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D E C I S I O N
of 13 September 1995

Case Number: T 0182/95 - 3.5.1

Application Number: 88310881.3

Publication Number: 0318208

IPC: G05D 23/02

Language of the proceedings: EN

Title of invention:
Thermo-actuator

Applicant:
KUZE, Yoshikazu

Opponent:
-

Headword:
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Relevant legal provisions:
EPC Art. 56, 83

Keyword:
"Inventive step (no)"

Decisions cited:
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Catchword:
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Case Number: T 0182/95 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 13 September 1995

Appellant: KUZE, Yoshikazu
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 19 October 1994 refusing European patent application No. 88 310 881.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: C. C. F. Biggio
G. Davies

Summary of Facts and Submissions

I. European patent application No. 88 310 881.3, claiming the priority of patent application No. 294 178/87 filed on 24 November 1987 in Japan, was filed on 17 November 1988 and published on 31 May 1989 under No. 0 318 208.

II. By its decision dated 19 October 1994, the Examining Division refused the application pursuant to Articles 97(1) and 56 EPC.

The decision was based on the application comprising the following documents:

Description: pages 5 and 7, as originally filed,
pages 2 to 4 and 6, as filed on 14 August 1990, and
pages 1, 1a and 8 as filed on 12 February 1993;

Claims: Nos. 1 and 2, as filed on 14 August 1990, whereby claim 1 was amended as set out on page 2, 5th paragraph, of the Applicant's letter dated 3 March 1994;

Drawings: sheets 1/5 to 5/5 as originally filed.

III. The following prior art documents were considered in the procedure:

D1: US-A-3 149 455,
D1a: FR-A-1 402 267 (corresponding to D1),
D2: US-A-4 679 530,
D3: GB-A-1 051 386, and
D4: FR-A-1 434 573.

Documents D1 to D2 were mentioned by the Examining Division in its decision.

IV. The appellant filed notice of appeal on 12 December 1994, paying the appeal fee the same day.

Grounds of appeal were filed on 17 February 1995.

On that occasion, the appellant filed four newly-drafted sets of claims, identified as: "SET A", "SET B", "SET C" and "SET D", respectively, to be considered as its main and auxiliary requests, in the order given.

The appellant requested that the appealed decision be set aside, and that a patent be granted on the basis of one of the said four sets of claims.

The right to be heard at oral proceedings was subsidiarily requested.

V. Claim 1 of "SET A" (main request) reads:

"A thermo-actuator having:
a rod (1),
a guide member (2) slidably mounted on the rod,
a seal spool (3) secured to the guide member at an end portion thereof,
a heat conductive cylinder (5) secured to the guide member and surrounding the seal spool, and
a wax (4) provided in the cylinder,
characterised in that
the seal spool (3) has a thickness between 30% and 5% of the diameter of the rod".

Claim 1 of "SET B" (first auxiliary request) differs from claim 1 of "SET A" in that its characterising clause is amended to read: "the seal spool (3) has a thickness between less than 30% and 5% of the diameter of the rod".

Claim 1 of "SET C" (second auxiliary request) differs from claim 1 of "SET B" in that its characterising clause is amended to read: "the seal spool (3) has a thickness between substantially 25% and 5% of the diameter of the rod".

Claim 1 of "SET D" (third auxiliary request) differs from claim 1 of "SET C" in that its characterising clause is amended to read: "the seal spool (3) has a thickness between 12% and 5% of the diameter of the rod".

VI. On 17 August 1995, joined to the summons to oral proceedings, the Board issued a communication, pointing out that, according to its preliminary opinion, the subject-matter of claim 1 of "SET A" (main request) lacked novelty over the disclosure of documents D1 and/or D1a, while the subject-matter of claim 1 of "SET B" (first auxiliary request), claim 1 of "SET C" (second auxiliary request) and claim 1 of "SET D" (third auxiliary request) lacked an inventive step in respect of the teaching from said documents D1 and/or D1a.

VII. Oral proceedings were held on 13 September 1995.

The appellant withdrew its main, second and third auxiliary requests (see Item IV), thereby requesting that the appealed decision be set aside and a patent be granted on the basis of claim 1 of "SET B".

In support of this single request, the appellant made the following submissions.

Documents D1 and/or D1a aimed to solve a problem which was totally different from that which was addressed by the present application.

Document D1, in fact, aimed to remedy the excessive friction and wear or scuffing between the rod and the sock arising from the difficulties in maintaining lubricants between them under the hydraulic pressures experienced in use; said excessive wear resulting in short life and loss of uniformly repeatable operating characteristics of the thermo-actuators known in the art as "squeeze-push" power elements (see D1, column 1, lines 18 to 23).

The invention according to the present application, on the contrary, aimed to remedy the drawback shown by known thermo-actuators, whose seal spool showed, at a cylindrical central portion, a relatively large thickness, for example, a thickness of 45% of the rod diameter, when such thermo-actuators are used to control the temperature of combustion engines.

By such thermo-actuators, in fact, when the temperature of the coolant rapidly decreases from a high temperature (about 100°C) to a low temperature (below 40°C), the seal spool rapidly expands by the restoring force, thereby forming a vacuum space between itself and the rod. The coolant is accordingly induced into said vacuum space and cannot be discharged therefrom.

The resulting negative effects are

- that the starting position of the rod is modified by the presence of said coolant,
- that the opening temperature of the valve is decreased, and, finally,
- that the engine, in which the thermo-actuator is used for controlling the temperature, is overcooled, its efficiency is reduced and the amount of the emissions increased (see present application, column 1, lines 4 to 43).

The teaching of documents D1 and/or D1a did not render the present invention obvious.

According to said documents, in fact, the seal spool (hollow sleeve or sock 15) should be formed of a resiliently flexible elastomeric material such as soft rubber or the like (see D1, column 2, lines 29 to 32) and should be so dimensioned that, at rest, an annular space 26 appears between the cylindrical wall 15a of the sock 15 and the rod 24. A small quantity of lubricant is present in the space 26 and on the rod and on the inner surface of the sock wall 15a (see D1, column 2, lines 58 to 65, and column 3, lines 57 to 63).

In the invention according to the present application, on the contrary, the seal spool

- shall have such a thickness - as defined in claim 1 - that its resiliency is reduced so far as possible, in order to reduce the restoring force and, accordingly, prevent the formation of any vacuum space between the seal spool and the rod, and

- is so dimensioned that neither an annular space is left between the cylindrical wall of the seal spool and the rod nor any lubricant is present between the rod and the inner surface of the seal spool.

In response to questions from the Board, the appellant

- stated that the specification: "less than 30%", presently mentioned by claim 1, had to be considered as a positive disclaimer intended to clearly distinguish the subject-matter claimed against the disclosure of document D1; in this respect, it was pointed out that in the example of the invention disclosed by the application as filed (page 2, lines 21 to 24), the thickness of the seal spool was stated to be 12% of the rod diameter, and

- admitted that in the application no specific material was disclosed, for the realisation of the seal spool; this meaning that any flexible elastomeric material, such as soft rubber or the like, could be used for said purpose.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

2. *Article 123(2) EPC*

The application, as originally filed, discloses for the proportion between the thickness of the seal spool and the diameter of the rod only the range 30% to 5% and one intermediate value: 12%.

The specification: "less than 30%" in the characterising clause of the presently effective claim 1 is intended as a disclaimer in respect of document D1, so that what is now claimed does fall within the range as originally disclosed.

Therefore, the presently effective claim 1 is properly based on the application as filed and thus does fulfil the requirements of Article 123(2) EPC.

3. *Novelty*

Document D1, representing the closest prior art on file, discloses a thermo-actuator having a rod 24, a guide member 12 slidably mounted on the rod 24, a seal spool (sock) 15 secured to the guide member at an end portion thereof, a heat conductive cylinder 11 secured to the guide member and surrounding the seal spool, and a wax 28 provided in the cylinder 11, in which the seal spool (sock) 15 has a thickness of about 30% of the diameter of the rod (see D1, column 3, lines 46 to 53).

Although the claims to be judged upon by the Examining Division indicated a range between 12% and 5%, on page 6 of the appealed decision - under reason 11.7 - the Examining Division found that a thickness 29% of the diameter of the rod was clearly disclosed by document D1, when taking due account of the tolerances admissible on the geometrical dimensions, as indicated by said document.

In the statement of grounds and during the oral proceedings, the appellant contested the disclosure of said value 29% and put forward that said value was the result of a wrong application of the tolerances

admissible on the geometrical dimensions. A correct application thereof would have led to the conclusion that document D1 disclosed only the values 30.8% and 32.1%.

Thus, the subject-matter of the presently effective claim 1 had to be novel.

Since the appeal will be dismissed on a different ground, i.e. lack of an inventive step (see reasons 5 to 5.3 below), there is no need to decide here whether the subject-matter of the presently effective claim 1 is novel or not.

4. *Problem and Solution*

The problem to be solved by the present application is, indeed, that pointed out by the appellant (see Item VII, paragraph 6), i.e. to avoid, in substantially-known thermo-actuators used for controlling the temperature of combustion engines, the formation of a vacuum space between the rod and the seal spool, when the latter rapidly expands, in the event that the therewith controlled temperature of the coolant rapidly decreases.

According to the present application and to its claim 1, the solution of this problem is represented by the fact that the thickness of the seal spool is made substantially lower than that of the seal spool comprised in the admittedly known thermo-actuators, i.e. the seal spool according to the claimed solution has a thickness of less than 30% of the rod diameter, instead of a thickness of, for example, 45% of the same diameter, as in the thermo-actuators acknowledged as known by the present application (see column 1, lines 22 to 25).

As stated in the present application (see column 1, lines 22 to 27), the negative behaviour of the known thermo-actuators, which the claimed invention aims to avoid, i.e. the formation of said vacuum space between the rod and the seal spool, uniquely depends on the strong inherent restoring force of the seal spools comprised in said known thermo-actuators; said strong inherent restoring force being inherently caused by the relatively large thickness of said seal spools, e.g. 45% of the rod diameter.

Thus, the problem to be solved was merely that of providing a new seal spool showing a substantially lower inherent restoring force and the claimed solution is merely represented by the fact that a new seal spool is provided, which shows, indeed, said substantially lower inherent restoring force; this merely because its thickness has been made substantially lower than that of the seal spools comprised in said admittedly-known thermo-actuators.

5. *Inventive Step*

5.1 A person skilled in the art would have considered, on the basis of his general background knowledge, that the inherent restoring forces of two different seal spools will uniquely depend on two of their physical characteristics and this in the following manner:

(a) if said two different seal spools have the same thickness, but are made with two different materials having different flexibilities, their respective inherent restoring forces will uniquely depend on the respective flexibilities of the materials with which they are made and be the lower, the higher is the flexibility of the material used; or

(b) if said two different seal spools are made with the same flexible elastomeric material (such as soft rubber or the like), but have different thicknesses, their respective inherent restoring forces will uniquely and directly depend on their respective thicknesses and be the lower, the thinner is the thickness of the seal spool walls.

Thus, a person skilled in the art, faced with the problem to be solved by the present invention, i.e. providing a new seal spool showing an inherent restoring force substantially lower than those of the known seal spools, would have immediately envisaged that said problem would have been solved:

(a) by a new seal spool having the same thickness as in the prior art, but made with a material having a flexibility substantially higher than that of the materials used in the prior art, or

(b) by a new seal spool made with the same material as in the prior art, but showing a thickness substantially thinner than that of the seal spools according to the admitted prior art.

Even a solution consisting in lowering the thickness of the seal spool, while realising said seal spool with a more flexible - or less resilient - material, would have been considered obvious by the person skilled in the art.

5.2 According to the above, the Board might, prima facie, take the view that the claimed solution is, at least, incomplete and therefore open to objection pursuant to Article 83 EPC, since the present application does not

disclose any specific material for the realisation of the seal spool, as admitted by the appellant (see Item VII, last paragraph, last sentence thereof).

This objection may, however be disregarded, since the silence of the present application as to the material to be used for realising the seal spool may be construed as meaning that any flexible elastomeric material, such as soft rubber or the like, could be used for said purpose.

5.3 On the question of inventive step, bearing in mind the considerations mentioned in previous points 4 and 5.1, the Board is of the opinion that the solution, as claimed by claim 1, does not involve an inventive step pursuant to Article 56 EPC, because, in the silence of the present application as to the material to be used for realising the seal spool, the said solution is the sole left open to the person skilled in the art

6. Accordingly, the appellant's single request (see Item VII, second sentence thereof) is rejected.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl P. K. J. van den Berg