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**Datasheet for the decision  
of 18 February 2014**

**Case Number:** T 1767/12 - 3.2.05

**Application Number:** 06742464.8

**Publication Number:** 1896755

**IPC:** F16K5/10

**Language of the proceedings:** EN

**Title of invention:**

A control valve

**Patent Proprietor:**

FRESE A/S

**Opponent:**

FlowCon International ApS

**Headword:**

-

**Relevant legal provisions:**

EPC 1973 Art. 56, 100(b)

**Keyword:**

Sufficiency of disclosure - (yes)

Inventive step - (yes)

**Decisions cited:**

**Catchword:**

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Case Number: T 1767/12 - 3.2.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.05**  
**of 18 February 2014**

**Appellant:** FlowCon International ApS  
(Opponent) Trafikcenter Allé 17  
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**Respondent:** FRESE A/S  
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**Representative:** Mikkel Roed Trier  
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**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office posted on 4 June 2012 rejecting the opposition filed against European patent No. 1896755 pursuant to Article 101(2) EPC.**

**Composition of the Board:**

**Chairman:** M. Poock  
**Members:** H. Schram  
G. Weiss

## Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal on 31 July 2012 against the decision of the opposition division, posted on 4 June 2012, by which its opposition against European patent Nr. 1 896 755 was rejected. The statement setting out the grounds of appeal was filed on 4 October 2012.
- II. Oral proceedings were held before the board of appeal on 18 February 2014.
- III. The appellant requested that the decision under appeal be set aside and that the European patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (main request) or in the alternative that the decision under appeal be set aside and that the patent be maintained on the basis of one of the auxiliary requests 1 to 3 as set out in the letter of 13 February 2013 or on the basis of one the auxiliary requests 4 to 9 filed with letter dated 17 January 2014 or on the basis of auxiliary request 10 filed at the oral proceedings.

- IV. The documents referred to in the appeal proceedings included the following:

D5 US 3,349,798;

D9 US 2,936,152.

- V. Claim 1 as granted reads as follows:

"1. A control valve for use in liquid-carrying systems, and particularly for use in heating or cooling systems,

having a valve housing (3) with an inlet side and an outlet side, and including an arrangement for maintaining a constant differential pressure between the inlet side and the outlet side independently of the liquid amount flowing therethrough, wherein a throttle elements sets itself in a balance under the influence of the inlet pressure on the one side and the outlet pressure and a spring pressure on the other side wherein it additionally comprises an arrangement for adjusting the liquid amount flowing therethrough with two cooperating valve members (4, 6) arranged in the flow path, characterized in that said valve members are constructed as two concentric rings which each have a recess extending approximately 180 degrees in the circumferential direction, wherein the outer one of the two concentric rings (4) is fixed relative to the valve housing (3), while the inner ring (6) is displaceable in the circumferential direction under the influence of a rotatable handle (10), whereby a greater or smaller overlap may be established manually in the circumferential direction between the recesses, and the inner ring (6) is also displaceable in the axial direction, so that a greater or smaller overlap may be provided between the recesses in the axial direction, as it is connectable with an actuator for controlled or automatic adjustment of the axial overlap."

VI. The arguments of the appellant, in writing and during the oral proceedings, can be summarized as follows:

The person skilled in the art would not know how to carry out the invention for the following reasons: Firstly, the differential pressure governor was defined in the preamble of claim 1 as granted by the following feature: "an arrangement for maintaining a constant differential pressure between the inlet side and the

outlet side independently of the liquid amount flowing therethrough, wherein a throttle elements sets itself in a balance under the influence of the inlet pressure on the one side and the outlet pressure and a spring pressure on the other side". However, in the differential pressure governor shown in figure 1 of the patent in suit it was not the outlet pressure and the spring pressure that balanced the inlet pressure, it was the pressure before the adjusting slots (rather than the pressure after the adjusting slots, ie the outlet pressure) and the spring pressure, as stated in paragraph [0012] of the patent in suit.

Secondly, the valve members of the "arrangement for adjusting the liquid amount flowing therethrough with two cooperating valve members (4, 6) arranged in the flow path" were "constructed as two concentric rings each having a recess", cf claim 1. Since a recess was not a through-hole, said valve members would completely block the flow rather than adjusting the liquid flow. The elements 4 and 6 shown in figure 2 of the patent in suit were neither "rings" nor had a "recess".

The subject-matter of claim 1 as granted was not new with respect to document D9. This document disclosed a control valve for use in liquid-carrying systems, which included a differential pressure governor with all the features of claim 1 as granted, and an arrangement for adjusting the flow comprising two cooperating valve members constructed as two concentric rings, namely liner sleeve 49 and valve element 55, which was a cylindrical object and therefore a ring as well.

Document D9 represented the closest prior art. Document D5 disclosed an arrangement for adjusting the flow through a valve comprising two cooperating valve

members constructed as two concentric rings. The valve was suitable for use in a gas system or in a liquid system (column 3, lines 36 to 40). It was obvious to the person skilled in the art starting from document D9 to consider the inner valve member in the form of a ring known from document D5 as an alternative construction for the shaft-like inner valve member 55 known from document D9 and thus arrive at the subject-matter of claim 1 as granted.

VII. The arguments of the respondent, in writing and during the oral proceedings, can be summarized as follows:

Differential pressure regulators and their functioning were well-known in the art and were standard components in control valves for use in liquid carrying systems. Their purpose was to maintain a constant differential pressure between the inlet side and the outlet side of the adjusting valve (see figure B on page 8 of the reply to the appeal dated 13 February 2013). It followed that the patent was disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

The subject-matter of claim 1 as granted was new with respect to document D9, since the inner valve member (shaft 55) shown in figure 5 was not a ring.

The subject-matter of claim 1 as granted also involved an inventive step. Document D9 related to a field, ie valves for hydraulic systems for operating a hydraulic motor or ram, which was remote from the field of the invention, namely valves for use in liquid-carrying systems, particularly for use in heating or cooling systems. The skilled person had no incentive to change the solid shaft by a ring. To the contrary, replacing

the shaft by a ring would render the inner valve pressure unbalanced. Document D5 was in a different field than that of document D9 and than the field of the invention. The skilled person had no motivation to consider document D5 or to combine documents D9 and D5. Even if he did so, the combination would still fail to have two concentric rings, "each having a recess extending approximately 180 degrees in the circumferential direction" as required by claim 1 as granted.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Ground for opposition of insufficiency of disclosure, Article 100(b) EPC 1973*
  - 2.1 Claim 1 as granted defines a control valve for use in liquid-carrying systems, which includes (i) a differential pressure governor, and additionally (ii) an arrangement for adjusting the liquid amount flowing there through with two cooperating valve members (4, 6) arranged in the flow path.

In the exemplary embodiment of the invention, the throttle member of the differential pressure governor consists of a rolling diaphragm 24 and a piston 25, cf paragraphs [0012] and [0013] and figure 1 of the patent in suit. The last two sentences of paragraph [0012] read as follows: "The pressure at the inlet is transferred to the outer side of the rolling diaphragm through a bore or a capillary pipe 21. A spring 26 urges the piston to its top position, while the piston, at its inner side, is affected by the pressure before the adjusting slots".

The board concurs with the parties that this explanation of the working principle of a differential pressure governor is basically correct. The thrust of the appellant's objection under Article 100(b) EPC 1973 is not that the functioning of a differential pressure governor was not disclosed in a manner sufficiently clear und complete for it to be carried out by a person skilled in the art, but that a differential pressure governor, wherein the inlet pressure on one side of the diaphragm and the outlet pressure and the spring pressure on the other side balanced each other out, was impossible to make, since instead of the outlet pressure it was the pressure before the adjusting slots, ie the internal pressure, that came in the force equation.

The person skilled in the art is aware that depending on the design of the valve there may be a small pressure drop across the adjusting slots (the lower pressure being at the outlet side) and that the pressure difference between the inlet and outlet is therefore only approximately equal to the pressure resulting from the spring force and the effective area of the diaphragm. The person skilled in the art also knows that for the functioning of the differential pressure governor the actual liquid pressures acting on each side of the rolling diaphragm are not critical, since the purpose of a differential pressure governor is to maintain a constant differential pressure across the valve under operating conditions and that aim is achieved, since the fluid (inlet) pressure on one side and the fluid pressure and a spring pressure on the other side keep the diaphragm assembly balanced.



In this respect it is noted that claim 1 merely requires that the throttle elements set themselves in balance under the influence of the inlet pressure on the one side and the outlet pressure and a spring pressure on the other side (emphasis added), a strict balance of dynamic forces is not claimed. It may be assumed that the pressure before the adjusting slots and the outlet pressure influence one another. But even if the claimed balance of forces would have been wrong, this would, by itself, not be sufficient to conclude an insufficiency of disclosure, since what matters is how a claim is understood by the person skilled in the art in the light of the disclosure of a patent as a whole, and not a literal interpretation of the claim.

- 2.2 The arrangement for adjusting the liquid flow is described in paragraphs [0014] to [0016] and shown in figure 2 of the patent in suit. In paragraph [0015] the function of said arrangement is described as follows: "[...] an outer cylindrical valve member 4 which is provided with an annular slot extending over approximately 180 degrees. Within this and concentrically with it is an inner valve member 6 which has a corresponding annular slot. These two slots are present in the normal position opposite each other. [...] Thereby, the overlap in the circumferential position between the two slots and thus the maximum flow amount through the governor may be adjusted manually."

In paragraph [0015] the word "slot" rather than the word "recess" is used. The term "slot" means "opening", cf column 2, line 34, of the patent in suit. These slots are shown in figure 2.

The board has no doubts that the person skilled in the art would interpret the terms "ring" and "recess", in the light of the disclosure of the patent specification read as a whole, as "sleeve or cylinder mantle" and "opening or slot", respectively.

2.3 Summarizing, the invention claimed in claim 1 of the main request is disclosed in a manner sufficiently clear und complete for it to be carried out by a person skilled in the art.

3. *Ground for opposition under Article 100(a) EPC 1973 in combination with Article 56 EPC 1973*

3.1 The problem that the invention seeks to solve is to provide a control valve for use in liquid-carrying systems having a differential pressure governor with a particular arrangement to preset the maximum flow through said valve, and to adjust that flow, cf paragraphs [0004] and [0005] of the patent in suit.

This object is solved by the subject-matter of claim 1 as granted, in particular by providing two cooperating valve members 4, 6 consisting of two concentric rings (cylinder mantles) each having a recess extending approximately 180 degrees in the circumferential direction (circumferential slots) as defined in the characterizing part of said claim.

3.2 Document D9 discloses an adjustable volume constant flow valve 10 comprising a mechanism to form an adjustable or variable orifice (see column 3, line 59 to column 5, line 39, figures 5 to 8) and a pressure compensator mechanism (see column 6, line 22 to 74). Although document D9 describes and shows a preferred embodiment of a hydraulic system for operating a

hydraulic motor or ram (column 1, lines 41ff), the invention it describes relates more generally to fluid flow control devices (column 1, lines 15 and 16) and as such it discloses "a control valve for use in liquid-carrying systems", cf claim 1 as granted.

The elements which cooperate to form a variable orifice include a sleeve 49 provided with two circumferential grooves 50 and 51 (figure 6) and a shaft 55 having a cylindrical portion 56 (figure 5). Groove 50 is provided with a rectangular slot 54 and groove 51 is provided with a pair of holes 53. The lower end of the portion 56 of shaft 55 is provided with a circumferentially extending groove 59 which is open to the holes 53 and is intersected by a slot 60 milled in the shaft having an uppermost side wall 61, thus leaving a semi-circular shaft portion 62 below the solid upper end of cylindrical portion 56. The valve element or shaft is adjustable both axially or longitudinally and rotationally in the liner sleeve 49 (column 4, lines 9 to 11). The adjustable orifice of the adjustable volume constant flow control valve 10 is formed by the milled rectangular slot 54 in sleeve 49 and the milled slot 60 in shaft 55 and the relative positions to which these elements are adjusted determines the effective size or open area of the orifice (column 5, lines 6 to 12, and figure 8). The path of fluid flow through the valve 10 is described in the passage from column 5, line 75, to column 6, line 13.

The part of sleeve 49 indicated by groove 50 corresponds to outer ring 4 of the patent in suit. Document D9 is silent about the extension of slot 54 in the circumferential direction. The extension of slot 54 shown in figure 1 is ca. 90 degrees in the

circumferential direction, whereas claim 1 as granted specifies that the extension of the outer ring must be approximately 180 degrees in said direction.

The lower end of the portion 56 of shaft 55 is provided with a circumferentially extending groove 59 which is open to the holes 53 in the liner sleeve 49 and it is important that the groove 59 joins or is intersected by the slot 60 milled in the shaft and extending at right angles to the axis thereof (see column 4, lines 20 to 25, and column 7, lines 13 to 24), so that the hydraulic forces on the uppermost side wall 61 of the slot and on the lowermost side wall of shaft portion 62 on the one hand, and the hydraulic force on the lowermost side wall on the other hand balance out, see column 1, lines 20 to 32, and column 7, lines 25 to 36.

The "inner valve member" of the arrangement for adjusting the liquid flow according to document D9 is constructed as a shaft, not as a ring. This was contested by the appellant, who raised a novelty objection and argued that valve element 55 was a cylindrical object and therefore a ring. However, a ring is a circular or tubular object, eg a sleeve which is designed to fit over another part. For this reason alone the subject-matter of claim 1 as granted is novel over document D9.

As noted above, the valve element (shaft 55) is displaceable both in the circumferential and axial direction. If the shaft is rotated or axially displaced, the effective length or width of the slot 54 is adjusted, respectively (column 5, lines 6 to 22, and figure 8). The shaft can be rotated by means of dial 69 and wing 70 (column 4, lines 66 to 70, and figure 4). The shaft can be shifted to different axial positions

by rotating the bushing 63 (column 5, lines 33 to 39), which is a cumbersome operation however (column 5, lines 40 to 74). In the opinion of the board, the bushing 63, which restricts any movement of the shaft in the cross-direction, can be considered as "an actuator for controlled adjustment of the axial overlap" in the meaning of claim 1 as granted.

The subject-matter of claim 1 of the main request differs from the valve known from document D9 in that "said valve members are constructed as two concentric rings which each have a recess extending approximately 180 degrees in the circumferential direction".

This distinguishing feature provides the control valve having a differential pressure governor with an additional arrangement for adjusting the liquid flow that is relative simple in its mechanical construction and yet offers many setting and adjustment options (cf paragraph [0017] of the patent in suit).

- 3.3 The person skilled in the art starting from document D9 and seeking to improve or simplify the arrangement for adjusting the liquid flow described therein consisting of an outer sleeve and a shaft had no motivation to replace the shaft, or a part thereof, by a ring-shaped element having a recess, in particular as such a replacement could impair the hydraulic balance of the shaft. Since the arrangement for adjusting the liquid flow known from document D9 is contained in a bore 29 (column 3, lines 63 to 66) and since the liquid flows from the high pressure conduit 19 through grooves 32, 41 and passage 37 to groove 33 and from there via passage 78 to holes 53 and slot 60 to slot 54 and groove 60, and finally via passage 79 to exhaust

conduit 20, the hydraulic balance of the shaft is important.

Document D5 discloses a variable orifice valve for use in a natural gas supply system (column 1, lines 7 and 8) or a liquid system (column 3, lines 36 to 40) comprising two cooperating valve members, namely a movable cylindrical valve element (inner element) shown in Figures 2 to 4, and a stationary valve element (outer element) shown in Figures 5 to 7. The inner and outer elements have each two recesses extending less than ca. 90 degrees in the circumferential direction.

It follows that the distinguishing feature is not known from document D5. As stated above, the person skilled in the art had no motivation to replace the arrangement for adjusting the liquid flow known from document D9 by another arrangement. The variable orifice valve of document D5 is not suitable to be contained in bore 29 of document D9 since the fluid inlet is through the opening of sleeve 20 located at the inlet connection 12 (figure 1). Moreover, since the movable cylindrical valve element is capped, the hydraulic balance of the shaft 74 is disturbed.

- 3.4 The subject-matter of claim 1 of the patent in suit was therefore not obvious to the person skilled in the art and hence involves an inventive step, Article 56 EPC 1973.
4. Since the claims of the main request are allowable, there is no need to consider the first to tenth auxiliary requests of the respondent.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



D. Meyfarth

M. Poock

Decision electronically authenticated