

Veröffentlichung im Amtsblatt	Ja/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non



Aktenzeichen / Case Number / N^o du recours : T 61/88 - 3.4.1

Anmeldenummer / Filing No / N^o de la demande : 80 105 249.9

Veröffentlichungs-Nr. / Publication No / N^o de la publication : 0 025 213

Bezeichnung der Erfindung: Ultrasonic flaw detector

Title of invention:

Titre de l'invention :

Klassifikation / Classification / Classement : G01N 29/04

ENTSCHEIDUNG / DECISION

vom / of / du 5 June 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /

Titulaire du brevet :

Hitachi Ltd./Hitachi Engineering Co., Ltd.

Einsprechender / Opponent / Opposant :

Siemens AG

Stichwort / Headword / Référence :

EPO / EPC / CBE Article 56 EPC

Schlagwort / Keyword / Mot clé : "Inventive step (no)"

Leitsatz / Headnote / Sommaire



Case Number : T 61/88 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 5 June 1989

Appellant : Siemens Aktiengesellschaft,
(Opponent) Berlin und München
Postfach 22 02 61
D-8000 München 22

Representative :

Respondents : 1. Hitachi Ltd.
(Proprietors of the patent) 5-1, Marunouchi 1-chome
JP - Chiyoda-ku Tokyo 100
2. Hitachi Engineering Co., Ltd.
2-1, Saiwai-cho 3-chome
JP - Hitachi-shi Ibaraki 317

Representative : Beetz, sen., Richard
Patentanwälte Dipl.-Ing. R. Beetz sen. et al.
Steindorfstraße 10
D-8000 München 22

Decision under appeal : Decision of Opposition Division of the European
Patent Office dated 4 December 1987 rejecting
the opposition filed against European patent
No. 0 025 213 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : K. Lederer
Members : J. Roscoe
L. Mancini

Summary of Facts and Submissions

- I. The Respondents are Proprietors of European patent No. 0 025 213, which was granted on the basis of European patent application No. 80 105 249.9.

The patent comprises four claims, of which Claim 1, the only independent claim, reads as follows:

"1. Semi-automatic scanning ultrasonic flaw detector comprising a motor driven carriage (3) travelling on a guide rail (11) mounted on a workpiece, a guide arm (5) pivotably mounted on the carriage (3) to pivot in a plane traverse to the travel direction; a probe holder (7; 7A) slidably mounted on the guide arm (5); and a probe (9) pivotably mounted on the probe holder (7), about a first axis (67) parallel to the travel direction of said carriage means (3), characterized in that the probe (9) is pivotable about a second axis (63) perpendicular to said first axis (67) and the probe holder (7) is manually shiftable on said guide arm (5)."

- II. The Appellant filed a notice of opposition against the European patent and requested revocation of the patent in its entirety on the ground of non-patentability because of lack of inventive step in view of the prior art disclosed inter alia in the documents:

DE-C-2 634 158 (D2); and
US-A-3 934 457 (D4).

- III. The Opposition Division rejected the opposition. In its decision, it stated in particular that the skilled person would not have carried out in the device of document D4

the claimed feature of the probe holder being manually shiftable, firstly, because the device of document D4 was intended to allow quick removal of the maintenance personnel from the danger area of inspection, and secondly, because the probe holder in document D4 was intended to be driven by a drive or stepping motor only.

IV. The Appellant lodged an appeal against the decision.

V. Oral proceedings were held, at the end of which the Appellant (Opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The Respondents (Patentees) requested that the appeal be dismissed and that the patent be maintained unamended (main request).

As an auxiliary request, the Respondents requested that the patent be maintained in amended form, on the basis of Claims 1 to 3 as handed over at the oral proceedings, of which Claim 1, the only independent claim, reads as follows:

"1. Semi-automatic scanning ultrasonic flaw detector comprising a motor driven carriage (3; 132) travelling on a guide rail (11; 131) mounted on a workpiece; a guide arm (5; 136) pivotably mounted on the carriage (3; 132) to pivot in a plane traverse to the travel direction; a probe holder (7A; 134) slidably mounted on the guide arm (5; 136); and a probe (9; 124) pivotably mounted on the probe holder (7A; 134) about a first axis (67; 139) parallel to the travel direction of said carriage (3; 132),
c h a r a c t e r i z e d in that
the probe(9; 124) is pivotable about a second axis (63; 159) perpendicular to said first axis (67; 139) and that the probe holder (7A; 134) is manually shiftable on said

guide arm (5; 136) and provided with an intermittent shifter (94) for axially shifting the probe holder (7A; 134) on the guide arm (5; 136) pitch by pitch by manual operation and with a mechanism (103-112) for releasing the probe holder (7A; 134) from the intermittent shifter (94) thereby permitting the probe holder to be freely movable on the guide arm (5; 136)."

VI. The Appellant's arguments in support of his request can be summarised as follows:

The subject-matter of Claim 1 in accordance with the Respondents' main request is distinguished from the scanning ultrasonic flaw detector known from document D4 by the use of a cardan joint for mounting the probe on the probe holder, and in that the probe holder is manually shiftable on its guide arm, instead of being actuated through a remote-controlled driving motor. However, cardan mountings have already been used in the art of ultrasonic flaw detection for allowing tight contact between an ultrasonic probe and a curved surface under inspection, as evidenced for instance by document D2. On the other hand, replacing the remote-controlled actuation of the probe holder in document D4 by manual operation represents no more than a technical backstep made at the expense of the physical integrity of the operators, without solving any discernable specific technical problem.

The only additional limitation in Claim 1 in accordance with the Respondents' auxiliary request is that the probe holder also comprises a releasable device permitting pitch-by-pitch shifting of the probe holder on the guide arm. However, pitch-by-pitch displacement of the probe holder is already achieved in the flaw detector of document D4. Providing some capability for overriding such pitch-by-pitch shifting mechanism when it is not desired,

in particular to allow quick adjustment of the probe holder into a proper position, does not go beyond the normal competence of the skilled person.

In addition, by filing on 10 July 1986 an amended main claim of restricted scope, against which the Appellant explicitly declared that he had no further objections, the Respondents actually waived their right to claim a broader scope of protection. For that reason already, they should not be allowed to revert to the wording of Claim 1 as granted.

VII. In support of an inventive step being involved in the claimed subject-matter, the Respondents submitted essentially the following arguments:

The flaw detector of the present patent is especially well adapted to the performance of ultrasonic flaw detection on bent piping portions, which requires not only that the probe be maintained in proper contact against a scanned surface of complex curvature, but also that the distance between the probe and the guide rail, which is mounted on an adjacent straight portion of the piping, be continuously varied in order to scan piping sections which include the centre of curvature of the bent portion. These specific requirements are readily met by the claimed use of a cardan mounting of the probe on the probe holder together with the capability of manually shifting the probe holder on the guide arm, which allows the operator to easily follow any desired scanning pattern while simultaneously pressing the probe against the inspected surface.

Whilst the use of a cardan mounting admittedly does not contribute to inventive step, the prior art does not hint at manually operating the probe holder.

On the contrary, the ultrasonic flaw detectors of documents D2 or D4 include electrical drive means for shifting the probe holder, so that inspection of bent piping portions, for which these detectors are not intended, would call for complex means to control the electrical drive motors. In addition, these known devices require some additional means such as pneumatic actuators or magnets to urge the probe against the inspected surface.

The drawbacks of an increased exposure of the operator to environmental hazards and of laborious handling of the probe, which a priori would have diverted the skilled person from envisaging manual shifting of the probe holder, are alleviated by a reduction of the time needed for installing the device on a pipe, due to the reduced overall dimensions of the device, and by the fact that the carriage which travels on its circumferential guide rail and bears the guide arm for the probe holder remains motor driven as in the prior art constructions.

As regards the subject-matter of Claim 1 in accordance with the Respondents' auxiliary request, the use of an intermittent shifter improves the reproducibility and accuracy of the measurements when inspecting straight piping portions. The prior art does not disclose or suggest any mechanism for releasing such pitch-by-pitch advancing device for the specific purpose of inspecting bent pipe portions, for which such advancing mechanism is not suitable.

Reasons for the Decision

1. The appeal is admissible.

2. **Main request**

2.1 **Novelty**

2.1.(a) Document D4 discloses an ultrasonic flaw detector as set out in the first portion of Claim 1 comprising a motor driven carriage (30) travelling on a guide rail (24) mounted on a workpiece, a guide arm (32) pivotably mounted on the carriage (30) to pivot in a plane traverse to the travel direction; a probe holder (54') slidably mounted on the guide arm (32); and a probe (38') pivotably mounted on the probe holder (54') about a first axis (73, 74) parallel to the travel direction of said carriage, (Figures 2 and 3, description column 2, line 58 to column 3, line 9, column 3, lines 44 to 61 and column 4, lines 46 to 54).

In this known device, the probe (38') is mounted on the probe holder (54') in such a way as to be slidable towards and away from the latter (column 4, lines 55 to 65), and the sliding movement of the probe holder (54') on the guide arm (32) is controlled through a reversible motor (52') and a drive screw (51') (column 3, lines 47 to 50).

Thus, the subject-matter of Claim 1 is distinguished from the ultrasonic flaw detector disclosed in document D4 in that the probe is pivotable about a second axis perpendicular to said first axis and the probe holder is manually shiftable on its guide arm, as set out in the characterising portion of the claim. The fact that the claimed detector is for "semi-automatic scanning" as

indicated in the designation of the subject-matter of the claim is a direct consequence of the feature of the probe holder being "manually shiftable" on the guide arm, and it cannot therefore be construed as an additional distinguishing feature of the claimed device.

- 2.1.(b) Document D2 discloses an ultrasonic flaw detector comprising a motor driven carriage (21,23) travelling on a guide rail (6) mounted on a workpiece, a guide arm (20,24) mounted on the carriage; a probe holder (15) slidably mounted on the guide arm; and a probe (16) pivotably mounted on the probe holder about a first axis (16.1) parallel to the travel direction of said carriage means and about a second axis (16.2) perpendicular to said first axis (16.1) (Figures 1 and 2 and column 3, line 23 to column 4, line 31).

In this known device, the guide arm (20,24) for the probe holder (15) is rigidly mounted on the carriage (21,23) and the slidable probe holder (15) is actuated through an electrical motor (21) and a drive screw (20).

Accordingly, the subject-matter of Claim 1 is distinguished from the ultrasonic flaw detector disclosed in document D2 in that the guide arm is pivotably mounted on the carriage to pivot in a plane traverse to the travel direction, and in that the probe holder is manually shiftable on said guide arm.

- 2.1.(c) The remaining documents on the file do not come closer to the subject-matter of Claim 1.
- 2.1.(d) For the above reasons, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

2.2 Inventive step

2.2.(a) The device set out in Claim 1 is distinguished from the ultrasonic flaw detector disclosed in document D4, which in the Board's view constitutes the nearest prior art, in that:

(a) the probe is pivotable about a second axis perpendicular to "said first axis", which in accordance with the first portion of the claim is parallel to the travel direction of the carriage means; and

(b) the probe holder is manually shiftable on the guide arm.

Feature (a) is known in the art to improve the ability of a probe to be closely contacted with a curved scanned surface as evidenced for instance by document D2 (Figure 2; column 4, lines 15 to 31) and it therefore contributes nothing inventive to the claimed subject-matter, which was admitted by the Respondents during the oral proceedings. Feature (a) therefore need not be considered further.

The ability of the probe holder to be shifted manually on the guide arm in accordance with feature (b) essentially allows suppression of the motor drive which in the flaw detector of document D4 enables translation of the probe holder (38') on its guide arm (32), and of its associated control means. In addition, manual operation of the probe, opens up the possibility of constructions whereby sufficient pressure can be applied manually on the probe by the operator himself to ensure good contact of the probe with the surface to be scanned thus allowing the magnetic wheel (61) and coil springs

(79) of the known device, which assure such contacting without manual intervention to be dispensed with.

Accordingly, the technical problem which is solved by feature (b) as objectively assessed in view of the nearest prior art is mainly to propose an ultrasonic flaw detector of simplified construction.

- 2.2.(b) Striving to reduce the complexity and cost of existing devices however is a common endeavour of any skilled person. Accordingly, no contribution to inventive step is to be seen in the mere recognition of the above defined technical problem.
- 2.2.(c) The Board cannot see any inventive step either in the claimed replacement of the remote-controlled shifting of the probe holder in the device of document D4 by direct manual operation.

Indeed, the ultrasonic flaw detector of document D4 is specifically designed to be remotely operated, in order to minimise exposure of its operators to radioactive fields (column 1, lines 25 to 39), as was correctly stressed in the Opposition Division's decision. Also, inspection of the remaining prior art documents on the file beyond doubt shows beyond doubt that there was at the date of the invention a general trend towards automatic ultrasonic flaw detection.

However, the skilled person in the face of an optimal but sophisticated solution to a given technical problem, which in the case of document D4 is to avoid exposure of operatives to radioactive radiation during ultrasonic scanning, cannot be denied the capacity to recognise that less complicated alternatives generally achieve less perfect results, and consequently, to envisage such

alternatives at least in situations in which the advantages of decreased complexity can reasonably be expected to outweigh the resulting loss of performance.

Accordingly, in circumstances in which protection of the operators from radioactive radiation is not of paramount importance, as is the case for instance when inspecting pipes in less radioactive areas of nuclear power plants or in nuclear power plants which are not yet in service, the skilled person would recognise that the capacity of the device of document D4 to be remotely controlled could be renounced and that such renunciation could entail substantial simplification of both the structure and the control means of the known device. To arrive at the mere idea of replacing remote by manual movement of at least some parts of the known device in order to achieve such simplification is well within the compass of the skilled person, especially since manual movement of ultrasonic probes or carriers bearing them is already known from US A 4 043 185, in the testing of steel plates (column 1, lines 36-52) and from the article starting at page 641 of Proc. TEEE, Vol. 67, No. 4 of April 1979 in medical diagnosis. So is the specific choice of the probe holder (54') in D4 for implementing such simplification because its scanning movement in close contact with a curved surface is obviously more

difficult to automatise than the travelling movement of the carriage (30) on its guide rail, for which the gain to be expected from manual operation would consequently be less.

Practical implementation of the above idea would not present the skilled person with any serious problems either. The mere removal of drive screw (51), or its replacement by a further guide rod, removal of the

redundant motor, and the provision of a suitable handle on the holder would indeed suffice.

2.2.(e) The Board cannot see that any unexpected effect results from the mere replacement of remote-controlled movement of the probe holder by manual shifting, beyond the advantages which directly follow from the intended simplification, such as the ability of the claimed device to allow inspection of bent piping portions without requiring complicated control means, and any possible reduction in overall dimensions which might permit quicker mounting in comparison with the device of document D4 as asserted by the Respondents. In the absence of unexpected effects, however, acceptance of a disadvantage resulting from the omission of features which in the art had been considered advantageous, such as the capacity of the known devices to be remotely operated, for example, that the testing procedure becomes more time consuming and tiring for the operator, as mentioned in US-A-4 043 185, cannot alone justify patentability of the claimed subject-matter.

2.2.(f) For these reasons, the subject-matter of Claim 1 in accordance with the Respondents' main request is not considered to involve an inventive step within the meaning of Article 56 EPC. Accordingly, the grounds for opposition mentioned in Article 100(a) EPC prejudice the maintenance of the European patent as granted. The Respondents' main request therefore cannot be allowed.

3. **Auxiliary request**

3.1 Claim 1 in accordance with Respondents' auxiliary request is distinguished from Claim 1 in accordance with the main request by the additional features that:

- (c) the probe holder is provided with an intermittent shifter for axially shifting the probe holder on the guide arm pitch-by-pitch by manual operation; and
- (d) the probe holder is provided with a mechanism for releasing the probe holder from the intermittent shifter thereby permitting the probe holder to be freely moveable on the guide arm.

3.2 Document D4 already teaches pitch-by-pitch shifting of the probes on their respective arms in order to scan the welds under examination (column 6, lines 16 to 28), the stepping movement of the probes being obtained by properly controlling electrical drive motors.

Providing some "intermittent shifter" for manually performing this known function, as is defined in feature (c) does not involve any inventive step once, for the obvious reasons set out above in paragraph 2.2, the skilled person has decided to replace automatic driving of the probe holder by manual shifting. On the contrary, the need for obtaining correct and reproducible positioning of the probe as manually operated obviously calls for some indexing aid for guiding the operator's movements.

In addition, the drawback of time consuming manual pitch-by-pitch advancing of the probe is readily apparent to the critical operator, in particular when such advancing is intended only to drive the probe towards the area to be inspected, before actual scanning. The Board therefore cannot see any inventive step either in providing some "mechanism" for selectively overriding the intermittent shifter, which is all that is called for by feature (d).

In this respect, Respondents' submission that the release mechanism is specially designed for use during inspection

of bent piping portions cannot contribute to a positive assessment of inventive step because Claim 1 does not include any limitation whatsoever to such use.

- 3.3 For these reasons, the subject-matter of Claim 1 in accordance with the Respondents' auxiliary request does not involve an inventive step within the meaning of Article 56 EPC.
- 3.4 Accordingly, the patent as amended in accordance with the Respondents' auxiliary request and the invention to which it relates do not meet the requirements of the EPC, and this request therefore cannot be allowed either.
4. Since neither of the Respondents' requests is held to be allowable, the question of whether the filing of an amended narrower Claim 1 under the circumstances referred to in the final paragraph of item IV, constituted a waiver of rights, to which the Board gave a provisional answer in its communication of 7 March 1989, need not be considered further.

Order

For these reasons, it is decided that:

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

The Registrar:

The Chairman:

J. Ruckerl

K. Lederer