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# D E C I S I O N
## of 13 November 2001

**Case Number:** T 0609/99 - 3.5.2

**Application Number:** 91311577.0

**Publication Number:** 0490685

**IPC:** H03M 1/24

**Language of the proceedings:** EN

**Title of invention:**
A rotary encoder

**Patentee:**
Xerox Corporation

**Opponent:**
Dr Johannes Heidenhain GmbH

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 114(1) and (2), 56

**Keyword:**
-

**Decisions cited:**
G 0009/91, G 0010/91, T 1002/92

**Catchword:**

Despite the proprietor's objection to the admission of evidence which had been disregarded in the opposition procedure pursuant to Article 114(2) EPC, the Board may, in certain circumstances, take account of this evidence without

any implication that it is *prima facie* highly relevant. This exercise of discretion is not inconsistent with the criteria set out in T 1002/92 (see points 2.1 to 2.3).

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 0609/99 - 3.5.2

**D E C I S I O N**
**of the Technical Board of Appeal 3.5.2**
**of 13 November 2001**

**Appellant:** (Opponent)
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**Representative:**
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**Respondent:** (Proprietor of the patent)
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**Representative:**
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**Decision under appeal:**
**Decision of the Opposition Division of the European Patent Office posted 5 May 1999 rejecting the opposition filed against European patent No. 0 490 685 pursuant to Article 102(2) EPC.**

**Composition of the Board:**

**Chairman:** R. G. O'Connell
**Members:** F. Edlinger
P. Muehlens

## Summary of Facts and Submissions

I. This appeal is against the rejection of the opposition to European patent No. 490 685.

II. Claim 1 of the patent as granted is worded as follows:

"A rotary encoder (2) including a stator (6) having at least one conductive pattern (30a, 30b) on one side thereof; a rotor (4) having another conductive pattern (40) on one side thereof which faces said at least one conductive pattern (30a, 30b) of said stator (6); and coupling means (15, 50) for inductively coupling said another conductive pattern (40) on said rotor (4) to said at least one conductive pattern (30a, 30b) on said stator (6) so as to generate an output signal indicative of the angular position of said rotor (4) to said stator (6); characterised in that said coupling means (16, 50) for inductively coupling includes processing means (50) for receiving at least an induced signal from said another conductive pattern (40) on said rotor (4) and generating said output signal, at least said processing means (50) being located on a side (14) of said stator (6) opposite from said at least one conductive pattern (30a, 30b)."

Claims 2 to 15 are dependent on claim 1.

III. The sole ground of opposition was lack of inventive step of the subject-matter of all claims of the patent. In support of this ground, the notice of opposition referred to the following documents:

O1: US-A-3 812 481

O2: EP-A-0 146 312

O3: WO-A-86/03580

O4: US-A-4 728 834.

IV. After expiry of the period for opposition the opponent filed two further documents:

O5: pages 1, 6 and 7 of a brochure produced by the firm Baumer electric, entitled "Inkremental-Drehgeber Absolut-Drehgeber" and dated 3/89, and

O6: DE-A-2 841 501.

V. The decision under appeal held that O5 was sufficiently relevant to be admitted into the opposition proceedings, but not O6. The reasons for rejecting the opposition may be summarized as follows:

O1 disclosed a rotary encoder including inductively coupled stator and rotor windings. None of O1 to O5 suggested the idea of locating the processing means on the reverse side of a stator which had "a function relating to the induction taking place in an inductive encoder". Optical rotary encoders, in particular the encoders disclosed in O2 and O5, had a different stator construction comprising "a normal printed circuit board having electronic components mounted on one side" (point 5 of the reasons).

VI. With a letter dated 1 August 2001, the appellant filed the following further document:

O7: Cover page and drawings of JP-A-2-27506 including an English translation of the cover page, the claim and a "Simple explanation of the drawings".

VII. Oral proceedings were held before the Board on 13 November 2001.

VIII. The appellant opponent argued essentially as follows:

O1 disclosed a rotary encoder including all the features of claim 1 of the opposed patent except the last one, viz processing means located on a side of the stator opposite to the at least one conductive pattern. According to the patent specification (page 2, lines 51 and 52) the underlying problem was to provide an induction type rotary resolver which was compact, having a reduced number of parts and a reduced size. Claim 1 merely specified an encoder where the processing means was located on the stator itself, on the side which was opposite to the side carrying the conductive pattern.

This problem of achieving compactness and reducing the number of parts was not linked to a specific transducer system. The person skilled in the art would therefore seek inspiration in neighbouring technical fields, such as that of optical rotary encoders. This assertion was supported by a statement in O6 (page 5, last paragraph), which was concerned with the same problem (O6, page 2, paragraph 4), saying explicitly that the invention described therein could be successfully applied to transducers operating on different physical principles, such as optical, inductive, capacitive and magnetic principles. In view of the reasoning given in the decision under appeal, O6 was *prima facie* relevant

and should therefore be admitted into the appeal proceedings.

O5 (page 7, right-hand column, second paragraph) addressed the same problem of rendering the encoder more compact by reducing the space requirements through the use of SMD (surface mounted) devices. The optical rotary encoder disclosed in O5 was of a type which used transmitted light. It had a stator disc which was the counterpart of the stator disc of the opposed patent: the side facing a rotor disc carried elements for receiving modulated light pulses which were indicative of the angular position of the rotor; processing means generating square wave pulses at the output of the rotary encoder were mounted on the opposite (reverse) side. In view of the above problem, it was obvious to apply the teaching of O5 to inductive rotary encoders as disclosed in O1 and thus to arrive at the subject-matter of claim 1 of the opposed patent.

Therefore, the respondent's view, which was shared by the opposition division in the decision under appeal, that an optical encoder was completely different in construction could not be maintained. In addition to the functional analogy set out above, it had to be borne in mind that a second stator disc was not necessary in the case of rotary encoders of the type using reflected light. In the latter case both the light source and the light receiving parts were located on the same side of the rotor disc. O7 (Figures 3 and 4) showed an example of an optical encoder using reflected light where electrical components of processing means were located on the side of a stator disc which was situated opposite to the side facing the rotor. For these reasons, O7, which had been found by

chance in the course of a search carried out by the appellant for an unconnected purpose, was highly relevant and should therefore be admitted into the appeal proceedings.

IX. The respondent proprietor argued essentially as follows:

O1 related to a rotary encoder and rotation transducer which employed inductive coupling and thus represented the closest prior art. The problem mentioned in the patent specification (page 2, lines 51 and 52) was to achieve a compact construction and reduced number of parts for the totality of the elements of the rotary encoder that were needed to generate an output signal indicative of the angular position of the rotor, in particular a stator and a rotor having respective conductive patterns and the processing means generating said output signal.

The encoder disclosed in O1 (Figure 2; column 5, lines 34 to 42) had processing means which were connected to the conductive pattern of the stator via an output cable, but O1 did not disclose where exactly the processing means were located. In any case, there was no suggestion in O1 of locating any processing means on the stator itself and on the side opposite to the side having the conductive pattern.

Neither did any of the other documents referred to in the opposition proceedings which showed rotary encoders based on an inductive transducer principle suggest locating processing means on the reverse side of the stator plate. O3 (Figure 1) disclosed a separate printed circuit board (62) spaced apart from a

stator (12). O4 disclosed the use of a flexible printed circuit board which was rolled into a cylindrical configuration and separate from the resolver mounted in the same housing. It should also be noted that O6 referred to a cable (18) which connected a transducer with processing means that were not shown in O6.

The different physical principle of operation of inductive rotary encoders resulted in completely different structural constraints. Optical rotary encoders normally had a rotor disc located between two stator plates carrying electrical components for emitting and receiving light modulated by the rotor disc. O5 showed nothing more than a normal printed circuit board arranged in a rotary encoder which was used for mounting electronic components generating square wave pulses on one side. The person skilled in the art would not derive any suggestion from O5 that processing means which included all the necessary components to generate an output signal indicative of the angular position of the rotor could be arranged at the side of the stator which faced away from the rotor. In the opposed patent (page 4, lines 25 to 35), an ASIC was provided which made it possible to locate the processing means on a surface of a stator disc.

Referring to the principles developed in decision T 1002/92 (OJ EPO 1995, 605), the respondent objected to the introduction of O6 and O7 because neither was *prima facie* highly relevant in the sense that it could reasonably be expected to change the eventual result and thus highly likely to prejudice maintenance of the European patent. Such documents should only very exceptionally be admitted into appeal proceedings. O6, which had been disregarded by the opposition division,

was clearly not relevant and should not be admitted by the Board. O7 was filed much later in the appeal proceedings and was likewise not *prima facie* highly relevant in the above sense because it related to optical rotary encoders for which substantially different constructional considerations applied. O7, Figures 3 and 4, related to yet another different type of optical transducer using reflected light. Furthermore O7 presented only scant information about "circuit parts" which were fixed on a "circuit base plate" (O7, claim). Nor could precise information concerning the significance of these circuit parts be derived from the drawings. Normally such components would be much larger than those shown in Figures 3 and 4 of O7 (cf Figure 1).

X. The appellant opponent requested that the decision under appeal be set aside and that the patent be revoked.

XI. The respondent proprietor requested that the appeal be dismissed.

## Reasons for the Decision

1. The appeal is admissible.

2. *Consideration of documents O6 and O7 (Article 114 EPC)*

2.1 O6 was introduced by the opponent subsequent to the summons to oral proceedings issued by the opposition division; the latter took the view that this document had not been submitted in due time and disregarded it pursuant to Article 114(2) EPC. The finding that O6 was

not submitted in due time was not contested on appeal, but the appellant maintained that it should nevertheless be considered because of its relevance.

2.2 The question as to whether the person skilled in the art would combine aspects of inductive and optical rotary encoders played a key role throughout the opposition and appeal proceedings. O6 cannot, of itself, answer the question whether the person skilled in the art would combine the teachings of O1 and O5 because it does not refer to these documents, but it does show that the authors of O6 considered different applications of the teaching of O6. The relevant part of O6 (page 2, paragraph 4; page 5, last paragraph) thus illustrates an instance of situations where the person skilled in the art might consider looking in technical fields relating to different physical transducer principles. Therefore, taking O6 into account does not enlarge the (legal and) factual framework set out in the notice of opposition. Rather, O6 may help to illustrate the circumstances in which the person skilled in the art might well consider physical transducer principles which are different from those of the opposed patent, and thus promote convergence of the debate. In the circumstances of the present case, where it has to be judged whether it was obvious to seek and find a suggestion for a more compact inductive rotary encoder in the technical field of rotary optical encoders, it appears unreasonable to ignore the details of a documented instance of this. For these reasons, and leaving open the question whether or not O6 was actually "submitted in due time" within the meaning of Article 114(2) EPC, the Board judges it appropriate to take the document O6 into account in the appeal proceedings in application of the

Board's discretion under Article 114 EPC.

2.3 This exercise of discretion is not inconsistent with the criteria set out in T 1002/92 (loc cit, point 3.4) insofar as these criteria were derived from the principles defined in decisions G 9/91 and G 10/91 of the Enlarged Board of Appeal (OJ EPO 1993, 408 and 420), in particular the principle that Rule 55(c) EPC also had the function of establishing the legal and factual framework within which the substantive examination of the opposition is in principle to be conducted, and that the primary purpose of appeal proceedings presupposes that this framework does not change following issue of the first instance decision (see T 1002/92, point 3.1 and point 3.4 referring to points (1) and (2) of the opinion in G 10/91). There the deciding Board had found that the opposition division's decision to disregard such late filed facts and evidence had had regard to the right principles and should be upheld (see T 1002/92, points 4.3 and 4.4). In the circumstances of the present case (cf point 2.2 above) the Board's admission of evidence which had been disregarded in the opposition procedure and which was again relied on in support of the same argument on appeal, has not extended the legal and factual framework. The Board may thus take account of this evidence despite the proprietor's objection to its admission, and without any implication that the evidence is *prima facie* highly relevant in the sense that it is highly likely to prejudice maintenance of the patent.

2.4 O7 was filed much later than O6, viz around four years after the notice of opposition and two years after filing the statement of grounds of appeal; its filing

is therefore not directly responsive to the reasoning of the decision under appeal. Furthermore O7 contains rather scant information about an optical rotary encoder of a different type, viz one using reflected light. A combination of the teachings of O1 and O7 would not only enlarge the factual framework on which the decision under appeal is based, it would also need further investigation as to what exactly is disclosed in O7, so as to avoid taking a decision based on speculative interpretation. In addition, the teaching of O7 is not *prima facie* highly relevant in the sense of T 1002/92, point 3.4 as will be apparent from the considerations below. All these factors tend towards divergence of the debate and do not justify that O7 should "very exceptionally be admitted into the proceedings" in a case where the patentee objects to its introduction (T 1002/92, point 3.4). Accordingly the Board will disregard O7 pursuant to Article 114(2) EPC.

3. *Inventive step*

3.1 The novelty of the subject-matter of claim 1 of the opposed patent has not been contested (Article 54(1) and (2) EPC), the parties agreeing that O1 represents the closest prior art.

3.2 It is also common ground that O1 (cf column 3, lines 34 to 62; Figures 1, 2 and 5) discloses the features of the precharacterising portion of claim 1, in particular a rotary encoder including a stator (10), a rotor (1) and coupling means for inductively coupling the conductive patterns (3, 4; 11 to 14) of the rotor and the stator as specified in claim 1 of the opposed patent. The combination including the rotor and stator

plates (1, 10) as well as the processing means (23 to 32; 301) which are connected to output lines (28) of the stator plate in O1 also include processing means for receiving at least an induced signal from the inductive pattern on the rotor (O1, column 4, line 66 to column 5, line 9; column 7, lines 11 to 15; Figure 2). As regards the conductive rotor and stator patterns, O1 (column 3, lines 34 to 38; column 5, line 67 to column 6, line 3; column 6, lines 50 to 57; column 7, lines 8 to 15) teaches that they may be formed "in accordance with printed circuit technology". It is also said that the "entire actively operating system of the transducer can be manufactured as printed circuits ... matched to specific operating requirements" in order to make the system compact (O1, column 7, lines 22 to 27). However, as the Board understands this teaching, the stator plate and the printed circuits carrying out processing functions would remain separate and nothing more than contact points would be formed on the reverse side of the stator support plate (O1, column 7, lines 11 to 15). There is no suggestion that processing means (which generate an output signal indicative of the angular position of the rotor) should be located on the stator, particularly not on "a side (14) of said stator (6) opposite from said at least one conductive pattern (30a, 30b)" as specified in claim 1 of the opposed patent.

3.3 The problem specified on page 2, lines 51 and 52, of the opposed patent, viz to provide an induction type rotary resolver which is compact, ie having a reduced number of parts and a reduced size, may be considered as the objective technical problem with respect to the prior art disclosed in O1 if the latter is understood

as referring to the combination of stator, rotor and coupling means including the processing means. In the embodiment described in the opposed patent (page 4, lines 25 to 35; Figures 1, 2 and 4), the stator takes the form of a plate (6) having a conductive pattern (30a, 30b) on one side (which faces the rotor plate) and processing means (eg an ASIC) located on its other side for inductively coupling the stator and rotor conductive patterns.

3.4 O5 relates to an optical rotary encoder comprising a plate on which electronic components are mounted. In encoders of this type, this plate has the functions of a normal printed circuit board in that it serves as a carrier for, and electrically interconnects, the components. At least a light receiving element constituting an essential element of the transducer and, usually, further electronic components would be mounted on the printed circuit board. The Board shares the respondent's view that the structural constraints of such a circuit board are quite different from those of a stator carrying a conductive pattern which is inductively coupled with the conductive pattern of the rotor. Since the skilled person, at the priority date of the opposed patent, was familiar with normal printed circuit boards and since O1 explicitly refers to printed circuit technology, he would not derive any suggestion from O5 that he should arrange an inductively coupled stator conductive pattern on one side of a stator and the processing means on its other side. The analogy drawn between the printed circuit board in O5 (or that of an optical transducer of the type using reflected light) and the reverse side of an inductive stator is thus based on an *ex-post facto* analysis which should be avoided in judging inventive

step.

3.5 The Board does not generally reject the argument that the person skilled in the inductive rotary encoder art confronted with the problem of providing a more compact inductive rotary encoder would also look for a solution in the transducer art generally, including transducers using different physical principles. Certain aspects of this problem, such as the arrangement of parts of the casing, bearings, connectors, etc, would be of general applicability. O6 (claim 1; page 2, paragraph 4; page 5, last paragraph) illustrates an example where a particular arrangement of an angular position detector for rotary or pivoting tables having a rotation or pivoting range of less than 360° was found to be more generally applicable. The detector is arranged in a special annular, arcuate housing having a slit and resilient sealing members. The housing substantially encloses and protects the detector from environmental influences.

3.6 However, care has to be taken to avoid the use of hindsight when intrinsically different transducer parts are concerned. The stator and rotor of the type of encoder which constitutes the subject-matter of the opposed patent, comprising inductively coupled conductive patterns were quite different in construction and had no other electronic components, in contrast to the conventional printed circuit boards of an optical rotary encoder. This results in different structural constraints, eg concerning the arrangement of extended conductive patterns on the surface of carrier plates when compared with the mounting of discrete electrical transducer components on printed circuit boards.

3.7 O3 (page 3, lines 18 to 20; page 9, line 33 to page 10, line 22; Figure 1) and O4 (column 1, lines 11 to 30; Figures 1 to 6) do suggest that processing means could be arranged in a common housing including the transducer proper so as to make rotary encoders more compact. However, both O3 and O4 rather teach away from the invention in that they suggest the use of separate printed circuit boards instead of arranging the processing means on a side of the stator.

4. The Board thus concludes that the subject-matter of the claims of the patent as granted involves an inventive step within the meaning of Article 56 EPC and that the ground of opposition pursuant to Article 100(a) EPC does not prejudice the maintenance of the opposed patent in unamended form.

## Order

## For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Hörnell R. G. O'Connell