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**Datasheet for the decision
of 9 October 2009**

Case Number: T 1994/08 - 3.2.07

Application Number: 02806842.7

Publication Number: 1476289

IPC: B28D 5/00

Language of the proceedings: EN

Title of invention:

A novel laser diamond sawing machine

Applicant:

Patel, Arvindbhai Lavjibhai

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56, 84, 123(2)

EPC R. 103(1)

Keyword:

"Added subject-matter - (yes, main request and third auxiliary request"

"Clarity - (no, second and fifth auxiliary requests)"

"Inventive step - (no, first and fourth auxiliary requests)"

"Reimbursement of the appeal fee - (refused)"

Decisions cited:

-

Catchword:

-

Case Number: T 1994/08 - 3.2.07

DECISION
of the Technical Board of Appeal 3.2.07
of 9 October 2009

Appellant:
(Applicant)

Patel, Arvindbhai Lavjibhai
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Representative:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted 5 June 2008
refusing European patent application
No. 02806842.7 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: H. Meinders
Members: P. O'Reilly
E. Dufrasne

Summary of Facts and Submissions

I. The examining division decided to refuse European application No. 02 806 842.

The examining division considered that a claim which was identical to claim 1 of the main request filed during the present appeal proceedings did not comply with the provisions of Articles 83, 84 and 123(2) EPC.

II. The appellant (applicant) filed an appeal against that decision.

III. In the written proceedings the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or, in the alternative, of one of the first to fifth auxiliary requests, all filed with letter of 3 October 2008.

IV. Oral proceedings took place on 9 October 2009. Although having been duly summoned, the appellant did not appear. In accordance with Rule 115(2) EPC, the proceedings were continued without it. The representative of the appellant had indicated by telephone before the oral proceedings that he would not attend them.

V. Claim 1 of the **main request** reads as follows:

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises

- a laser head (4) consisting of a lamp and an Nd:YAG rod,
- a Q switch (5),
- front (1) and back (7) mirror,
- two apertures (3, 6), one between the Q-switch and the back mirror (7) and one between the laser head (4) and the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,
- safely shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14) the beam at 90 deg which is then focused by the focusing lens (14)
- the machine further comprises:
 - a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes which is connected to the rear portion of a micropositioner (18) having a 37-pin connector/parallel port,
 - an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),
 - a chiller unit for providing chilled water to the laser head (4) and Q switch (5),
 - a CCD camera (16) and CCTV (17) for viewing the cutting process and
 - a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

Claim 1 of the **first auxiliary request** reads as follows (amendments when compared to claim 1 of the **main request** are struck through):

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises
- a laser head (4) consisting of a lamp and an Nd:YAG rod,
- a Q switch (5),
- front (1) and back (7) mirror,
- two apertures (3, 6), one between the Q-switch and the back mirror (7) and one between the laser head (4) and the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,
- safety shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14) the beam at 90 deg which is then focused by the focusing lens (14)
- the machine further comprises:
 - a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes ~~which is connected to the rear portion of a micropositioner (18) having a 37-pin connector/parallel port,~~

- an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),
- a chiller unit for providing chilled water to the laser head (4) and Q switch (5),
- a CCD camera (16) and CCTV (17) for viewing the cutting process and
- a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

Claim 1 of the **second auxiliary request** reads as follows (amendments when compared to claim 1 of the **main** request are depicted in bold or struck through):

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises
- a laser head (4) consisting of a lamp and an Nd:YAG rod,
- a Q switch (5),
- front (1) and back (7) mirror,
- two apertures (3, 6), one between the Q-switch and the back mirror (7) and one between the laser head (4) and the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,
- safely shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14)

the beam at 90 deg which is then focused by the focusing lens (14)

- the machine further comprises:

- a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes which is connected to the rear portion of an ~~micropositioner~~ **accupos** (18) having a 37-pin

connector/parallel port,

- an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),

- a chiller unit for providing chilled water to the laser head (4) and Q switch (5),

- a CCD camera (16) and CCTV (17) for viewing the cutting process and

- a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

Claim 1 of the **third auxiliary request** reads as follows (amendments when compared to claim 1 of the **main request** are struck through):

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises

- a laser head (4) consisting of a lamp and an Nd:YAG rod,

- a Q switch (5),

- front (1) and back (7) mirror,

~~two apertures (3, 6), one between the Q switch and the back mirror (7) and one between the laser head (4) and~~

~~the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,~~

- safely shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14) the beam at 90 deg which is then focused by the focusing lens (14)
- the machine further comprises:
 - a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes which is connected to the rear portion of a micropositioner (18) having a 37-pin connector/parallel port,
 - an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),
 - a chiller unit for providing chilled water to the laser head (4) and Q switch (5),
 - a CCD camera (16) and CCTV (17) for viewing the cutting process and
 - a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

Claim 1 of the **fourth auxiliary request** reads as follows (amendments when compared to claim 1 of the **main** request are struck through):

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for

igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises
- a laser head (4) consisting of a lamp and an Nd:YAG rod,
- a Q switch (5),
- front (1) and back (7) mirror,
- ~~- two apertures (3, 6), one between the Q switch and the back mirror (7) and one between the laser head (4) and the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,~~
- safely shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14) the beam at 90 deg which is then focused by the focusing lens (14)
- the machine further comprises:
 - a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes which is connected to the rear portion of a micropositioner (18) having a 37-pin connector/parallel port,
 - an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),
 - a chiller unit for providing chilled water to the laser head (4) and Q switch (5),
 - a CCD camera (16) and CCTV (17) for viewing the cutting process and

- a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

Claim 1 of the **fifth auxiliary request** reads as follows (amendments when compared to claim 1 of the **main request** are depicted in bold or struck through):

"A laser diamond sawing machine comprising a laser source, beam delivery system and power supply unit for igniting and controlling the intensity of said laser light, characterized in that:

- the laser source comprises
- a laser head (4) consisting of a lamp and an Nd:YAG rod,
- a Q switch (5),
- front (1) and back (7) mirror,
- ~~- two apertures (3, 6), one between the Q switch and the back mirror (7) and one between the laser head (4) and the front mirror (1), wherein the apertures are configured to sharpen the laser light frequency band,~~
- safely shutter (2) and
- beam expander where the laser beam coming from the beam expander is to be sent to the work surface and where the Q switch (5) is used to store the laser light energy,
- the beam delivery system comprises a beam bender (13) and a focusing lens (14) where the beam bender bends (14) the beam at 90 deg which is then focused by the focusing lens (14)
- the machine further comprises:
- a CNC interface consisting of X (8) or Y (9) or Z (11) axis and a computer unit (10) to control the movement of the axes which is connected to the rear portion of an

~~micropositioner~~ **accupos** (18) having a 37-pin connector/parallel port,
- an RF Q Switch driver which allows a pulsed output with high peak power of the laser when in Q-switched mode (5),
- a chiller unit for providing chilled water to the laser head (4) and Q switch (5),
- a CCD camera (16) and CCTV (17) for viewing the cutting process and
- a servo stabilizer, which prevents the whole machine from variations of the electricity supply."

VI. The documents cited in the present decision are the following:

D2: US-A-4 467 172,

D5: US-A-5 932 119,

D9: "Increasing laser brightness by transverse mode selection - 1", D.C. Hanna, Optics and Laser Technology, August 1970, pages 122 to 125,

D10: "Modelling and analysis of pulsed Nd:YAG laser machining characteristics during micro-drilling of zirconia (ZrO₂)", A.S. Kuar, B. Doloi, B. Bhattacharyya, International Journal of Machine Tools & Manufacture, 46 (2006), 1301-1310, Elsevier.

VII. The arguments of the examining division in the decision under appeal may be summarised as follows:

(i) The amendment to claim 1 which introduces the term "micropositioner" does not comply with Article 123(2) EPC. The term "accupos" which it replaced was not known at the date of filing of

the application and does not provide support for the amendment. Even if the use of the term "accupos" was an error, as argued by the applicant, there is nothing to indicate that its correction to "micropositioner" was obvious as is required by Rule 139 EPC.

(ii) The feature that there are two apertures which sharpen the frequency is not clear and cannot be put into practice by the skilled person. An aperture can influence the spatial distribution but not the wavelength of a laser beam. Therefore the application does not satisfy the requirements of Articles 83 and 84 EPC.

(iii) The division further holds the view that starting from D5 the subject-matter of claim 1 lacks an inventive step for reasons that have already been explained in its communications dated 18 January 2007 and 30 January 2008.

VIII. The arguments of the appellant may be summarised as follows:

(i) The term "accupos" is well known and refers to a "micropositioner" as evidenced by Annex 1 which is a publically accessible internet publication. The term in fact means "actual positioner" with a "micro" view of the object. The term "micropositioner" is intended to give a better explanation than "actual positioner".

(ii) The description of the application is sufficient and there is no lack of clarity. It is normal to

provide apertures to operate a laser in the fundamental (single) mode, i.e. the TEM 00 or Gaussian mode.

- (iii) The grounds of insufficiency and lack of clarity were raised for the first time during the oral proceedings before the examining division. The applicant attempted to overcome these grounds by amendments made during those proceedings. The examining division did not express any negative opinion about these amendments but then announced the decision that the application was refused.

The actions of the examining division constitute a substantial procedural violation so that the appeal fee should be reimbursed pursuant to Rule 103(1) EPC.

- (iv) The subject-matter of claim 1 of the main request involves an inventive step. There are a number of differences between the machine of claim 1 and the one disclosed in D5. The type of laser specified in the claim is different to that suggested in D5. Although D5 does mention the claimed laser it indicates it as having disadvantages. There is no indication in the prior art to provide apertures. Other differences are the location of a Q-switch between the back mirror and the laser head, the amplification of light using front and back mirrors, the presence of a safety shutter and servo stabilizers.

IX. Together with the summons to oral proceedings the Board included an annex setting out its provisional opinion.

The content of that annex essentially corresponds to the reasons for the present decision.

- X. With letters dated 16 January 2009, 4 August 2009 and 8 September 2009 a third party filed observations.

Reasons for the Decision

Main request

1. *Added subject-matter*
 - 1.1 Claim 1 of this request specifies a "micropositioner (18)". This term replaces the term "accupos" which was present in the description of the application as originally filed (page 2, line 24). The examining division considered that this amendment did not comply with Article 123(2) EPC.
 - 1.2 A principal reason why the amendment was considered by the examining division not to be allowable was based on its view that the term "accupos" had no technical meaning and thus was obviously an unclear and erroneous term. The examining division considered that there was no indication in the application as originally filed that the term was intended to describe a micropositioner.
 - 1.3 The appellant argued that the examining division was wrong to consider that the term "accupos" had no technical meaning and filed as Annex 1 a copy of an internet web page which mentioned the term. The appellant suggested that the term meant "actual

positioner" and that the term "micropositioner" is simply an alternative to this.

1.4 The Board agrees with the examining division.

First of all the term "accupos" is not one which has been found by the examining division or the Board in any publication which indicates that it has a technical meaning. Also, the appellant has not indicated such a publication. The web page cited by the appellant as Annex 1 is from 2008, whereas the filing date of the application in suit is 14 October 2002 so that the relevance of this page is in question already for this reason. Also, the content of the web page gives no indication of a technical meaning since it appears to be a listing of machine names including "Accupos" under which is indicated "CNC ACCUPOS CNC STAGES WITH CONTROLLERS". No technical meaning can thus be derived from it.

The Board itself found a publication from the year 2005 on the internet (D10), introduced with its preliminary opinion, wherein in the bottom two lines of the left-hand column on page 1302 it is stated: "The CNC controller consists of X-Y-Z axes and controlling unit named Accupos". This designation indicates that "Accupos" is the trade name of a unit, which is consistent with Annex 1.

The appellant also suggested in its appeal grounds that the term meant "actual positioner". There is no evidence to support this suggestion. Even if there were, that would not support an amendment to "micropositioner" since "actual positioner" gives no

indication of the level of positioning accuracy, whereas "micropositioner" could be considered to imply accuracy at the micrometre level. There is no indication, however, that the term "accupos" guarantees that specific level of accuracy.

- 1.5 The Board therefore concludes that claim 1 as amended according to this request does not comply with Article 123(2) EPC.

First auxiliary request

2. *Inventive step*

- 2.1 In its decision grounds the examining division did not set out its views regarding inventive step since it had already concluded that the application was not allowable for other reasons. The examining division did, however, make reference to specific parts of its communications which preceded the oral proceedings at which it decided to refuse the application. In its appeal grounds the appellant presented arguments regarding the presence of an inventive step in the subject-matter of the main request. In its provisional opinion the Board expressed its doubts regarding the presence of an inventive step in the subject-matter of claim 1 of the main request. In each of the above cases the starting document was D5.

- 2.2 The appellant in its appeal grounds argued that the subject-matter of claim 1 is distinguished over the disclosure of this document by the following features:

- a) the Nd:YAG rod;
- b) two apertures;
- c) the Q-switch located between laser head (gain material) and back mirror;
- d) amplification by front and back mirrors;
- e) safety shutter;
- f) servo stabiliser.

The Board agrees with this assessment of the appellant with the exception of feature d). By its nature a laser works by the repeated passage of light through a gain medium placed between two mirrors which form an optical cavity. Feature d) is therefore implicitly disclosed by the term "laser", in particular since it is described in D5 as a solid state laser (column 15, line 4).

- 2.3 With regard to features a) and b), these features together provide a beam which may be brought to a narrow focus and provide a high pulse energy as is required for diamond sawing.

D5 indicates (see column 6, lines 37 to 43) that a Nd:YLF laser is the preferred laser over the Nd:YAG laser because the latter requires extra equipment for its functioning. This means that the skilled person is aware that a Nd:YAG laser can perform the required task in the same way as the Nd:YLF laser though with some extra costs. There is thus no technical prejudice against choosing the known alternative of the Nd:YLF laser.

The provision of an aperture is the standard method of ensuring the TEM00 mode is selected which allows a narrow focus. D9 was found by the Board and was

introduced into the proceedings with its provisional opinion. This document shows that the provision of two apertures (see for example figures 2a and 3b) was a standard option available to the skilled person for mode selection, which would have the effect of sharpening the frequency band since modes other than the fundamental Gaussian mode would be eliminated. These apertures are provided in a system including a Nd:YAG laser (see column 3, lines 42 to 48).

2.4 The appellant has argued that the position of the Q-switch between the back mirror and the laser head (feature c)) is not disclosed in D5. There is, however, no disclosure in the application in suit that this position of the Q-switch has any particular effect. Indeed this position is necessary in order to ensure that the laser light pulse exits via the front mirror. The feature is known to the skilled person as standard practice as evidenced by D2 (see figure 1).

2.5 Feature e) is a normal feature which the skilled person would provide for safety purposes, i.e. to effect a rapid shut down. The appellant has provided no argument as to why the provision of such a feature should be inventive.

2.6 Also feature f) is a normal feature which is commonly provided on many types of electronic apparatus because of the known variations in electricity supplies.

2.7 With the exception of features a) and b) it has not been demonstrated that there are any combinatorial effects arising from the simultaneous provision of the features. Any combinatorial effects arising from

features a) and b) are already known since the apparatus disclosed in D5 is provided with both these features as explained in point 2.3 above.

- 2.8 The Board concludes therefore that the subject-matter of claim 1 of this request does not involve an inventive step in the sense of Article 56 EPC.

Second auxiliary request

3. *Clarity (Article 84 EPC)*

- 3.1 In claim 1 of this request the term "micropositioner" has been replaced by "accupos".

- 3.2 The Board is of the opinion that the term "accupos" is not clear.

As already explained in point 1.4 above the Board considers that this term is a trade name for some form of controlling unit. There is no evidence to indicate the functions of this unit. The only reference to the term in the application as originally filed is on page 2, lines 23 to 24 where it is stated that: "a control card is placed which is connected to the rear portion of the accupos 18 having a 37-pin connector/parallel port." In figure 1 of the application as originally filed the unit is only indicated schematically as a box. Therefore the application itself is devoid of information concerning the functioning of the unit.

Since the term has no precise meaning it cannot be clear.

- 3.3 Claim 1 of this request therefore lacks the clarity required by Article 84 EPC.

Third auxiliary request

4. *Added subject-matter*

4.1 This request includes the term "micropositioner" in claim 1. The Board has already explained with respect to the main request (see point 1 above) that the amendment to introduce this term into the claim is not allowable.

4.2 The Board therefore concludes that claim 1 as amended according to this request does not comply with Article 123(2) EPC.

Fourth auxiliary request

5. *Inventive step*

5.1 Claim 1 of this request differs from claim 1 of the first auxiliary request in that the feature of providing a pair of apertures is no longer present in the claim. The claim is thus broader than claim 1 of the first auxiliary request which has been found to lack an inventive step (see point 2 above).

5.2 Therefore, the subject-matter of claim 1 of the fourth auxiliary request does not involve an inventive step in the sense of Article 56 EPC.

Fifth auxiliary request

6. *Clarity (Article 84 EPC)*

6.1 Claim 1 of this request includes the term "accupos". The Board has already explained with respect to the second auxiliary request (see point 3 above) that this term lacks a precise meaning.

6.2 Claim 1 of this request therefore lacks the clarity required by Article 84 EPC.

7. *Third party observations*

A third party filed several submissions including some documents. Since the appeal is to be dismissed even without considering them it is not necessary for the Board to express any view regarding these.

8. *Request for reimbursement of the appeal fee*

8.1 The appellant requests the reimbursement of the appeal fee pursuant to Rule 103(1) EPC. According to the appellant the grounds of lack of clarity and insufficiency were raised without forewarning by the examining division for the first time at the oral proceedings, mentioning that its right to be heard had not been observed.

8.2 The Board notes that the ground of added subject-matter under Article 123(2) EPC had been raised in the communication of the examining division annexed to its summons to oral proceedings (see point 2 thereof) so that for at least one of the grounds for the decision

there is no question of a procedural violation. The filing of an appeal was thus necessary irrespective of any possible substantial procedural violation on the other issues.

- 8.3 Before the appeal fee can be reimbursed the appeal must be allowable (Rule 103(1)(a) EPC). In the present case the appeal is not allowable so that for this reason alone the appeal fee cannot be reimbursed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

G. Nachtigall

H. Meinders