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D E C I S I O N
of 15 April 1997

Case Number: T 0576/95 - 3.2.3

Application Number: 89909175.5

Publication Number: 0427775

IPC: F24D 19/10

Language of the proceedings: EN

Title of invention:

Method of regulating a central or district heating plant by means of a differential pressure valve, and unit for working method

Patentee:

FRESE ARMATUR A/S

Opponent:

Danfoss A/S

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - no"

Decisions cited:

T 0248/85, T 0162/86

Catchword:

-



Case Number: T 0576/95 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 15 April 1997

Appellant: Danfoss A/S
(Opponent) DK-6430 Nordborg (DK)

Representative: Knoblauch, Andreas, Dr.-Ing.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 30 March 1995,
posted on 10 May 1995 rejecting the opposition
filed against European patent No. 0 427 775
pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. T. Wilson
Members: H. Andrä
L. C. Mancini

Summary of Facts and Submissions

- I. European patent application No. 89 909 175.5, filed on 2 August 1989 and published on 22 May 1991 under publication No. 0 427 775, was granted on 31 March 1993.

Independent Claims 1 and 5 as granted read as follows:

"1. Method for regulating a central or district heating plant provided with a differential pressure valve (11, 111) for circulating a heat carrying fluid, such as water, through a building with several rooms, each of which has at least one radiator (5) provided with a thermostat valve (6), said differential pressure valve (11, 111) being placed after the radiators (5) in the direction of flow and having an inlet (17) and an outlet (18) and a closing device (24, 25) therebetween controlled by a membrane (23) for regulating the flow of the heat carrying fluid through a passage (19) between the inlet (17) and the outlet (18), characterised in that the differential pressure valve (11, 111) is provided with an adjustable throttle (26, 34) between the inlet (17) and the closing device (24, 25), and that the throttle (26, 34) is adjusted to allow a maximum amount of fluid to pass, regardless of the state of distribution of pressure in the plant.

5. Central or district heating plant for use in the implementation of the method according to Claim 1, said plant being designed to conduct a heat carrying liquid, such as water, and said plant comprising several radiators (5) each provided with a thermostat valve (6), said radiators being designed to be placed in a number of at least one in each room in a building, and with a differential pressure valve (11, 111) being placed after the radiators (5) in the direction of

flow, said valve having an inlet (17) and an outlet (18) and a closing device (24, 25) therebetween controlled by a membrane (23) for regulating the flow of heat carrying liquid in a passage between the inlet (17) and the outlet (18), characterised in that the differential pressure valve (11, 111) has an adjustable throttle (26, 34) between the inlet (17) and the closing device (24, 25)."

- II. The patent was opposed by the Appellant (Opponent) who requested revocation of the patent in accordance with Article 100(a) EPC on the ground that the granted claims do not define inventive subject-matter.

The opposition was supported by the following documents:

- (D1) DE-B-1 253 429
- (D2) "Differenzdruckregler mit Durchflußbegrenzung Typ 46-5, Typ 46-6" Einbau und Bedienungsanleitung EB 3030, Ausgabe Januar 1988, Samson AG
- (D3) DE-B-2 315 045
- (D4) DE-B-2 110 188

With a letter dated 18 October 1994, i.e. outside the opposition period stipulated in Article 99(1) EPC the Appellant submitted the document:

- (D5) "§7 der Heizungsanlagen-Verordnung"

- III. By decision taken at the oral proceedings on 30 March 1995, posted on 10 May 1995, the Opposition Division rejected the opposition.

The Opposition Division held that the subject-matter of Claim 1 and of Claim 5 cannot be derived from the cited prior art documents and accordingly involves an inventive step.

IV. On 12 July 1995 the appellant lodged an appeal against the decision paying the appeal fee on the same day.

In the Statement of Grounds of Appeal filed on 14 September 1995 the Appellant referred for the first time to

(D6) Brochure "Danfoss AVD Druckregler" 3N.3.50.03,
December 1967

The Appellant held that by reference to (D6) it was intended to prove that the features according to the first part of Claim 1 are known from a single piece of prior art which circumstance had not been acknowledged by the Opposition Division.

V. In a communication dated 23 September 1996 the Board expressed its provisional opinion that (D6) appeared to describe the nearest prior art and that it would therefore probably be admitted to the proceedings. Further according to this communication, the Board pointed out, that it could be considered that the skilled person would be induced to combine the teachings of (D6) and (D2) arriving thereby in an obvious manner at the subject-matter of Claims 1 and 5, respectively.

VI. The Appellant requests that the patent be revoked. He argued essentially as follows:

- The nearest prior art with regard to Claim 1 is described by (D6). This citation discloses all the features according to the first portion of Claim 1 and the features according to the characterising portion of the claim that the differential pressure valve is provided with an adjustable throttle and that the throttle is adjusted to allow a maximum amount of fluid to pass,

regardless of the state of distribution of pressure in the plant. The feature that the throttle is adjustable is derived from the information in (D6) under the heading "Beispiel 2", namely that in the operation of the mass flow limiter the pressure difference over a fixed resistance which may be a valve is kept at a constant value.

- Even if one would not acknowledge that (D6) discloses an adjustable throttle instead of a differential pressure valve which comprises only a throttle of a fixed size, the problem as set out in the description on page 2, lines 28 to 41 of the patent in suit is already solved by (D6). Thus, Claim 1 is distinguished from the disclosure of (D6) by the features that the throttle of the differential pressure valve is adjustable and is provided between the inlet and the closing device. The objective problem solved by these features, must be seen in providing a valve which is better adapted to changes in the heating plant and is more compact.
- (D2) describes a heating plant and a differential pressure valve arranged therein which has an adjustable throttle provided between the inlet and the closing device of the valve. The skilled person would make use of such a throttle in the method known from (D6) and arrive thus at the teaching of Claim 1 in an obvious way.
- The considerations relating to Claim 1 apply also to Claim 5 because the latter claim corresponds to the former claim, the difference between these claims lying only in the category "product" and "process", respectively.

VII. In support of his request for maintenance of the patent as granted the Respondent (Patentee) argued in the written and oral proceedings essentially as follows:

It is clear from the description of the application that the term "adjusted to allow a maximum amount of fluid to pass..." should be read "limited to a maximum..." and should be interpreted as such.

(D6) describes a method for regulating a central or district heating plant provided with a differential pressure valve for circulating a heat carrying fluid such as water, said plant comprising several radiators each provided with a thermostat valve (RAV) and with a differential pressure valve being placed after the radiators in the direction of flow, said valve having an inlet and an outlet and a closing device (6) therebetween controlled by a membrane (9) for regulating the flow of heat carrying liquid in a passage between the inlet and the outlet.

The subject-matter of claim 1 differs from the disclosure of (D6) in that the differential pressure valve is provided with an adjustable throttle between the inlet and the closing device and that the throttle is adjusted to allow a maximum amount of fluid to pass, regardless of the state of distribution of pressure in the plant.

(D2) shows a regulating valve (Figure 3) in which an adjustable throttle (1.2) is provided between the inlet and the closing device (2, 3) which throttle is adapted to allow a maximum flow of fluid to pass. This valve can be used in the return pipe of a heating circuit.

It was, however, not possible to find an indication of the use of thermostatic valves in heating circuits with the arrangement of regulating valves arranged in the return pipe in the prior art. The fact that the patent considers thermostatic valves as known, (see the preamble of Claim 1), does not mean that the technical problem arising from the use of such valves is evident to the person skilled in the art.

There is no indication in (D6) as to the introduction of an adjustable throttle instead of a throttle with a constant opening. The person skilled in the art had no reason, therefore, to look into the disclosure of (D2) in expectation of some improvement or advantage. The subject-matter of Claim 1 and Claim 5 respectively, involves therefore, an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Novelty*
 - 2.1 (D6) cited for the first time in the Statement of Grounds of Appeal discloses a method for regulating a central or district heating plant provided with a differential pressure valve for circulating a heat carrying fluid, such as water, said plant comprising several radiators each provided with a thermostat valve (RAV) and with a differential pressure valve, the latter valve being placed after the radiators in the direction of flow and having an inlet and an outlet and

a closing device (6) therebetween controlled by a membrane (9) for regulating the flow of the heat carrying fluid through a passage between the inlet and the outlet (see page 2, figure under the heading "Konstruktion and Beschreibung" and Figure 2).

The further feature according to the preamble of Claim 1 that every room of the building to be heated has at least one radiator has not been described expressis verbis in (D6). The disclosure on page 2 under the heading "Allgemeines" in (D6) that in large heating systems often load variations occur due to the necessary local adjustments, makes it clear to the skilled person that in (D6) a heating system is disclosed which is intended to be used with the radiators spaced apart in a building. Such a configuration of a heating plant corresponds to the typical situation prevailing in heated buildings, which normally have a number of rooms having each at least one radiator.

Hence, (D6) discloses all features according to the preamble of Claim 1. Furthermore, (D6) specifies that for the purpose of limiting the mass flow the pressure difference across a fixed resistance (restrictor or valve) is maintained constant (see "Beispiel 2" on page 3). The differential pressure valve of the type AVD safeguards that a selected value of the mass flow is not exceeded (see the first page, central column, paragraph 4) which means that the mass flow is limited to a maximum value regardless of the state of distribution of pressure in the plant, in accordance with the interpretation of Claim 1 given by the Respondent on page 4, paragraph 2 of his letter dated 20 December 1995.

The above considerations apply basically also to Claim 5 which in its first portion incorporates the features according to the preamble of Claim 1 in the form of "product"-features.

Hence, (D6) is more relevant to the claimed subject-matter than (D1) considered in the contested decision to describe the nearest prior art, and is, therefore admitted to the proceedings.

2.2 Both Claim 1 and Claim 5 differ from the disclosure of (D6) by the features that the throttle of the differential pressure valve is provided between the inlet and the closing device of the valve and that the throttle is adjustable.

2.3 It follows from the foregoing that the subject-matter of Claim 1 and of Claim 5, respectively, is novel. Since novelty was no longer disputed in the oral proceedings before the Board, this issue needs no further argument.

3. *Inventive step*

3.1 The technical problem underlying the patent in suit as indicated in the description and maintained in the Respondent's letter dated 7 April 1997, page 7, paragraph 2, is to reduce unwanted heat losses due to excessive circulation of the heating fluid in case of thermostatic valves in the circuit during heating conditions, for instance during the time in which the room is cooled by opening the windows and the valves are not closed. As explained on page 2, lines 47 to 52 of the patent in suit, the total amount of heat carrying liquid through the plant can be limited by providing the differential pressure valve with an adjustable throttle even if all the thermostat valves are opened at a maximum which means that the throttling

which normally takes place in the plant by the combined effect of a plurality of thermostat valves, is transferred down to the differential pressure valve. In this way a constant loss of pressure is provided across the thermostat valves and/or the throttle in the differential pressure valve, regardless of whether the thermostat valves are more or less open.

It is clear that also with a differential pressure valve comprising a throttle of a fixed size a constant loss of pressure is provided although with such a throttle the pressure loss cannot be varied by adjusting the throttle.

According to (D6) which describes a system comprising a heating plant with thermostat valves and a differential pressure valve with a fixed-size throttle the above-cited problem has already been solved. It must therefore be investigated which problem remains effectively to be solved by the features of Claim 1.

- 3.2 In the present case, the problem-solution approach as advocated in a number of decisions of the Boards of Appeal (see e.g. T 248/85 (OJ EPO 1986, 261) and T 162/86 (OJ EPO 1988, 452)) has been applied for examination of the claimed subject-matter. In accordance with this method, the technical problem has to be identified on the basis of objective criteria, i.e the problem which can be seen to have been actually solved in the light of the closest prior art which may be different from the prior art which was at the disposal of the inventor.

Having regard to the above-cited features distinguishing Claim 1 from the arrangement disclosed by (D6), according to the latter, the throttle is provided outside of the differential pressure valve and is of a fixed size (see Figure 2 "Mengenbegrenzer", the

figure below the heading "Konstruktion und Beschreibung" and "Beispiel 2"). Due to these differences the system according to (D6) suffers from the detriments that the valve requires a large space and cannot be easily adapted to different values of the maximum amount of fluid mass flow.

The inherent objective problem solved by Claim 1 when starting out from (D6) as the relevant prior art resides therefore in providing a compact differential pressure valve which is easily adaptable to different values of the maximum amount of fluid mass flow, e.g. in the case of changes in the number or size of radiators.

- 3.3 It has to be investigated now whether the posing of this problem requires from the skilled person already more than customary considerations.

It comes within the normal experience of the skilled person that the time and expense required for mounting or dismounting a valve depends on the number of components to be handled for the replacement of the valve. It is moreover self-evident for the skilled person that the complete replacement of a valve in a duct system is more laborious than an adjustment of a valve of the type the characteristics of which can be changed. Thus, the objective problem becomes evident from the drawbacks revealed during operation of the heating system described in (D6) when the skilled person has to adjust this known system to accommodate a different number and/or size of radiator.

It has therefore to be concluded that the recognition of the underlying problem as such cannot contribute to an inventive step of the subject-matter of Claim 1.

- 3.4 (D2) relates to a system comprising a differential pressure valve installed in the return pipe of a heating plant (see Figure 3 "Typ 46-6 (DN 15...25) and Figure 4 on page 3 with the corresponding description). Thus, the citation concerns the same technical field as according to the patent in suit.

This known differential pressure valve comprises an adjustable throttle (1.2) provided between the inlet and the closing device (2, 3) of the valve, the valve serving the purpose of allowing an amount of fluid to pass which is adjustably limited to a maximum value (see page 1, section "1. Aufbau und Wirkungsweise", paragraph 2 and last paragraph).

The skilled person studying the disclosure of (D2) would immediately recognise that the particular construction of the valve described therein overcomes the disadvantages connected with a valve throttle which is of a fixed size and is arranged outside of the differential pressure valve.

Contrary to the opinion of the Respondent, the skilled person would be motivated to substitute the differential pressure valve described in (D2) for the valve illustrated in (D6) and would thus arrive readily at the subject-matter of Claim 1 and Claim 5, respectively. He would see that by such a substitution advantages as to an easy adaptation of the valve to different values of the maximum permissible amount of the fluid flow and, respectively, as to a compact construction of the valve are to be expected.

- 3.5 The Respondent argues further that the system described in (D2) does not dispose of thermostat valves and cannot, therefore, be combined with the system known from (D6).

It is true that in (D2) there is no express reference to the use of thermostat valves. There can be, however, no doubt that at the date of publication of (D2), that is January 1988, the provision of the radiators with thermostat valves was the normal situation and was even prescribed in one of the member states of the EPC (see (D5), §7(2)). The use of thermostat valves in the heating system disclosed in (D2) would, therefore, be regarded by the skilled person as at least not excluded, even if not implicitly included.

Furthermore, it must be emphasized that (D6) which expressly refers to radiators comprising thermostat valves provides already the solution to the problem of avoiding unwanted heat losses in connection with thermostat valves, for example in the case of opened windows in the compartment to be heated. The skilled person having studied (D6) is therefore only confronted with the objectively underlying problem as indicated above to which (D2) - even in the case that it would not implicitly disclose a heating plant having on the user side thermostat valves - offers the solution as claimed.

3.6 The subject-matter of Claim 1 and of Claim 5, respectively, is not therefore based on an inventive step (Article 56 EPC) so that Claims 1 and 5 cannot be maintained.

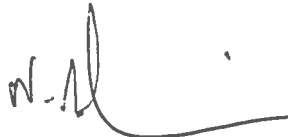
4. Since the Board is bound by the single request of the Respondent, it is not necessary to comment on the Claims 2 to 4 and 6 to 8 dependent on Claims 1 and 5, respectively. These claims must therefore fall with Claims 1 and 5.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:



N. Maslin

The Chairman:



C. T. Wilson

