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Datasheet for the decision of 26 November 2014

Case Number: T 2095/09 - 3.4.01

Application Number: 01947955.9

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Title of invention:
MAGNETIC RESONANCE IMAGING APPARATUS

Applicant:
HITACHI MEDICAL CORPORATION

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
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Case Number: T 2095/09 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 26 November 2014

Appellant: (Applicant)	HITACHI MEDICAL CORPORATION 1-14, Uchikanda-1-chome, Chiyoda-ku Tokyo 101-0047 (JP)
Representative:	Strehl Schübel-Hopf & Partner Maximilianstrasse 54 80538 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 25 May 2009 refusing European patent application No. 01947955.9 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Assi
Members:	P. Fontenay
	C. Schmidt

Summary of Facts and Submissions

I. The appeal, filed on 4 August 2009, lies from the decision of the examining division, dispatched on 25 May 2009, to refuse European patent application No. 01 947 955.9. The appeal fee was paid on the same day. The statement setting out the grounds of appeal was filed on 5 October 2009.

II. The examining division refused the application because the main request, first and second auxiliary requests underlying the impugned decision did not comply with the provisions of Article 84 EPC 1973 (lack of conciseness, lack of clarity and lack of support), Article 82 EPC 1973 (lack of unity), Article 54(1),(2) EPC 1973 (lack of novelty), Article 56 EPC 1973 (lack of an inventive step) and Article 123(2) EPC (added subject-matter).

The examining divison cited the following prior art documents *inter alia*:

D3: JP-A-2000-126153;
D5: JP-A-11-155831;
D6: JP-A-11-28199;
D8: JP-A-11-104109;
D10: EP-A-0 883 143;
D11: WO-A-99/21476.

With regard to the main request, the examining division held that the subject-matter of independent claim 7 was not new with respect to Figure 7 of D3 (cf. point 1.4.1 of the Reasons).

Moreover, the examining division considered that the subject-matter of claim 1 did not involve an inventive

step having regard to Figures 7-9 of D3 or Figure 5 of D5 or Figure 11 of D11. In this respect, the examining division held that the sole difference between the claimed subject-matter and this prior art consisted in that permanent magnets with pole pieces were used as source of the static magnetic field instead of superconductive coils. However, such a difference was banal for a skilled person (cf. point 1.4.2 of the Reasons).

With regard to the first auxiliary request, the examining division held that the subject-matter of independent claim 5 did not involve an inventive step having regard to Figures 7-9 of D3 or Figure 5 of D5 or Figure 11 of document D11 in combination with Figure 1 of D8 or Figures 33-36 of D10. In this respect, the examining division held that the sole difference between the claimed subject-matter and the prior art as disclosed in documents D3, D5 or D11 consisted in that the second ferromagnetic member had an oval or rectangular cross-sectional shape rather than a circular one. However, such a difference was a minor obvious modification that did not give rise to any unexpected technical effect (cf. point 2.3.1 of the Reasons).

With regard to the second auxiliary request, the examining division held that the subject-matter of independent claim 1 did not involve an inventive step having regard to Figures 7-9 of D3 or Figure 5 of D5. In this respect, the examining division held that the magnet devices according to this prior art allowed a bed to be introduced therein at angles falling within the claimed ranges. The sole difference between the claimed subject-matter and this prior art thus consisted in the banal exchange of a superconducting

field source by a permanent magnet (cf. point 3.2 of the Reasons).

III. With the statement setting out the grounds of appeal, the appellant (applicant) requested that the decision under appeal be set aside and a patent be granted on the basis of sets of claims according to a main request or a first auxiliary request or a second auxiliary request. These new requests, annexed to the statement of grounds, were based on the requests underlying the impugned decision.

IV. In accordance with an appellant's request, summons to attend oral proceedings were issued on 27 August 2014.

V. In a communication of the Board pursuant to Article 15(1) RPBA issued on the same day, the appellant was informed of the provisional opinion of the Board with regard to the new filed requests.

The attention of the appellant was drawn to some ambiguities (Article 84 EPC 1973) in the wording of the claims with regard to the definition of features of a geometrical nature. Moreover, it was stressed that expressions like "*one column*" and "*one second ferromagnetic member*" did not necessarily imply in the context of the claims a limitation to "*a single column*" or "*a single second ferromagnetic member*".

The Board also held that the finding of lack of novelty relied upon by the examining division against claim 7 of the former main request, which was based on the disclosure of D3 (cf. Figure 7), would apply to claim 7 of the new main request. The same finding would apply with regard to D5 (cf. Figure 5).

Concerning the issue of inventive step, the Board considered the disclosure of D11 to be particularly relevant.

In this respect, explicit reference was made to document D11a: US-B-6 600 318, which is a family member of D11.

Although D11a has been published after the filing date of the present application and thus does not form part of the prior art according to Article 54(2) EPC 1973, reference was made to this document since its content, drafted in the English language, was considered to help to better understand the disclosure of D11.

In the Board's opinion, the characterising features of independent claim 7 of the main request did not involve an inventive step having regard to the imaging apparatus disclosed in D11 in combination with D3 or D5 or D10.

A similar conclusion of lack of an inventive step starting from D11 would also apply with regard to the first and second auxiliary requests.

VI. By letter of reply dated 24 October 2014, the appellant filed a new main request and four new auxiliary requests, taking due account of the comments made by the Board with regard to the ambiguities in the claims wording. The appellant disagreed with the arguments of the Board in relation to novelty and inventive step.

By letter dated 20 November 2014, following a phone conversation on 17 November 2014 between the representative of the appellant and the rapporteur of

the Board, the appellant filed amended pages of the description in order to complete the requests on file.

VII. Oral proceedings before the Board took place on 26 November 2014. As previously announced in the letter of 24 October 2014, they were conducted in the absence of the appellant.

VIII. The final requests made by the appellant in writing are that the decision under appeal be set aside and a patent be granted on the basis of sets of claims according to the main request or one of first to fourth auxiliary requests, all the requests filed with the letter of 24 October 2014.

IX. Claim 1 of the main request reads:

"*1. A magnetic resonance imaging apparatus comprising:*

permanent magnets (52a, 52b) disposed vertically opposed to each other with a space (50) sufficient to accommodate an object (1) under examination between them, for generating a static magnetic field in the vertical direction between them;

pole pieces (53a, 53b) disposed on the sides of the permanent magnets facing the space, for improving uniformity of the static magnetic field;

yokes (51a, 51b) made of ferromagnetic material and disposed on the sides of the permanent magnets facing away from the space to be opposed to each other with the space between them; and

a single column (57) made of ferromagnetic material, for magnetically connecting the yokes;

wherein the permanent magnets and the pole pieces are formed to be circular in horizontal cross section, and

wherein each of the yokes comprises a main body portion (511a, 511b) with a respective one of the permanent magnets mounted thereto and a protrusion (512a, 512b) joined to a respective end of the column, and wherein the main body portions are formed so as to be aligned with the circular horizontal cross sections of the permanent magnets and pole pieces along a circular arc,

characterized *in that the width of the column and the protrusions of the yokes in a first horizontal direction perpendicular to the plane including the vertical center axis (O') of the column and the common vertical center axis (O) of the permanent magnets is smaller than the diameter of the circular arc shape of the main body portions of the yokes, and*

wherein the width of the yokes in the first horizontal direction gradually decreases from the main body portions to the protrusions in a second horizontal direction perpendicular to the first one."

Claims 2 to 6 are dependent claims. Independent claim 7 relates to a magnetic resonance imaging apparatus which differs from the apparatus of claim 1 in that the means for generating a static magnetic field are constituted of superconductive coils. Claims 8 to 13 depend on independent claim 7.

X. Claim 1 according to the first auxiliary request differs from claim 1 of the main request in that the features of the characterising portion have been further specified as follows:

" ***characterized*** *in that the width of the column and the protrusions of the yokes in a first horizontal direction perpendicular to the plane including the vertical center axis (O') of the column and the common vertical center axis (O) of the permanent magnets is*

smaller than the diameter of the circular arc shape of the main body portions of the yokes, and

wherein the width of the yokes in the first horizontal direction gradually and monotonously decreases from the main body portions to the protrusions in a second horizontal direction perpendicular to the first one in such a way that the sides of the yokes assume a smoothly recessed shape" (underline added by the Board with regard to the amendments as compared to claim 1 of the main request).

Similar amendments were carried out in independent claim 7 of the first auxiliary request as compared to claim 7 of the main request. Claims 2 to 6 and 8 to 13 depend on claims 1 and 7, respectively.

XI. Claim 1 according to the second auxiliary request differs from claim 1 of the main request, essentially, in that the characterising portion reads:

" ***characterized*** *in that the column (57) is formed either to be a rectangle or an ellipse in horizontal cross section, wherein the longer sides of the rectangle are parallel to the plane including the vertical center axis (O') of the column and the common vertical center axis (O) of the permanent magnets (52a, 52b) or, respectively, the longer axis of the ellipse coincides with the plane."*

Independent claim 5 according to the second auxiliary request has been amended in a similar manner with regard to claim 7 of the main request.
Claims 2 to 4 and 6 to 9 of the second auxiliary request depend, respectively, on claims 1 and 5.

XII. Claim 1 according to the third auxiliary request differs from claim 1 of the main request, essentially, in that the characterising portion reads: "***characterized*** *in that the magnetic resonance imaging apparatus is arranged such that a bed can be disposed in it and the angle formed by the line connecting the centers of the space and the column and the line connecting the centers of the space and the bed in horizontal cross section ranges from 45° to 135° and from 315° to 225°, respectively.*"

Claims 2 and 3 according to the third auxiliary request are dependent claims.

XIII. Claim 1 of the fourth auxiliary request differs from claim 1 of the third auxiliary request in that the characterising portion of the claim reads: "***characterized*** *in that the magnetic resonance imaging apparatus is arranged such that a bed can be disposed in it and the angle formed by the line connecting the centers of the space and the column and the line connecting the centers of the space and the bed in horizontal cross section is 135°or 225°*" (underline added by the Board with regard to the amendment as compared to claim 1 of the third auxiliary request).

Claims 2 and 3 according to the fourth auxiliary request are dependent claims.

Reasons for the Decision

1. Applicable law

It is noted that the revised version of the Convention (EPC 2000) does not apply to European patent applications pending at the time of its entry into

force (13 December 2007), unless otherwise provided. In the present decision, where Articles or Rules of the former version of the EPC apply, their citation is followed by the indication "*1973*".

2. Admissibility of the appeal

The appeal meets the requirements of Articles 106 to 108 EPC and Rule 99 EPC. It is thus admissible.

3. *Prior art documents*

For the following assessment of novelty and inventive step reference is made to the prior art documents as already mentioned above.

4. Main request

4.1 Document D11a is a family member of D11. Its content, drafted in the English language, helps to better understand the content of D11, drafted in the Japanese language, and thus to provide evidence of the actual disclosure of D11.

The appellant did not challenge this approach mentioned in the Board's communication of 27 August 2014.

4.2 Figures 1 and 2 of D11 (cf. D11a, Figures 1 and 2 and the corresponding description) disclose an open type magnetic resonance imaging apparatus comprising *inter alia* superconductive coils 21-31, upper and lower cooling vessels 17 and 18 contained in respective vacuum vessels 14 and 15 coupled by coupling tubes 19 and 20, ferromagnetic bodies (yokes) 6 and 7, 8 and 9, as well as support columns 10 and 11.

Contrary to the appellant's statement (cf. section 4 of the statement of grounds of appeal), a construction with a single column is explicitly disclosed in document D11 (cf. page 7, lines 4-7 corresponding to D11a, column 4, lines 50-55).

It is noted, in this respect, that the fact that the apparatus of D11 comprises coupling tubes is not excluded by the wording of the claims as confirmed by the fact that the embodiment according to Figures 4A and 4B of the published application incorporates a connecting tube. Moreover, the presence of such tubes is directly associated to the presence of cryostats which implies that the tube(s) would be superfluous in a structure with permanent magnets.

4.3 The subject-matter of claim 1 of the main request thus differs from the MRI apparatus disclosed in D11 in that

a) the means for generating a static magnetic field are constituted of permanent magnets associated with pole pieces, and

b) each of the yokes comprises a main body portion and a protrusion, the protrusion being joined to a respective end of the support column with a geometry such that the width of the yoke gradually decreases from the main body portion to the protrusion.

4.4 Concerning the first difference a) identified above, the Board concurs with the view expressed by the examining division in point 1.4.2 of the Reasons of the impugned decision, according to which no inventive contribution could be recognised in replacing superconductive coils by permanent magnets with pole pieces. Indeed, as acknowledged by the appellant itself in section 1 of the statement of grounds of appeal,

permanent magnets and superconductive coils define "two *alternative solutions for providing an MRI apparatus with a static magnetic field*". In this respect, no inventive step can be recognised in the fact of replacing one element in an apparatus by a well known equivalent.

4.5 Concerning the second difference b) identified above, it is acknowledged that D11 does not provide any details as to the geometry of the yokes.

As underlined by the appellant, the claimed geometry permits to achieve a smooth flow of the magnetic flux without leakage.

In the Board's assessment, the structure of the yokes and the support column results from a trade-off among different constraints like the type of the MRI apparatus, the need for mechanical stability as well as the requirement of magnetic shielding of the surrounding space.

With regard to the mechanical stability, the main constraint to be considered would be the torque resulting from the weight of the yokes and the magnetic field generating elements mounted thereon as well as from the resulting magnetic forces.
With regard to magnetic shielding, a due channelling of the magnetic field flux should be provided.

As the yokes have the function of joining the magnetic field generating elements to the supporting column, their structure has to match both the (horizontal) dimensions of the magnetic field generating elements and the (horizontal) cross section of the support column.

The yokes also provide for channeling the flux of the magnetic field. In this respect, a smooth shape of the yokes, as disclosed in D3 (cf. Figures 4 and 5, for example) or D10 (cf. Figures 27 and 28, for example) would be advantageous, as is well known.

Whether the width of the yokes should continuously decrease from one end to the other or rather decrease and then increase as, for example, illustrated in D10 (cf. Figures 28) is a matter of mere design. In the absence of any identifiable technical effect in the claimed geometry over known configurations, the presence of an inventive step is to be denied.

4.6 Consequently, the subject-matter of claim 1 according to the main request is not inventive in the sense of Article 56 EPC 1973 considering the disclosure of D11 and known geometries as known from D3 or D10.

5. First auxiliary request

5.1 As expounded above with regard to the main request, differing shapes of the yokes would be equivalent to the extent that they meet the requirements of high mechanical stability and low magnetic leakage.

For this reason, the additional limitation in claim 1 of the first auxiliary request, according to which "*the width of the yokes in the first horizontal direction gradually and monotonously decreases from the main body portions to the protrusions in a second horizontal direction perpendicular to the first one in such a way that the sides of the yokes assume a smoothly recessed shape*", does not affect the reasoning mentioned above with regard to the main request.

5.2 It follows that the subject-matter of claim 1 according to the first auxiliary request is not inventive in the sense of Article 56 EPC 1973.

6. Second auxiliary request

6.1 The characterising portion of claim 1 of the second auxiliary request further defines the shape and orientation of the connecting column.

6.2 In its letter dated 24 October 2014, the appellant submitted that the claimed configuration was advantageous in view of its mechanical strength, of the accessibility to the imaging volume it offers and the simplicity of production it allows.

The Board notes that the third advantage mentioned is not directly related to the claimed MRI apparatus as such, but rather, to its manufacturing process. For this reason, this aspect is not considered directly relevant when assessing inventive step.

With regard to mechanical stability, purely mechanical considerations, as already referred to above, would indeed lead the skilled person to select a configuration as claimed. Ideally, a suitably oriented support column with, for example, a H-shaped cross section may be conceived. However, the requirement of accessibility, which may be inferred from D11 (cf. page 7, lines 4-7 corresponding to D11a, column 4, lines 50-55), implies that a compromise be found between the requirements relating to mechanical stability and accessibility to the imaging space. The skilled person, looking for a compromise solution, would without undue

burden or inventive activity arrive at the claimed apparatus.

6.3 For these reasons, the subject-matter of claim 1 according to the second auxiliary request is not inventive in the sense of Article 56 EPC 1973 considering the disclosure of document D11 and common general knowledge.

7. *Third auxiliary request*

7.1 The features concerning the arrangement of a bed in the MRI apparatus, as recited in the characterising portion of claim 1 according to the third auxiliary request, are known from D11. This is, in particular, true for the configuration with one single column explicitly addressed on page 7, lines 4-7, of D11 (corresponding to D11a, column 4, lines 50-55).

For these reasons, the subject-matter of claim 1 of the third auxiliary request differs from the MRI apparatus disclosed in D11 solely in that the means for generating a static magnetic field are constituted of permanent magnets associated with pole pieces.

7.2 As already stated above, superconductive coils and permanent magnets associated with pole pieces are well known equivalents in order to generate a static magnetic field and cannot justify the existence of an inventive step.

7.3 For these reasons the subject-matter of claim 1 of the third auxiliary request is not inventive in the sense of Article 56 EPC 1973.

8. *Fourth auxiliary request*

The subject-matter of claim 1 differs from the subject-matter of claim 1 according to the third auxiliary request in that it is specified that the bed is disposed at an angle of 135° or 225° with respect to the line connecting the center of the permanent magnets to the center of the column.

8.1 As stressed above with regard to claim 1 of the third auxiliary request, the apparatus disclosed in D11 allows a bed to be disposed in it so that the conditions as to the range of possible orientations recited in claim 1 of the third auxiliary request are met by said apparatus. This also applies to the specific angles now recited in claim 1 of the fourth auxiliary request.

For these reasons the reasoning developed above with regard to claim 1 of the third auxiliary request also applies *mutatis mutandis* to claim 1 of the fourth auxiliary request.

8.2 Even assuming that claim 1 implies an access along the two mentioned specific directions only, the same conclusion as to lack of an inventive step would still apply. In fact, notwithstanding a possible objection under Article 123(2) EPC, the selection of an angle of 135° or 225° is explicitly disclosed in D6 (cf. Figure 2), when selecting any of the right or left support column as reference for measuring the angle.

8.3 It follows that the subject-matter of claim 1 according to the fourth auxiliary request is not inventive in the sense of Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Assi

Decision electronically authenticated