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D E C I S I O N
of 5 February 1997

Case Number: T 0435/95 - 3.4.2
Application Number: 87900923.1
Publication Number: 0252143
IPC: G01M 19/00, F16K 37/00
Language of the proceedings: EN

Title of invention:

Motor operated valve analysis and testing system with monitoring of spring pack movement through torque switch post

Patentee:

WESTINGHOUSE ELECTRIC CORPORATION

Opponent:

SIEMEN AG Abtlg. ZFE GR PA 3

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0435/95 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 5 February 1997

Appellant:
(Opponent)

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Representative:

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 22 March 1995
rejecting the opposition filed against European
patent No. 0 252 143 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: E. Turrini
Members: R. Zottmann
L. C. Mancini

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal against the decision of the Opposition Division on the rejection of the opposition against the patent No. 0 252 143 with the application No. 87 900 923.1.

Opposition was filed against the patent as a whole and based on Article 100(a) EPC.

The Division held that the subject-matter of claim 1 was novel and involved an inventive step, having regard to documents

D1: US-A-4 542 649 and

D2: Hans Walcher: "Winkel- und Wegmessung im Maschinenbau", 2nd edition, VDI-Verlag, Düsseldorf, 1985, pages 14 to 17, 26 to 33 and 150 to 164.

II. Oral proceedings were held.

The Appellant requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent (Patentee) requested that the appeal be dismissed and that the patent be maintained on the basis of the documents as granted.

III. Claim 1 reads as follows:

"1. A valve operator and a valve stem load correlation monitoring device, wherein said valve operator (16) includes a driven worm shaft (2), which in turn drives a worm (3), which in turn drives a worm gear (4), which in turn drives a valve stem (5) to open and close a valve (15) attached to the valve stem, and a spring pack (7) provided at one end of the wormshaft (2) for

compression by the worm (3), the axial movement of the worm being related to spring pack movement, the valve stem load correlation monitoring device characterized by:

- a rack (47) movable with the worm (3) as it compresses the spring pack (7),
- a gear member (52) driven by the rack,
- a post member (54) protruding from the gear member (52) for rotation about a central longitudinal axis thereof as the gear member is driven by the rack (47),
- means (8, 60, 61, 63, 64, 69) for detecting a rotational movement of the post member (54); and
- means (10a) for recording said detected rotational movement of the post member (54) and for correlating this movement with the load on the valve stem (5)."

Claims 2 to 4 are dependent on claim 1.

IV. The arguments presented by the Respondent are summarized as follows:

The mechanical engineer is neither the skilled person for the subject-matter of D1 nor for the subject-matter of the attacked patent. The person skilled in the art is rather the expert of nuclear power plants, the device of the invention being particularly suitable in this technical field. This expert would not take into account the teachings of D2 which belong to the technical field of mechanical engineering.

If nevertheless the skilled person combined the teachings of D1 and D2, he would not arrive at a device with all the features of claim 1 of the attacked patent. He would take into account the arrangement of Figure 2b of D2. As a consequence, he would provide a stationary rack and a movable spur gear and he would not provide a post member. Moreover, one would equate worm 3 of D1 with spindle c of D2 which would lead to a device being unsuitable for measuring the upsetting of the spring pack 7. Use of the teaching of D2 for converting the longitudinal shift of the spring pack of D1 into a rotary motion for measuring purposes may not be considered, since, according to the description on page 16 of D2, both the workpiece to be measured and the tool would have to be at fixed positions in their fixtures. This makes a dynamic measurement according to the patent-in-suit impossible.

Since neither of the two citations mentions a torque switch control post, the objects indicated in the description dealing with monitoring movement of said post, cannot be accomplished by means of a combination of the teachings of said citations and even the knowledge of them will not suffice to arrive at the invention.

V. The arguments presented by the Appellant are summarized as follows:

The subject-matter of claim 1 is distinguished from D1 only by the differences of the structures of the devices for measuring the axial movement of the worm. A device for transferring axial movement into a rotary movement, which is simpler than that of D1, is shown in Figure 2b of D2. This device comprises a stationary toothed rack and an axially movable spur gear.

Use of the alternative "stationary spur gear/movable rack" instead of a stationary rack and a movable spur gear as shown in Figure 2b of D2 is trivial for the skilled person and advantageous, since it does not require a flexible lead to the rotary movement sensor.

Moreover, the alternative to the axial worm movement measurement of D1 as disclosed in claim 1, namely a stationary spur gear driven by a toothed rack, is based on the same principle as realized by particular sliding calipers or by dial gauges.

Use of a post member, which is nothing but a shaft, is an obvious measure for the skilled person since there is little space in the neighbourhood of the worm for the device to sense the rotation of the spur gear.

Claim 1 is not restricted to its use in nuclear power plants or the like. Thus, when trying to overcome the disadvantages of D1, not the expert of nuclear power plants but the mechanical engineer is the skilled person.

Reasons for the Decision

1. The appeal is admissible.
2. None of the cited documents discloses a valve operator with all features of claim 1. Since this has not been disputed by the Appellant, there is no need for further detailed substantiation of this matter. The subject-matter of claim 1 is, therefore, considered to be novel within the meaning of Article 54 EPC.

3. *Inventive step*

3.1 It is undisputed that the nearest prior art with respect to the subject-matter of claim 1 is described in D1.

Said document discloses a valve operator and a valve stem load correlation monitoring device with all features of the preamble of claim 1 of the attacked patent. Moreover, valve stem load is measured by an extension post member 22 movable with the worm as it compresses the spring pack 7, by means 8 and 23 to 30 for detecting a linear movement of said member 22 requiring much space and means 10 and 10a for recording said detected linear movement of the post member 22 and for correlating this movement with the load on the valve stem 5 (see particularly Figures 2 and 5 to 7 of D1 and the corresponding description and claim 1).

3.2 Thus, claim 1 differs therefrom only in that the member 22 being pressed against the spring pack (or core 24 which is also movable with the worm) is replaced by a rack which drives a gear member and a post member protruding from the gear member. In essence, the linear movement transducer 8 of D1 is replaced by a rack and gear assembly, the gear being supported by a shaft, transferring the linear movement into a rotational movement and a corresponding detecting means.

3.3 Apparently, the effects of these differences are that this alternative detecting principle requires less space and allows an enlargement of the longitudinal movement of the worm and the rotation of the shaft bearing the gear member can be used for other purposes such as actuating of switches or a further gearing up.

- 3.4 The problem underlying the subject-matter of claim 1 is therefore to further develop the device of D1 in such a way that the above-mentioned effects are attained.

The problems ("object" or "objective") disclosed in the description of the patent-in-suit (column 3 lines 24 to 38) are either already solved by the device according to D1 (lines 24 to 26 in the middle and lines 32 to 34) and/or are not solved by the device according to claim 1 (the rest of the passage) and thus not suitable for describing the actual problem underlying the subject-matter of claim 1 when starting from the nearest prior art of D1. Claim 1 does not mention a torque or limit switch which are integral parts of said object. Moreover, the remaining text of the introductory part of the description dealing with the prior art (in column 1 line 10 to column 3 line 56), its disadvantages and the characterizing features of the invention is not based on D1 or, respectively, on the text of claim 1 (see e.g. column 3 lines 39 to 56) and, therefore, these passages cannot be taken as a basis for a definition of said problem, too.

- 3.5 Since claim 1 is not restricted to its use in nuclear power plants or the like, firstly the mechanical engineer and not the expert of nuclear power plants is, when trying to overcome the disadvantages of D1, the skilled person. However, even if the expert of nuclear power plants were regarded as person skilled in the art, such a person would be trained in mechanical engineering or would consult a mechanical engineer.

The person skilled in the art of mechanical engineering, faced with the above problem, would take into consideration a rack and gear assembly. This principle is well-known to the skilled person for example from dial gauges where linear movements were determined with high accuracy and where little space is required.

This view is also supported by document D2 which is a standard book for mechanical engineers and where (on page 15 lines 21 to 25) the principle of a transformation of the longitudinal movement into a rotational movement by a toothed rack with a spur gear for a measurement of a linear displacement is mentioned (" ... So läßt sich eine Wegmessung durch Umwandlung der Längs- in eine Drehbewegung ... über eine Zahnstange mit einem Ritzel vornehmen ... "). The examples of Figures 2a to 2c described on page 15 line 26 to page 16 last but one paragraph refer to machine tools with a slide and a transport spindle which is rotating but is not displaced along its axis - unlike the worm of D1 and the attacked patent. In view of these differences of D1 and D2 the skilled person would not prefer the arrangement of the example according to "Bild 2b" where the toothed rack h is stationary and the spur gear g is longitudinally displaceable or one of the remaining examples. On the contrary, he would prefer a movable rack and a stationary gear member, since only then the detecting means could also be stationary and a flexible lead to transmit the sensing signal is unnecessary.

Provision of a shaft or post member protruding from the spur gear to accommodate the bearings is the preferred option to support the gear. Moreover, such a post is advantageous to accommodate a disc or the like - due to the relatively small gear member and the adjacent rack a direct sensing of the rotational movement of the

gear member would be difficult - with a relatively large diameter with respect to those of the gear member to increase the measuring accuracy or a further gear member for further gearing up.

Consequently, the Respondent's view that a combination of D1 and D2 does not lead to a valve operator with all features of claim 1 does not prove right.

- 3.6 Therefore, the subject-matter of claim 1 does not involve an inventive step within the meaning of Article 56 EPC and, irrespective of the judgment of the dependent claims, said ground of Article 100(a) EPC prejudices the maintenance of the patent.

Order

For these reasons it is decided that:

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

The Registrar:

P. Martorana

The Chairman:

E. Turrini