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**D E C I S I O N**  
**of 20 July 1999**

**Case Number:** T 1150/98 - 3.4.2  
**Application Number:** 92307680.6  
**Publication Number:** 0534607  
**IPC:** A61F 7/00, A61B 17/36

**Language of the proceedings:** EN

**Title of invention:**

Magnetic resonance surgery using heat waves produced with a laser fiber or focussed ultrasound

**Applicant:**

General Electric Company

**Opponent:**

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**Headword:**

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**Relevant legal provisions:**

EPC Art. 56, 123(2)

**Keyword:**

"Inventive step - main request (no)"  
"Admissible amendment - auxiliary request (no)"

**Decisions cited:**

-

**Catchword:**





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Boards of Appeal

Chambres de recours

**Case Number:** T 1150/98 - 3.4.2

**D E C I S I O N**  
**of the Technical Board of Appeal 3.4.2**  
**of 20 July 1999**

**Appellant:** General Electric Company  
1 River Road  
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**Representative:** Goode, Ian Roy  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 15 July 1998  
refusing European patent application  
No. 92 307 680.6 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** E. Turrini  
**Members:** M. A. Rayner  
B. J. Schachenmann

## Summary of Facts and Submissions

I. The present appeal is against the decision of the examining division to refuse European patent application 92 307 680.6 (publication number EP-A-0 534 607) for lack of novelty or inventive step, respectively, of the subject matter of the independent claim of the main and auxiliary requests before it. Amongst others, the following documents were mentioned in the decision:-

D4 WO89/07907

D5 "MR imaging of laser-tissue interactions", Jolesz et al., Radiology 168:249, July 1988.

II. In its notice of appeal, the appellant (=patent applicant) requested that the decision be set aside and, in the event the board intended to confirm the decision of the examining division, oral proceedings. The appellant filed a set of claims as main request, indicating that it was closely based on the auxiliary request before the examining division.

III. The appeal board issued a summons to oral proceedings indicating its preliminary opinion that the submissions of the appellant in support of inventive step appeared doubtful and implementation of features disclosed in document D5 appeared no more than routine and therefore not to involve an inventive step. The board also indicated that any further observations should be filed at least one month before the oral proceedings and furthermore it was intended that a decision be taken at the end of the oral proceedings.

IV. The wording of the independent claim according to the main request is as follows:-

A magnetic resonance (MR) surgery system comprising a heat source means, positioning means for said heat source means, imaging means and display means, characterized in that:

- (a) the heat source means (80) provides pulsed energy at a desired location, the heat source means including means for enabling an operator to adjust the pulse rate at an application point at the desired location to vary the penetration depth of the pulsed energy so as to create a heated region of a desired size at the application point having a temperature distribution around the application point;
- (b) the positioning means comprises a mechanical guide, controllable through a control unit by an operator by means of a three-dimensional pointing device, to position the pulsed heat means at the application point such that the selected tissue has the desired temperature distribution;
- (c) the imaging means is an MR imaging means (10,20,30) for creating fast scan MR images of the temperature distribution around the application point during the surgical procedure, including an image of the tissue to be destroyed; and
- (d) said display means (110) is coupled to the MR imaging means and adapted to display the temperature distribution images to an operator

while said pulsed heat is applied to the patient to allow control of the temperature distribution whereby a tumour can be selectively destroyed without damaging the surrounding tissue.

V. The arguments of the appellant can be summarised as follows:-

Document D5 is a speculative academic paper based on the precept that there is a potential for integration of MR imaging and lasers for three dimensional control and monitoring. In the experiments temperature measurements were performed with a small crystal thermometry instrument and it is noted that conventional spin warp MR is too slow to monitor dynamic effects of laser irradiation in real time. Moreover document D5 has no disclosure of adjusting the pulse rate to vary the size of the heated region. Page 252, column 1, paragraph 3 mentions pulse rate only in conjunction with power density and pulse duration. Nor does document D5 disclose positioning means, a mechanical guide, control unit or a three dimensional pointing device. Column 3, paragraph 3 states that manipulation of the laser is not a trivial challenge. Furthermore column 1 of page 253 explains that MR imaging cannot serve as a thermometer for tissue undergoing dynamic thermal processes. Thus document D5 only hints at possibilities of the some features of claim 1 and others are completely missing. Document D5 must thus be read with hindsight to make it fit the features claimed in claim 1.

VI. On the second working day before the date appointed for oral proceedings, the appellant notified the board by

facsimile of its intention not to attend the oral proceedings. The appellant made an auxiliary request that an amendment by way of insertion be made to claim 1 of the main request. The wording of claim 1 according to the **auxiliary request** differs from that of the main request above by insertion of "in inverse relation to pulse frequency" between "energy" and "so" in the fifth line of feature (a) thereof. In support of the auxiliary request, the appellant argued that document D5 does not teach how adjusting pulse rate would vary penetration depth and feature (a) of claim 1, including this insertion, is sufficient on its own to provide an inventive step.

VII. In the notification of non attendance at the oral proceedings, the appellant requested a decision be made on the basis of the written submissions. The oral proceedings took place in the absence of the appellant in accordance with Rule 71(2) EPC and at the end of the oral proceedings, the appeal board gave its decision.

## **Reasons for the Decision**

### 1. *Admissibility*

The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

### 2. *Main request*

2.1 The investigations of laser tissue interactions reported in document D5 concern a magnetic resonance

imaging system (first line of last paragraph of middle column of page 249) utilising equipment comprising a laser pulse heat source (see third line of first complete paragraph of right column on page 249) positioned by insertion of a quartz waveguide (see paragraph bridging middle and right columns on page 249) which creates a heated region around the application point imaged by MR (see Figure 5 for example).

- 2.2 The investigations performed according to document D5 led to results which formed a basis upon which the authors mapped out implementation of the surgical application of the MR imaging system. Fibre optic placement through needles with stereotactic instruments is disclosed in the middle of the right hand column on page 251 of document D5. Furthermore, the thermal effects depend on repetition rate of the heat source which controls energy deposition according to the third sentence of the last paragraph of the left column on page 252. This paragraph then explains that reversible lesions can be localized with MR and subsequently irreversible and reversible thermal effects depicted by MR, which according to the subsequent paragraph may provide control for laser surgery. Moreover energy deposition should be tailored to the energy absorption and heat dissipation characteristics of the tumour and surrounding tissue according the end of the paragraph bridging the middle and right columns on page 252. According to the only complete paragraph in the right hand column on page 252, while conventional spin-warp MR imaging techniques are too slow to monitor laser-tissue interactions in real time, high speed imaging could keep pace with the time scale of laser induced

thermal changes, albeit with some trade off in spatial resolution. Obviously, such real time monitoring must take place on a display coupled to the MR imaging means.

2.3 Since the discussion relating to targeting and surgery using MR according to document D5 is based on the experiments performed, the suggestions to a skilled person contained are not "speculation" in the sense of random guesswork about what might be possible, but positive guidance towards what has to be done. Accordingly, the board concludes that the skilled person reading the disclosure of document D5 is led without any inventive step along a "one-way street" towards a teaching of a system using real time MR for targeting a tumour and then monitoring repetition rate dependent thermal interactions with tissue of an accurately positioned laser during its destruction. Implementation of such a teaching requires no more than normal practical knowledge from a skilled person reading an academic paper and therefore does not involve an inventive step.

2.4 A comparison of the subject matter of claim 1 with the teaching of document D5, without ascribing meaning to the disclosure of document D5 deriving from the present application (i.e. without hindsight), reveals that a three dimensional pointing device controllable through a control unit is not known from the disclosure of document D5. Submissions relating to other features submitted by the appellants as being novel are not correct. Thus the fact that document D5 explicitly states that thermal effects depend on repetition rate of the laser indicates that pulse rate adjustment

varies the size of the heated region. Moreover, a needle is a mechanical guide. Finally, the issue of using MR as a thermometer amounts to no more than a red herring, because this is not claimed in claim 1 and a temperature distribution, which is claimed, is the result of the laws of physics following application of heat, which is just what occurs according to document D5.

- 2.5 The problem solved by use of the three dimensional pointing device controllable through a control unit is precise control of the position of the heat source in neurosurgery. Just such a three dimensional pointing device is represented in Figure 2 of D4, which concerns ultrasound neurosurgery, by the precision joystick apparatus 48. The member 49 is linearly translatable and pivotable in two perpendicular planes thus providing the three dimensions. No inventive step can therefore be considered involved in the application of the solution according to this teaching of D4 to the problem of D5. Accordingly, the subject matter of claim 1 according to the main request does not involve an inventive step within the meaning of Article 56 EPC.

*Auxiliary request*

The insert made according to the auxiliary request specifies an inverse relation of the penetration depth to pulse frequency. This explicit wording does not occur in the documents as filed. The appellants have pointed to Table 1 and Figure 1 of the application as filed as support for this wording. However, since an inverse relation entails the product of penetration depth and frequency being constant, the values given in

Table 1 cannot support this term because the value of the product for each line of the table has a different value. Figure 1 shows no more than the values of Table 1 plotted on a logarithmic scale and accordingly offers no more support. In fact Table 1 and Figure 1 cannot support the wording "inverse relation" because, following the textbook equation denoted as the second equation [4] in the description, they show values of penetration depth corresponding to a square root of an expression including a reciprocal of frequency. Therefore, any inverse power relation other than a square root relation produces very different values, not falling within the framework of the disclosure of the documents as filed. Accordingly, the wording of the insert according to the auxiliary request referring to "inverse relation", does not satisfy Article 123(2) EPC. Moreover, in view of its inadmissibility, the insertion in accordance with the claim of the subsidiary request cannot affect the conclusion of the appeal board relating to lack of inventive step of the remaining subject matter of the claim.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

M. Beer

E. Turrini