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D E C I S I O N
of 21 February 2002

Case Number: T 0976/99 - 3.5.1

Application Number: 91302285.1

Publication Number: 0448315

IPC: G05D 23/13

Language of the proceedings: EN

Title of invention:
Improved thermostatic mixing valve

Patentee:
THE HORNE ENGINEERING CO. LTD.

Opponent:
David Auld Valves Limited
GSA Industries (Aust) Pty Ltd.

Headword:
Mixing valve/THE HORNE ENGINEERING

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123

Keyword:
"Sufficiency of disclosure (yes)"
"Extension beyond the content of the application as filed (no)"
"Novelty and inventive step (yes)"

Decisions cited:
Judgement CH 1997 T 6180 of the High Court of Justice (GB)

Catchword:
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Case Number: T 0976/99 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 21 February 2002

Other Party:
(Opponent I)

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Decision under appeal:

Interlocutory decision of the Opposition Division of the European Patent Office posted 25 August 1999 concerning maintenance of European patent No. 0 448 315 in amended form.

Composition of the Board:

Chairman: S. V. Steinbrener
Members: R. Randes
S. C. Perryman

Summary of Facts and Submissions

I. This appeal is against the decision of the Opposition Division given on 2 August 1999, with written reasons posted on 25 August 1999, finding European patent No. 0 448 315 in amended form to meet the requirements of the Convention.

II. The patent was granted with Claim 1 reading as follows:

"A thermostatic mixing valve comprising a valve casing (2) wherein relatively hot and cold fluids are mixed, inlets (14, 15) in the casing (2) for said hot and cold fluids, valve means (10) controlling fluid flows through the fluid inlets (14, 15), a thermostatic control (6) in the casing (2) for the valve means (10) including an elongate thermal responsive member (7) responding to fluid temperature, ducting (10A, 10B, 10C, 18) for delivering hot and cold fluids passing from the fluid inlets (14, 15) to said thermal responsive member (7) and an outlet (5) from the casing (2) for mixed fluid,

characterised in that said elongate thermal responsive member (7) includes a first upper portion (7A) and a second lower portion (7B) adjacent said first portion (7A), in that the fluid inlet (15) for cold fluid and a portion (10B)of said ducting are arranged to provides [sic] a dedicated flow of cold fluid radially onto said first portion (7A) of the thermal responsive member (7) whereby said first portion (7A) is responsive predominantly to the temperature of said cold fluid, and in that said second portion (7B) of the thermal responsive member (7) is responsive to the temperature of the mixed fluid."

III. Two oppositions were filed against the patent, Opponents I (the other party in these appeal proceedings) asking that it be revoked on the grounds of lack of novelty and inventive step, and Opponents II (the Appellants in these appeal proceedings) asking that the patent be revoked on the grounds of lack of novelty and inventive step, insufficiency and because the subject-matter extended beyond the contents of the application as originally filed.

IV. On 7 November 1997 the proprietors (Respondents in this appeal) filed in the opposition proceedings an amended set of claims with the amended claim 1 reading:

"A thermostatic mixing valve comprising a casing (2) wherein relatively hot and cold fluid streams are mixed to provide a mixed fluid stream, inlet ports (14, 15) in the casing (2) receiving hot and cold fluids at supply pressures from inlet ducts (3, 4), valve means (10) controlling fluid flows through the fluid inlet ports (14, 15), a thermostatic control (6) in the casing (2) for the valve means (10) including an elongate thermal responsive element (7) responding to fluid temperature, ducting (10B, 10C, 18) for delivering hot and cold fluid streams passing from the fluid inlet ports (14, 15) to said thermal responsive element (7) and a mixed fluid outlet (5) from the casing (2) downstream from the thermal responsive element (7), characterised in that the fluid inlet ports (14, 15) and said ducting (10B, 10C, 18) are arranged to direct the fluid streams so that there is provided a dedicated flow of cold fluid radially onto a first upper portion (7A) of the thermal responsive element (7) whereby said first portion (7A) is responsive predominantly to the temperature of said cold fluid, and to direct a flow of hot fluid to engage the cold fluid stream to form a mixed fluid stream which passes over a lower second substantially longer

portion (7B) of the thermal responsive element (7) downstream from the first portion (7A) whereby said second portion (7B) of the thermal responsive element (7) is responsive to the temperature of said mixed fluid, the arrangement being such that the lengths of said first and second portions (7A/7B) vary by a transfer (Δ) between the portions (7A, 7B) with changes in the cold and hot fluid streams passing to the thermal responsive element (7) caused by changes in the supply pressures of the hot and cold fluids."

V. In a communication dated 14 April 1998, the Opposition Division indicated its preliminary opinion to the effect that with the claims as amended all the provisions of the EPC were considered met.

Opponents I (other party on appeal) indicated that it agreed with the opinion of the Opposition Division and took no further active part in the opposition.

Opponents II (the present Appellants) raised objections under Articles 84 and 123(2) and (3) EPC to the proposed amendments and maintained its objections raised against claim 1 as granted on the grounds of lack of novelty and inventive step and insufficiency and inadmissible amendment.

VI. In parallel with the opposition proceedings, infringement proceedings took place before the High Court of Justice, Chancery Division (Ref: CH 1997 T 6180) in the United Kingdom in which the proprietors (and present Respondents) sued Reliance Water Controls Limited ("Reliance"), an associated company of the present Appellants, for infringement of the UK part of the European Patent in suit, and Reliance

counterclaimed for revocation of the UK part of the European patent as being invalid for lack of novelty, obviousness and insufficiency under the provisions of the UK Patents Act 1977 corresponding to Articles 54, 56 and 83 EPC.

In these UK infringement proceedings, the proprietors applied to amend claim 1 in the same way as in the opposition proceedings, namely to the form set out in point IV above.

Judgement ("the UK judgement") was given in the UK proceedings on 10 June 1999, with the learned judge finding that there was no infringement, and that claim 1 (whether as granted or as proposed to be amended) was novel, but was obvious and that insofar as the invention was not obvious the specification gives insufficient directions for putting the invention into effect. The judge indicated that he would not have refused the amendment on discretionary grounds and did not think it objectionably obscure. In the UK proceedings grounds equivalent to those under Article 123 EPC had not been originally pleaded, and the judge refused permission to change the pleadings, so issues under this Article raised in the present proceedings were not considered in the UK proceedings.

On 30 June 1999 Opponents II submitted a copy of the UK judgement and a selection of what was described as the thousands of pages of the entire written documentation of the proceedings. The reason for the submission was stated to be that while accepting that the Opposition Division would not be bound by the judgement they should be aware of the reasoning of the UK judge so that they can satisfy themselves that their decision as intended is correct under EPO practice, given that the provisions of the UK statute are intended to have the same effect as the corresponding provisions of the EPC.

On 2 July 1999 the proprietors filed further submissions and documents.

VII. Oral proceedings took place on 2 August 1999, with the Opposition Division finding the patent with the amended claims as submitted on 7 November 1997 (for claim 1 see point IV above), to meet the requirements of the Convention and rejecting the attacks of insufficiency, inadmissible amendment, and lack of each of clarity, novelty and inventive step. In particular it considered that there was novelty over document D1 ("Vernet")

French Patent of Addition No. 92.539

because in the valve there shown the hot and cold water flows were mixed before they reached the thermally responsive element, and the arrows in Figure 1 in D1 could not be treated as indicating separate cold and hot flows.

The Opposition Division started from document D1 as closest prior art and considered that the problem to be solved was that of reducing temperature variations caused by variations in the cold water pressure, as had been stated in the patent in suit. It found that nothing in the prior art suggested the solution as claimed because this always taught mixing of the hot and cold water before it reached the thermally responsive element.

VIII. The Appellants (Opponents II) filed a Notice of Appeal on 11 October 1999, paid the appeal fee on 12 October 1999, and filed a Statement of Grounds of Appeal on 22 December 1999. They asked that the decision should be reversed, the patent be revoked and the appeal fee be reimbursed, as the decision under appeal was not a reasoned decision in the sense of Rule 68(2) EPC because the reasons left the Opponents unaware of why

the amendments were considered to meet the requirements of Article 123(2) and (3) EPC. All of the legal grounds of invalidity relied on in the opposition proceedings were also relied on in the appeal.

IX. The Respondents (Proprietors) made a response dated 22 May 2000, submitting detailed arguments and requesting the dismissal of the appeal.

X. The Board on 26 November 2001 issued a summons to oral proceedings, and in a communication annexed thereto expressed its preliminary non-binding opinion on the issues.

The Respondents by letter of 21 January 2002 made further submissions and filed an amended set of claims.

The Appellants by letter of 21 January 2002 made further submissions, and indicated that they withdrew their request of reimbursement of the appeal fee.

The other party indicated on 27 December 2001 that it would not be attending the oral proceedings, and it took no active part whatsoever in the appeal proceedings.

XI. Oral proceedings took place before the Board on 21 February 2002, during the course of which the Respondents filed an amended set of claims and an amended description replacing all previously filed. Claim 1 read as follows:

"A thermostatic mixing valve comprising a casing (2) wherein relatively hot and cold fluid streams are mixed to provide a mixed fluid stream, inlet ports (14, 15) in the casing (2) receiving hot and cold fluids at supply pressures from inlet ducts (3, 4), valve means (10) controlling fluid flows through the fluid inlet

ports (14, 15), a thermostatic control (6) in the casing (2) for the valve means (10) including an elongate thermal responsive element (7) responding to fluid temperature, ducting (10B, 10C, 18) for delivering hot and cold fluid streams passing from the fluid inlet ports (14, 15) to said thermal responsive element (7) and a mixed fluid outlet (5) from the casing (2) downstream from the thermal responsive element (7), characterised in that the fluid inlet ports (14, 15) and said ducting (10B, 10C, 18) are arranged to direct the fluid streams so that there is provided a dedicated flow of cold fluid radially onto a first upper portion (7A) of the thermal responsive element (7) whereby said first portion (7A) is responsive predominantly to the temperature of said cold fluid, and to direct a flow of hot fluid to engage the cold fluid stream to form a mixed fluid stream which passes over a lower second substantially longer portion (7B) of the thermal responsive element (7) downstream from and adjacent to the first portion (7A) whereby said second portion (7B) of the thermal responsive element is responsive to the temperature of said mixed fluid, the arrangement being such that said first and second portions (7A/7B) become smaller and larger respectively by a transfer (Δ) between the portions (7A, 7B) with changes in the cold and hot fluid streams passing to the thermal responsive element (7) caused by reductions in the supply pressure of the cold fluid relative to that of the hot fluid, thereby to reduce or eliminate increases in the mixed fluid temperature caused by said reductions."

XII. The submissions of the Appellants in writing and at the oral proceedings relevant to the final requests made to the Board can be summarised as follows:

Article 83 EPC

- The only consistent way of interpreting the description and claim 1 was that the first portion 7A should take the form of an annulus at the upper end of the thermal element, having a certain identifiable "length" and being responsive predominantly to the temperature of the cold fluid. However the experimental evidence generated for the English High Court, relating to series of measurements on the different valves, all of which the Respondents considered to be covered by claim 1, showed that such an annulus was not formed, nor was there a measurable Δ on a fall of cold water pressure, since the temperature around and along the "thermal responsive element" varied continuously during the mixing procedure and there was a complex and moveable distribution of warmer and cooler areas.

- Since Δ was not measurable, a skilled person could not know how to carry out the invention claimed contrary to the requirements of Article 83 EPC.

- Even if the above objection did not succeed, the evidence in the proceedings before the English High Court further showed that a feature not mentioned in the claim at all, the tubular sleeve 16, and its positioning would be critical to achieving success. The description did not mention the importance of this feature, and the skilled person was not given enough information on it to be able to achieve dedicated radial flow of cold fluid directed onto the upper cold portion of the thermal element in such a way as to achieve a transfer Δ on a drop in the cold water pressure.

Article 123(2) EPC

- If, however, claim 1 was to be interpreted in the way put forward by the Respondents, namely that the cold annulus could be considered as a freely movable upper part of the thermal element without any clearly defined borders towards the lower portion having the temperature of the mixed water, then it appeared that the patent did not meet the requirements of Article 123(2) EPC, being inconsistent with the description in the application as originally filed.

Article 84 EPC

- Moreover also the requirements of Article 84 EPC were not met, because the use of transfer (Δ) in the amended claim was in conflict with the explanation of transfer (Δ) given in the description.

Article 54 EPC

- Claim 1 was not novel, containing no distinguishing features over the valve shown in document D1 where arrows in its Figure 1 indicated a radial flow of cold water in the direction of the upper portion of a thermal responsive elongate element.

- While it was true that in D1 the inlet of cold water into the mixing chamber was not radial, the feature in claim 1 did not require a radially directed inlet, but one which caused a radial flow: this did occur in D1. This was the Respondents' own interpretation as in the Horne 15 valve (manufactured by the Respondents and considered by them to fall under claim 1)

(Figure filed in the opposition proceedings on 5 October 1998 by the Appellants), the influx of cold water was not radial but rather the cold water was ejected diagonally downwards (in the direction of the mixed water outlet) into the mixing chamber.

- Further the Respondents' own witness, Mr Luke, in the proceedings before the English High Court had agreed that in the valve disclosed in D1 there was probably a kind of cold annulus around the top of the element in the mixing chamber.

Article 56 EPC

- What was claimed worked in the same way as the valve of document D1. If there was any difference from the valve in D1, no problem other than providing an alternative valve could be regarded as having been solved. Any differences were routine variations which should be regarded as obvious.

- A designer of a valve while exercising no inventive ingenuity in his design might, in seeking to implement Vernet or indeed in setting out to design a new valve merely by exercising his common general knowledge, by the use of known expedients in his design, come up with something which was within the claim. This was what the patentee did, and also what was done in designing the alleged UK infringement. In neither design process was it possible to identify anything other than the non-inventive design of a new valve to satisfy explicit requirements.

XIII. The submissions of the Respondents in writing and at the oral proceedings relevant to the final requests made to the Board can be summarised as follows:

Article 123(2) EPC

- The amended Claim 1 found a basis in claim 1 as originally filed, and the description originally filed.

- The deletion of certain of the dependent claims or features therein had removed any possible objections thereto.

- In particular the added passages relating to the transfer (Δ) were fairly based on the original description of this feature in relation to Figures 3A and 3B, and the term "length" referred to in the Claim 1 as maintained by the Opposition Division no longer appeared.

Article 123(3) EPC

- The reinsertion of the words "and adjacent to" after the words "downstream from" removed any basis for an objection that the claim was broader than claim 1 as granted.

Article 84 EPC

- The claims as amended were clear and supported by the description.

Article 83 EPC

- There was no evidence that anyone trying to carry out the invention claimed in the patent in suit had failed to do so.

Article 54 EPC

- Document D1 had already been considered in the examination proceedings. It did not show ducting arranged to direct the fluid streams so that there is provided a dedicated flow of cold fluid onto a first upper portion of the thermal responsive element.

- Nor was there any evidence or likelihood that a valve constructed in accordance with D1 would have a transfer portion between two portions of the thermal responsive element. The hot and cold streams in D1 met head-on and would be thoroughly mixed before the flow reached the thermal responsive element.

Article 56 EPC

- The problem to be solved over the valve shown in document D1 could be stated as being to reduce temperature variations caused by variations in the water pressure.

- There was nothing at all in the prior art that suggested that the problem could be solved in the way now claimed.

- The Appellants' attack did not amount to any sort of case on obviousness. The story of their own development of a valve did not start from document D1 and could not be considered as something the skilled man at the priority date would have done to solve the above stated problem.

XIV. At the end of the debate in the oral proceedings the following requests were made:

The Appellants (Opponents II) requested that the decision under appeal be set aside and the patent be revoked.

The Respondents (Proprietors) requested that the appeal be dismissed and that the patent be maintained on the basis of:

Description and claims filed at the oral proceedings on 21 February 2002,

Figures 1, 2 and 4 of the drawings as filed on 7 November 1997,

Figure 3 of the drawings as filed on 23 April 1991.

XV. At the end of the oral proceedings the Board announced its decision.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC, and thus is admissible.

Background comments

2. The patent relates to the field of mixing valves for use for example in controlling the water temperature in a shower. In the simplest form of such valve, hot and cold water enter the valve through hot and cold water inlet ports whose inlet area can be varied by the user

setting the valve. The hot and cold water are mixed in the valve and the mixed water comes out at a single output. The user sets the valve so that the output mixed water is at the desired temperature at the time of setting. However fluctuations in the supply pressure of the hot or cold water or in the temperature of the water inputs can cause this temperature to vary. A reduction in the supply pressure of the cold water, for example due to a cold tap connected to the same supply being turned on elsewhere, might lead to such a severe reduction in the inflow of cold water that the mixed water emerges at a temperature that could scald the user (see column 1, lines 3 to 22 of the patent in suit).

In the prior art there already existed a thermostatically controlled mixing valve that alleviated the problems caused by variations in the water supply pressures and temperatures changing away from those existing when the user set the valve. Such a prior art valve has hot and cold water inlet ports respectively whose inlet area is caused to vary from that initially set by the user in dependence on the length of a thermal responsive element, to keep the output mixed water close to this desired temperature despite fluctuations in the supply pressure of the hot or cold water or in the temperature of the water input. The hot and cold water are first mixed in the valve, and then led past the thermal responsive element which is connected so that if due to a fall in the mixed water temperature, the length of the element decreases, the inlet area of the cold water inflow port is decreased and that of the hot water inflow port is increased. Vice-versa if the mixed water temperature rises, the length of the element increases, the inlet area of the cold water inflow port is increased and that of the hot water inflow port is decreased.

To respond to the changed conditions due to the different input cold water pressure, the length of the element must change. As in this prior art valve the length of the thermal responsive element is dependent solely on the temperature of the mixed water, the output mixed water temperature must rise somewhat to cause an increase in the length of the thermal responsive element and thus to increase the cold water inflow port area and decrease the hot water port inflow area to compensate for lower input cold water pressure. This temperature difference compared to the temperature originally desired by the user is known as the permanent deviation, and is unavoidable with a simple feed-back control element, which element is responsive only to the mixed water temperature (see column 1, lines 22 to 49 and Figure 1 of the patent in suit).

According to the Respondents, they have overcome this problem of permanent deviation with a construction barely more complicated than the above described prior art valve, by having a flow of cold water directed at the upper portion of the thermal responsive element. If the cold water pressure falls, the flow of cold water becomes less forceful and the size of this upper portion exposed to it decreases and the size of the second lower portion exposed to the mixed water temperature increases. This causes the length of the thermal responsive element to increase (irrespective of any increase of temperature in the mixed water) allowing the fall in pressure to be compensated for without any increase in the output water temperature. The thermal responsive element thus also functions as an element responsive to (relative) changes between the cold water and the hot water pressure (see Figures 3A and 3B of the patent in suit).

Nothing similar to such a use of a thermal responsive element in valves for mixing water to respond to pressure differences has been explicitly described in the prior art put before the Board. The lines of attack on validity by the Appellants are rather that a skilled person does not find sufficient information in the patent to make a valve as claimed, that prior art valves already met all the claimed features, or that a skilled man might arrive at such a valve by routine modifications for other reasons. That on virtually identical evidence, these lines of attack on insufficiency and obviousness (but not on lack of novelty) succeeded in the UK infringement proceedings, but not before the Opposition Division appears attributable mainly to different approaches being used as to what evidence is needed to make good the case on each issue. The question of infringement, to which the major part of the UK evidence was devoted, is, of course, not one that ever has to be decided by the Board.

Article 123(2) EPC - subject matter extending beyond content of application as filed

3. Claim 1 as amended finds a basis in the claim 1 as originally filed together with the description relating to Figures 2, 3A and 3B.

4. The original description did not refer to the cold portion 7A of the elongate thermal responsive member being annular, nor can Figures 3A and 3B be interpreted as making this a necessary requirement. No objection under Article 123(2) EPC arises here.

5. The Appellants have not argued that the amendments to the dependent claims or the description are open to objection under Article 123(2) EPC, and the Board agrees with the Respondents' view that these are fairly based on the application as originally filed.

Article 123(3) EPC - extension of protection

6. The Appellants have no longer argued that the claims now under consideration involve any extension of protection compared to the claims as granted, and the Board sees none.

Article 84 EPC - clarity and support

7. The claim now appears as clear as possible given the subject matter and the text of the original application. Compared to the claim as granted, the claim has been improved by the functional feature at its end indicating the purpose that the fluid flows impinging on the thermal responsive element are to achieve.

Article 83 EPC - sufficiency

8. Article 83 EPC requires that the invention be disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. For an opponent to succeed on this ground, the Board would expect evidence that a skilled man in the relevant art in possession of the description and the drawings of the patent in suit, and his general knowledge, is unable to come up with something as claimed that works. The skilled person must be trying his best to succeed, and certain routine experimentation can be expected of him. The skilled man cannot however be expected to exercise inventive ingenuity or to make undue efforts in making up for any lack of information in the patent.

9. No evidence was put before the Board that anyone having the description and drawings failed to put the invention into practice. The bulk of the experimental evidence in the UK proceedings related to various alleged infringements. But according to their designer, a Mr Hay, he was not aware of the patent in suit and not trying to realise a valve according to it. That experiments carried out on these alleged infringements, using thermocouples attached to the thermal responsive element, failed to provide evidence of two portions with a transfer Δ between them on a relative change in the cold water pressure seems incapable of being relevant to the issue of sufficiency of the patent in suit.

10. The Appellants relied in particular on an argument, successful in the UK proceedings, based on the manner in which the invention was made by the Respondents. A witness for the Respondents in the UK proceedings had said that a slight temperature drop with falling cold input pressure was first noticed in a valve which had been designed to include a long thin element, and investigation suggested that the reason for the effect was that the head of the element was not fully immersed in the mixed water. After experimentation with different lengths of baffle sleeve (the sleeve 16 which separates the hot water arriving via the port and the descending mixed water in Figure 2 of the patent in suit) it was decided to file the patent application. On this evidence and on the basis in particular of the following extract of the cross-examination of the expert witness of the Respondents in the UK proceedings (see HORNE v. RELIANCE Proceedings Day 4, pages 378 and 379, Q. = question by cross-examining Counsel; A.= answer by Respondents' witness):

"Q. In particular, it is necessary, in your view, to have a jet of cold water on to the top of the element.
A. Yes, we direct cold water on to the top of the element.
Q. By way of a jet? A. A jet, a stream.
Q. And that is essential? A. That is essential for the working of the patent.
Q. It is also true that the length of the baffle tube is critical, is it not? A. The length of the baffle tube is critical inasmuch as if you want the optimum performance, it is critical. If the baffle tube length is not at the best length, for want of a better term, the invention would still work, but the degree of temperature control may not be quite so good.
Q. It is right, is it not, that if the baffle is the wrong length, you could get a temperature control that was no better than you say prior art valves would achieve. A. Yes. If the baffle tube is too long, then you could force the hot water to the top of the element, where it will mix with the cold and we would not get a transfer delta. If the baffle tube is too short, then we are liable to leave the top of the element too cold, or a portion of it which does not get warm at all. That would be inefficient and lose expansion."

It was argued by the Appellants that the length of the baffle tube was crucial, and as this was not explained in the description, and the baffle tube was not even a feature required by the claim, the invention was not adequately described to be carried out.

11. The Board cannot make this deduction from the evidence given by the expert witness. The witness explains that it is the jet of cold water to the top of the element that is critical, and if the baffle tube is too long this would force hot water to the top of the element where it will mix with the cold, ie this would prevent

the critical jet of cold water to the top of the element. This would appear self-evident to the skilled man. If on the other hand the baffle tube is too short, the design would be suboptimum, but still work as claimed.

The Board cannot here see any problem preventing the skilled man in possession of the specification and drawings from achieving success in making a valve as claimed.

12. Nor can the Board see any other evidence put before it that raises doubts as to the sufficiency of the patent. The skilled man will see that the important thing is to get a flow of cold water to the upper portion of the element so that, if the cold water pressure falls relative to the hot water pressure, more of the element is exposed to the mixed water temperature. The Board would expect the skilled man to try something as similar to the illustrated valve as possible, to measure the output mixed water temperature, and to see what differences occurred with modifications.

It may be that there would be great difficulty in measuring, using thermocouples, the temperatures of the various portions of the element, and whether there was a transfer Δ between geometrically well-defined temperature zones. However the upper and lower portions are not constructional features open to manipulation by the skilled man, but the consequences of having a directed cold flow of water at the top of the element. Provided the skilled man could achieve the desired response, ie compensation for cold water pressure variation with no or a reduced permanent deviation of the originally set mixed water temperature, the Board cannot see a skilled man trying to make such a valve being concerned with the exact shape of the boundary between the two portions.

13. There is no evidence which even suggests that a significantly different response to a drop in cold water pressure cannot be obtained with a valve as claimed. The claim covers also cases where the Δ might be minimal: this would make assessment of infringement difficult, but the Board does not see that this makes out a case of insufficiency.

14. The description does not give absolute dimensions for a valve, pressures to be used, or even that the thermal responsive element is a wax filled one. However all parties accepted that such details were with the common general knowledge of the skilled man.

The Board therefore is satisfied that the requirements of Article 83 EPC are met.

Article 54 EPC - novelty

15. By the time of the oral proceedings, novelty attacks other than that based on document D1 had been abandoned. Document D1 is a patent relating to a hot and cold water mixing valve, with a thermal responsive element to regulate the temperature of the output mixed water. As described in the description (see page 2, right-hand column, lines 2 to 8) the thermal responsive element is responsive to the mixed water temperature. The hot and cold water enter the periphery of a mixing chamber at the centre of which is the thermal responsive element. The cold water enters this chamber in an axial direction from the top, and the hot water in an axial direction from the bottom. From the arrangement shown the Board would expect that the streams would meet head on to mix, and the mixed flows would then move radially inwards to the thermal

responsive element, and then on to a centrally located exit port. The Respondents' expert witness in the UK proceedings also expressed the view that the hot and cold water would mix before moving radially inward.

However, in the Figure 1 of document D1 there are also shown arrows to indicate flow. There is a pair of arrows, one on each side of the central axis, which could be interpreted as showing the cold water following a smoothly bent curve towards the middle (approximately radially) of the chamber. However these arrows, and also arrows indicating the flow of hot water, cannot be taken as representing actual flows. If the arrows as drawn were taken seriously, there would be no mixing, the cold water would stay at the top of the mixing chamber and only hot water would exit. To consider that the element was responsive to anything other than the mixed water temperature would be in contradiction to the written description.

16. There was no evidence that a valve as shown in document D1 had been made: the patentee, [Société etc.] Vernet was acknowledged to be the major supplier (including to both Appellants and Respondents) of thermal responsive elements but was apparently not itself a manufacturer of valves. Certainly there was no evidence available on any prior art valve made in accordance with document D1, which might have resolved some disputed issues.

17. There was a dispute between the parties as to whether or not in the UK proceedings the expert witness of the Respondents had admitted or not that in the valve of D1 there would be a cold annulus around the upper part of the thermal element, depending on whether more reliance was placed on what he had said in cross-examination by Reliance's Counsel or re-examination by the Respondents' Counsel. In this situation and in the absence of experimental evidence the Board follows its

own view that document D1 cannot be treated as showing a dedicated flow of cold fluid radially onto the first portion of the thermal responsive member.

18. Given that document D1 describes its thermal responsive member as responding to the temperature of the mixed fluid, and does not have a dedicated flow of cold fluid radially onto the first portion of the thermal responsive member, the Board also concludes that the valve of D1 does not show the transfer Δ feature. In the absence of any experimental evidence on something that can be acknowledged as being or corresponding to publicly available prior art the Board is not prepared to find that unknown to everyone what is now claimed was anticipated. Thus novelty is not destroyed by document D1.

Article 56 EPC - inventive step

19. For the purpose of the standard problem-solution approach used by the Boards of Appeal for the assessment of inventive step, document D1 can be taken as the closest prior art starting point, as was done by all parties and the Opposition Division. Compared to the valve in document D1 using a thermal responsive element responsive to the mixed water temperature, the problem that can be regarded as solved by the valve of claim 1 is to reduce the permanent upward deviation of the mixed water temperature caused by a fall in cold water pressure. The problem as stated by the Respondents and used by the Opposition Division, "to reduce temperature variations caused by variations in the water pressure" is too vague to be acceptable, and is one which could already be regarded as solved by the valve of document D1.

20. It is the Board's view that a skilled man in this art must be deemed to be aware that the valve of document D1 would show such a permanent temperature deviation. In any case, such deviation manifests itself when using the valve in daily practice. The skilled man to be considered is a somewhat fictional being, having all the relevant knowledge in the art, but no inventive ingenuity.

21. Faced with the problem of reducing the permanent upward deviation of the mixed water temperature caused by a fall in cold water pressure in a valve of document D1, the question to be answered is what solution(s) to this problem would the skilled man derive in an obvious manner from the prior art. This formulation is based on the more explicit French and German text of Article 56 EPC. The focus is on what the skilled man would do given the prior art, not on an attempt to assess the ingenuity of what the inventor did.

22. If any solution to the stated problem which the skilled man would derive in an obvious manner from the prior art falls under the patent claims, then there is a lack of inventive step. Here in the evidence, the Board sees no prior art that gives the slightest suggestion towards the solution now claimed. The skilled man might have considered introducing much more complicated pressure sensors, but nothing suggests the use of the existing thermal responsive element also as some kind of pressure sensor independently of the rise in temperature of the mixed water caused if the cold water pressure falls. Accordingly, inventive step can be acknowledged.

23. It should be pointed out that for the problem-solution approach it makes a critical difference whether what is claimed can be recognized as providing a beneficial technical effect, or whether the only problem solved is

that of providing an alternative to existing prior art. If a beneficial technical effect is provided the problem to be solved should be formulated as aiming to obtain this effect, providing this can be done without hindsight of the solution.

24. Assessing whether the inventor used inventive ingenuity is open to the objection that there is no basis for the assumption that actions of the actual inventor can be equated with those of the skilled man. Further the evidence here fails to identify any clear starting point in the prior art when making this assessment. It may be that the inventor hit upon the subject matter now claimed when trying to do something else, but the Board cannot see any basis for concluding that any skilled man would encounter a similar happy accident, or even notice what they had achieved. Instead the Boards of Appeal when assessing inventive step use the problem-solution approach as an instrument to arrive at an assessment as objective as possible, and on this approach inventive step must be acknowledged as indicated in point 22 above.

25. Thus the Board is of the opinion that the subject-matter of claim 1 meets the requirements of Articles 54(2) and 56 EPC in conjunction with Article 52(1) EPC.

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 on the following basis:

   - Description and claims filed at the oral proceedings on 21 February 2002,

   - Figures 1, 2 and 4 of the drawings as filed on 7 November 1997,

   - Figure 3 of the drawings as filed on 23 April 1991.

The Registrar: The Chairman:

M. Kiehl S. V. Steinbrener