and 60 on Figure 2 indicate that the sensor signal are received by something external to the pump.

Thus neither E1 nor E5 nor their combination could lead the skilled person to the subject-matter of claim 1.

6.2 E3 discloses that it is advantageous to integrate fluidics and electronics in a single building group (see page 66, middle column first paragraph), that sensors can be built into the fluidic device (see page 66, right-hand column, second paragraph) and that sensors and electronics can be integrated in a valve (see page 83, left-hand column, second paragraph).

6.3 Moreover page 83 of E3 discloses a closed loop control valve with sensors and where the electronics are in a casing abutting the valve body (see Figure 4 and lines 12 to 18 of the left-hand column). Apparently such a valve is shown in Figure 3 on page 68 linked by arrows to components such as a cylinder, a motor, sensors and controllers.

6.4 While E3 makes several general points it is short on detail especially where the construction of the valve of Figure 4 on page 83 is concerned. It could be imagined however that this valve is similar to the servo valve assembly 34 with an on-board microprocessor based valve controller 32 shown in detail in Figure 2 of E4.

6.5 The question is whether E3 would lead the skilled person from the machine of E1 to the claimed subject-matter. Certainly on Figure 4 on page 83 of E3 the

sensor and electronics are part of the assembly but the assembly is a servo valve and not a variable displacement rotary hydraulic machine.

There is no reason why the skilled person modifying the machine of E1 would be led by E3 (or E4) to mount the sensors and the electronics on the valve block of the variable displacement rotary hydraulic machine, remembering that this valve block is a specific part of the machine and not the block of just any valve (see section 5.3 above).

On page 68 of E3 the valve is linked to a motor by an arrow but this does not mean that the valve is meant to be mounted directly on the motor, it is more likely that they are merely meant to be connected together by piping. Moreover there is no indication that the motor is a variable displacement rotary hydraulic machine with a valve block. Even if it were, and if the valve were mounted physically on the motor, then the sensors and electronics would still be mounted on the servo valve and not on the valve block of the variable displacement machine.

6.6 Neither E3 nor E4 nor E5 discloses the features in the characterising portion of the claim. The respondent has not cited any prior art document that shows these features but argues that they are acknowledged as known by the patent in suit, e.g. in lines 40 and 41 of column 8 where "pump 40 is of generally conventional construction". However this statement is preceded by the words "To the extent thus far described" and concerns only the basic construction of the case, valve block, shaft and pistons etc. but not the sensors and

electronics which are described after this statement.

6.7 The statements in E3 referred to in the above section 6.2 (e.g. concerning the desirability of integrating fluidics and electronics in a single building group) would not lead the skilled person from the machine of E1 to the claimed machine in an obvious manner. These statements are too general and could not lead to the specific arrangement of sensors and electronics on the valve block set out in claim 1.

6.8 Accordingly the board cannot see that any combination of the documents E1 to E5 could (let alone would) lead the skilled person in an obvious manner to the claimed subject-matter.

6.9 Thus, as required by Article 56 EPC, the subject-matter of the independent claim 1 involves an inventive step.

7. The patent may therefore be maintained amended, based on independent claim 1, claims 2 to 30 dependent thereon, the amended description and the granted drawings.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in the following version:

- claims 1 to 30 filed in the oral proceedings,

- columns 1 to 6 of the description together with the supplement to be inserted in column 3 between lines 36 and 37, filed in the oral proceedings,

- columns 7 to 15 of the description as granted, as well as

- the figures as granted.

The Registrar: The Chairman:

N. Maslin C. Andries