

**Internal distribution code:**

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen

**D E C I S I O N**  
**of 18 June 1996**

**Case Number:** T 0254/94 - 3.4.1

**Application Number:** 89122595.5

**Publication Number:** 0374607

**IPC:** G01P 5/00

**Language of the proceedings:** EN

**Title of invention:**

Apparatuses for the determination of movement of an airborne vehicle in the atmosphere

**Applicant:**

THE TITAN CORPORATION

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 123(2)

**Keyword:**

"Main and third auxiliary requests: added subject-matter (yes)"  
"First, second, fourth and fifth auxiliary requests: inventive step (no)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0254/94 - 3.4.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.1  
of 18 June 1996

**Appellant:**

THE TITAN CORPORATION  
9191 Towne Centre Drive  
Suite 600  
San Diego  
California 92122 (US)

**Representative:**

Schumann, Klaus, Dr.  
Grünecker, Kinkeldey,  
Stockmair & Schwanhäusser  
Anwaltssozietät  
Maximilianstrasse 58  
80583 München (DE)

**Decision under appeal:**

Decision of the Examining Division of the European  
Patent Office dated 5 November 1993 refusing  
European patent application No. 89 122 595.5  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** G. D. Paterson  
**Members:** H. J. Reich  
U. G. O. Himmler

## Summary of Facts and Submissions

- I. European patent application No. 89 122 595.5 (publication No. 0 374 607) was refused by a decision of the Examining Division.
- II. The refusal was based on a main and three auxiliary requests filed 25 October 1993 and a fourth auxiliary request handed over on 26 October 1993. The reasons given for the refusal were as follows:
- (a) Claim 1 of the **main request** did not satisfy Article 123(2) EPC in that it comprises the following feature: "the current of substantially constant magnitude is at such a low level as not to affect the temperature of operation of the laser reached by the periodic energising of the laser between the first and second spaced terminals by the current of the first magnitude." This feature cannot be derived from the original disclosure.
- (b) Claim 1 of the **first auxiliary request** lacked novelty over document:  
  
D2: DE-A-3 603 548.
- (c) Claim 1 of the **second auxiliary request** did not meet the requirements of Article 123(2) EPC since the feature: "the temperature regulating means is operative without any delay in response to the variations in the voltage" cannot be derived from the original disclosure, even not implicitly since it is generally known that any control or regulating means has a measurable response time.

- (d) Claim 1 of the **third auxiliary request** does not satisfy Article 56 EPC. Document D2 already discloses electrically controlled means operative to transfer variable amounts of heat from the laser, said means being controlled in dependence on variations of the voltage producing the current of low amplitude. Claim 1 of the third auxiliary request solves the problem of providing suitable means for heating/cooling the laser in order to regulate its temperature by disposing a heat transfer means in abutting relationship with one of the laser terminals. This solution does not involve an inventive step considering the disclosure of document

D5: EP-A-0 152 916.

According to document D5 a laser is mounted on a mounting block. The temperature of the laser is regulated by regulating the temperature of the mounting block by means of an electrically controlled Peltier element. To ensure proper transfer of heat and mechanical stability, a person skilled in the art would mount one of the major surfaces of the laser to the mounting block as a matter of routine.

- (e) **Claim 1 of the fourth auxiliary request** adds to Claim 1 of the third auxiliary request the additional feature that "the current of substantially constant amplitude has a magnitude of approximately 1 milliamperes". Following the teaching of document D2, the current of low amplitude used for determining laser temperatures has to be lower than the current at which laser radiation is emitted. Document D2 mentions 50-200 mA as possible current values for laser

emission. Other types of lasers are known to emit light even in the range lower than 5 mA. The requested value of "1 mA" is thus a normal selection dictated by the requirement to stay below light emission. Since the abutting relationship of terminal and heat transfer means, and the selection of 1 mA as current of low amplitude, does not show any non-obvious working inter-relationship, the subject-matter of Claim 1 of the fourth auxiliary request does not involve an inventive step as required by Articles 52(1) and 56 EPC.

III. The Applicant lodged an appeal against this decision maintaining the version of the rejected third auxiliary request as main request.

Claim 1 of the main request filed on 15 March 1994 reads as follows:

"1. A laser constructed to transmit coherent light, the laser including

first and second spaced terminals (40, 42), and

an intermediate layer (44) disposed between the pair of spaced terminals,

means (41) for periodically energising the laser between the first and second spaced terminals with a current of a first magnitude to obtain the emission of light from the laser,

means (66) for producing a current of substantially constant magnitude, less than the first magnitude, at times between the periodic energising of the laser with a current of the first magnitude,

the voltage required to produce a current of the substantially constant magnitude being dependent upon the temperature of the laser at the intermediate layer, and

means (64, 52) for regulating the temperature of the intermediate layer (44),

**characterised in that**

heat transfer means (48, 52) in abutting relationship with one of the first or second terminals (40, 42) and operative to transfer from the laser variable amounts of heat under electrical control are provided,

and in that the heat transfer means is controlled in dependence of variations of the voltage required to produce a current of the substantially constant magnitude in order to regulate the temperature of the intermediate layer."

Claims 2 to 12 are dependent on Claim 1.

IV. In an annex to a summons to oral proceedings, the Board informed the Appellant inter alia of its provisional view that Claim 1 of the main request appears to be distinguished from the laser disclosed in document D2 in that:

- (a) the heat transfer means are "operative to transfer from the laser variable amounts of heat under electrical control ... in order to regulate the temperature of the intermediate layer", and that

- (b) the heat transfer means are "in abutting relationship with one of the first or second terminals.

Distinguishing feature (a) would be disclosed in document D5, in particular page 8, paragraph 1.

Document:

D3: Electronique Applications, No. 45, December 1985/January 1986, pages 19 to 27 (cited in a communication of the Examining Division dated 17 July 1992), in particular Figures 2 and 6 with the corresponding description, or alternatively document

D6: H. Ungerer: "Optische Nachrichtentechnik", Teil II, 1985, Dr. Alfred Hüthig Verlag GmbH, Heidelberg (cited by the Board) in particular Bild 9.36 and 9.39 and page 385, lines 3 to 5.

would evidence that distinguishing feature (b) belongs to the state of the art. Therefore, the subject-matter of Claim 1 of the main request might possibly be held not to satisfy Article 56 EPC. Furthermore, the words "less than the first magnitude" in Claim 1 and "as not to effect the temperature of operation of the laser" in Claim 4 should be cancelled in order to satisfy Article 123(2) EPC.

V. In reply to this communication, the Appellant filed on 20 May 1996 five auxiliary requests.

- (a) Claim 1 of the **first auxiliary request** is worded like the main request (see paragraph III above) and the words "less than the first magnitude" in Claim 1 and "as not to effect the temperature of operation of the laser" in Claim 4 are cancelled.

- (b) Claim 1 of the **fifth auxiliary request** comprises in addition to the wording of Claim 1 of the first auxiliary request the wording:

"the current of substantially constant magnitude has a magnitude of approximately one milliamper".

- (c) Claim 1 of the **second auxiliary request** comprises the wording of the pre-characterising part of Claim 1 of the first auxiliary request. Its characterising part reads:

**"characterized in that**

the means (52) for regulating the temperature of the intermediate layer (44) includes means (54, 56) for providing a variable transfer of heat from the laser (18) and further includes

means (64) for varying the rate of transfer of the heat from the laser by the means (54, 56) for providing a variable transfer of heat in accordance with the variations in the voltage producing the current of the substantially constant magnitude so as to maintain such voltage substantially constant."

- (d) Claim 1 of the **third auxiliary request** comprises in addition to the wording of Claim 1 of the second auxiliary request the feature:

"the temperature regulating means (52) is operative without delay in response to the variations in such voltage."

- (e) Claim 1 of the **fourth auxiliary request** comprises in addition of the wording of Claim 1 of the second auxiliary request the features:

"the means for varying the rate of transfer of the heat from the laser includes a cooler for drawing heat from the laser at a variable rate and also includes a source for energizing the cooler at variable periods of time to vary the rate at which heat is drawn from the laser and further includes means responsive to variations in the voltage for varying the periods of time at which the source energizes the cooler to draw heat from the laser, thereby maintaining the voltage at a particular value."

- (f) Claims 2 to 12 of the first to fourth auxiliary requests and Claims 2 to 7 of the fifth auxiliary request are dependent on the respective Claim 1.

VI. Oral proceedings were duly held on 18 June 1996 during which the Board invited the Appellant inter alia to comment on the question of original disclosure of the features stated in paragraphs V-(b) and (d) above and on the question of inventive step involved in the subject-matter of Claims 1 of the first, second, fourth and fifth auxiliary requests in view of documents D2, D5, D6 and the generally known state of the art, particularly as recognised in the description of the present application, column 6, lines 26 to 52.

During the oral proceedings the Appellant requested that the decision under appeal be set aside and a patent be granted on the basis of Claims 1 to 12 of the main request filed on 15 March 1994 or the sets of claims according to the first to fifth auxiliary requests as filed on 20 May 1996 with the amendment in Claim 1 of

the fourth auxiliary request replacing in the feature stated in paragraph V-(g) above the words "and further includes means..." by the words "or includes means ..."

VII. In support of his requests the Appellant argued essentially as follows:

(a) The invention concerns a device for regulating and thereby keeping constant the temperature of a laser in order to avoid the known problems of destruction and frequency instability of the laser emission. The problem of a precise automatic control of the temperature in the intermediate layer of a laser is solved by the combination of the three following means:

(1) a heat transfer means which can transfer variable amounts of heat under electrical control,

(2) an abutting relationship of the heat transfer means with one of the laser terminals, and

(3) automatically controlling the laser temperature by measuring the actual value of temperature via the voltage drop in the laser produced between its periodic energising by a constant current.

(b) Document D2 only discloses a measurement of the actual value of the laser temperature via the voltage drop in the laser produced between respective energising pulses by a constant current but no automatic control of the laser temperature. A skilled person only derives from document D2, in particular page 4, line 32 to page 5, line 6; page 6, lines 32 to 35 and page 7, lines 28 to 32,

that the energising current of the laser is lowered to a fundamental current below that of the lasing threshold when the measured temperature surpasses a critical value. In de-energizing the laser above a threshold value of the laser temperature a skilled person only sees a protective system. Such system does not suggest an automatic control of the laser temperature, not even by way of the laser current as regulating variable. Hence, there is no hint in document D2 to regulate the temperature of the laser by varying the rate of transfer of the heat from the laser.

- (c) Document D3 does not disclose an abutting relationship between the heat transfer means and a laser terminal. Figure 3 and the corresponding description does not specify the element to be cooled. Figure 6 demonstrates that the laser diode is placed apart from the cooling means. From the device of Figure 10 a skilled person derives that the mounting plate for the complete circuit is cooled, since only the surface of the laser housing is outlined in Figure 10, excluding thus any direct contact of the cooling means with a laser terminal.
- (d) The **first auxiliary request** takes into account the amendments proposed by the Board in order to satisfy Article 123(2) EPC. The specification of the magnitude of the constant current for temperature measurement to be 1 mA in the **fifth auxiliary request** is not obvious in view of the advantages, that such low current produces no heat, does not falsify the measured temperature value and does not impede cooling. The **second auxiliary request** is another attempt to formulate the invention, i.e. to provide "means for providing a variable transfer of heat", for instance a Peltier

element, and means for varying this rate in form of the measured voltage, which is proportional to the laser temperature such as disclosed in the original description page 13, paragraphs 1 and 2, in particular lines 21 to 23. The feature "without delay" in Claim 1 of the **third auxiliary request** shall clarify that the control signal (voltage) is not delayed on its way from the output of the means for measuring the actual value of the temperature to the input of the means for regulating the temperature of the laser as in the control system according to document D2, page 6, lines 16 to 18. Claim 1 of the **fourth auxiliary request** specifies that the cooler is either energised by pulses having an adjustable rate and fixed duration or by pulses having a fixed rate and a variable duration such as disclosed in the original description page 10, line 14 to page 11, line 6, in particular page 11, lines 2 to 6.

VIII. At the conclusion of the oral proceedings the decision was announced that the appeal was dismissed.

### Reasons for the Decision

1. *Article 123(2) - main and third auxiliary request*

1.1 In Claim 1 of the main request the current of a first magnitude is defined to produce the emission from the laser. The fact that the current of substantially constant amplitude for sensing the temperature shall be "less than the first magnitude" cannot be derived from the original application documents. There is no reference point disclosed in the description allowing to relate the magnitude of the current of substantially

constant amplitude quantitatively to the current of the first magnitude. Such relationship is also not implicitly derivable by a skilled reader's understanding of the working principle disclosed, since the subject-matter of Claim 1 of the main request is not narrowed to an amplitude of the constant current below the lasing threshold.

1.2 In Claim 1 of the third auxiliary request the feature that "the temperature regulating means (52) is operative without delay in response to the variations in such voltage" cannot be directly and unambiguously derived from the original application documents as filed. The schematic view according to Figure 8 and the enlarged fragmentary schematic view in Figure 9 do not allow a skilled person to derive all details of the control loop. The exact circuitry underlying the principles derivable from Figures 8 and 9 and the corresponding description is totally open. In the Board's view, only on the basis of the disclosure of a functionally complete embodiment or an explicit statement would a skilled reader understand that the control loop of the invention shall comprise no time elements. Such an explicit statement is still more indispensable in the present case, where the introduced amendment shall clarify a deviation from the prior art technology; see paragraph VII-(d) above.

1.3 For the above reasons, Claims 1 of the main and third auxiliary requests contain subject-matter which extends beyond the content of the application as filed and do not meet the requirements of Article 123(2) EPC.

2. *Article 56 EPC - first and second auxiliary request*

2.1 From the closest prior art disclosed in document D2 there is known in the identical wording of the pre-characterising parts of all auxiliary requests:

"A laser constructed to transmit coherent light, the laser including first and second spaced terminals and an intermediate layer disposed between the pair of spaced terminals (follows from the term "Ga As Al/P-Laserdiode" in D2, page 3, line 8), means (D2, 2 in Figure 1; and the term "Impulsbetrieb" on page 4, line 34) for periodically energising the laser between the first and second spaced terminals with a current of a first magnitude to obtain the emission of light from the laser, means (2 in Figure 1 in combination with page 4, line 32 to page 5, line 6) for producing a current of substantially constant magnitude, at times between the periodic energising of the laser with a current of a first magnitude, the voltage required to produce said current of the substantially constant magnitude being dependent upon the temperature of the laser at the intermediate layer, and means (5 in Figure 1 in combination with page 7, lines 28 to 36) for regulating the temperature of the intermediate layer."

Hence, the features of the pre-characterising parts of Claims 1 of all auxiliary requests concern essentially the means for **sensing** the actual temperature value of a laser for regulating its temperature as disclosed in document D2. In the laser system disclosed in document D2 the means for regulating the temperature of the (light emitting) intermediate layer of the laser is moreover - according to the characterising parts of Claims 1 of all requests - either in the wording of the **main request** "combined in dependence of the variations of the voltage required to produce a current of the

substantially constant magnitude" or in the wording of Claim 1 of the **second auxiliary request** operative "in accordance with the variations in the voltage producing the current of the substantially constant magnitude".

2.2 The above evaluation of document D2 concerns exclusively the means for sensing the temperature and the input of the measured signal into a control loop for the temperature as actual value; i.e. means (3) of the solution as defined by the Appellant in paragraph VII-(a) above. The arguments of the Appellant in paragraph VII-(b) explain differences of means (1) of the solution with regard to document D2 - i.e. differences of the means for adjusting (regulating) the temperature - which have no technical effect on the sensing means (3).

2.3 Starting from the closest prior art disclosed in document D2, the objective problem underlying the present invention as claimed in all requests is to provide a laser, the temperature of which can be regulated more precisely. In other terms, the objective problem consists in lowering the maximum deviation which shows in practice between actual and desired value in a control loop for the temperature of a laser. In the Board's view, the necessity to lower fluctuations in the working temperature of a laser may arise out of known requirements in a specific practical use of a laser - such as for instance the known requirements for the measurement of a speed; see the description of the present application column 1, paragraph 2 and column 2, paragraph 2 and document D5, pages 2 to 4. Furthermore, frequency shifts in the laser emission allow to easily recognise insufficiently limited fluctuations of the temperature in the emissive layer; see also paragraph VII-(a) above.

For these reasons, the formulation of the objective problem does not contribute to an inventive step underlying the subject-matter of Claims 1 of all requests:

2.4 The above objective problem is solved by the technical means defined in Claim 1 of the **first auxiliary request** by the wording:

(a) "that heat transfer means ... operative to transfer from the laser variable amounts of heat under electrical control are provided, and in that the heat transfer means is controlled ... in order to regulate the temperature of the intermediate layer."

and defined in Claim 1 of the **second auxiliary request** by the wording:

(a') "that means for regulating the temperature of the intermediate layer includes means for providing a variable transfer of heat from the laser and further includes means for varying the rate of transfer of the heat for providing a variable transfer of heat ... so as to maintain such voltage (and thus the temperature of the intermediate layer) substantially constant."

2.5 Means (a) and (a') for adjusting the temperature are both known from document D5 disclosing a Peltier element (3) which is connected to a control loop (12) for the working temperature of a laser (1); see document D5, Figure 1 and page 8, paragraph 1. A Peltier element is generally known to provide variable heat transfer under electrical control. Document D5, page 8, lines 4 to 8 teaches explicitly that the means disclosed in document D5 effect "eine genaue Temperaturstabilisierung

(a precise stabilisation of the temperature) and thereby a stabilisation of the wavelength of the emitted radiation". These statements allow a skilled person to recognise that the temperature adjusting means (a) and (a') disclosed in document D5 will solve the objective problem set out in paragraph 2.2 above. Hence, a skilled person has a clear technical motif to replace the adjustment of the laser temperature by varying the laser current in the laser system disclosed in document D2 into a variation of the rate of the heat transfer from the laser as disclosed in document D5. A skilled person **would** therefore make use of the known advantageous effects of means (a) and (a') disclosed in document D5 in combination with the laser system (in particular with the sensing means for the actual value of the laser temperature) disclosed in document D2 and thereby arrive in an obvious way at the subject-matter of Claim 1 of the **second** auxiliary request. It should be noted that the Appellant's arguments in paragraph VII-(b) are based on the disclosure of document D2. Though invited, he has submitted no comments on the disclosure of document D5.

2.4 The subject-matter of Claim 1 of the **first auxiliary request** comprises additionally the constructional feature:

(b) to provide "heat transfer means in abutting relationship with one the first or second terminals" of the laser.

Interpreting the term "terminal" (40, 42) in the light of the schematic view according to Figure 8 of the present application - and in line with the Appellant's arguments in paragraph VII-(c) concerning the disclosure of document D3 - as the contact electrodes of the laser on opposing surfaces of its semiconductor body, constructional feature (b) is disclosed in document D6,

Figure 9.36 on page 381. Document D6, page 385, lines 3 to 5 hints a skilled person explicitly to make use of an "abutting" laser terminal according to feature (b) in particular in the thermoelectric cooling of a laser by a Peltier element. Furthermore, in the Board's view, it belongs to a skilled person's routine knowledge that such direct contact increases thermal conductivity and thereby shortens the interval during which the actual laser temperature can be brought back to its desired value. For the above reasons, the Board regards it obvious to make simultaneous use of temperature adjusting means (a) disclosed in document D5, and of the "abutting" relationship of a laser terminal to these means according to feature (b) disclosed in document D6, in the laser system disclosed in document D2. No comments have been submitted by the Appellant with regard to means (2) of the solution defined in paragraph VII-(a) and the state of the art evidenced by document D6; see also paragraphs IV-(b) and VI above.

2.5 For the reasons set out in detail above in paragraphs 2.1 to 2.4 Claims 1 of the first and second auxiliary requests do not involve an inventive step in the sense of Article 56 EPC.

3. *Article 56 - fourth auxiliary request*

3.1 The subject-matter of Claim 1 of the fourth auxiliary request adds to that of Claim 1 of the second auxiliary request the features stated in paragraph VI-(e) above which specify alternative characters of the operating method of the means for adjusting the laser temperature (Peltier element) disclosed in document D5. Document D5 is silent about the mode of operation of the Peltier element in the laser system of document D5. Hence, a skilled person has the option in between the following four known possibilities of varying the heat transfer

from the laser by the energising current of a Peltier element: continuous amplitude control, pulse amplitude control, pulse frequency control and pulse length control. The selection of pulse frequency or pulse length control as claimed in Claim 1 of the fourth auxiliary request has to be regarded as arbitrary, since it is based on no unexpected effect. In the standard practice of the jurisdiction of the Board of Appeal an arbitrary selection is regarded to imply no inventive step. Filling out the gap of information in document D5 about the operating mode of the cooling means disclosed in document D5 is thus obvious.

3.2 Moreover, the description of the present application column 6, lines 26 to 52 admits that a thermoelectric cooler suited for an embodiment of the invention, was obtainable on the market at the priority date of the present application and adapted for both claimed alternative modes of operation.

3.3 For the above reasons, Claim 1 of the fourth auxiliary request is held not to satisfy Article 56 EPC.

4. *Article 56 - fifth auxiliary request*

4.1 The subject-matter of Claim 1 of the fifth auxiliary request adds to that of Claim 1 of the first auxiliary request the specification that the sensing current of the laser temperature shall be 1 mA; see paragraph V-(b) above. In the Board's view, the advantages of such low sensing current set out in paragraph VII-(d) above are foreseeable and hint a skilled person to select the lowest possible value of the sensing current which - at the given ohmic resistance of the intermediate layer of the laser and the given temperature coefficient of this resistance - still allows to detect the intended maximum difference between the actual and desired value of the

temperature. Hence, the subject-matter of Claim 1 of the fifth auxiliary request added to that of Claim 1 of the first auxiliary request, represents a routine adaptation of the sensing current to practical needs which is obvious to a skilled person. For these reasons and the reasons set out in paragraph 2 above Claim 1 of the fifth auxiliary request does not involve an inventive step in the sense of Article 56 EPC.

5. For the above reasons, Claims 1 of the first, second, fourth and fifth auxiliary requests do not satisfy the requirements of Article 56 EPC and are not allowable pursuant to Articles 52(1) EPC.
6. Claims 2 to 12 of the main and first to fourth auxiliary requests and Claims 2 to 7 of the fifth auxiliary request fall because of their dependence on the respective Claim 1.

### Order

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

The appeal is dismissed.

The Registrar:

The Chairman:

M. Beer

G. D. Paterson