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Datasheet for the decision of 2 July 2009

Case Number: T 1089/06 - 3.2.07

Application Number: 97900954.5

Publication Number: 0871794

IPC: C23C 14/34

Language of the proceedings: EN

Title of invention:
Sputtering targets and method for the preparation thereof

Patentee:
Bekaert VDS

Opponent:
W. C. Heraeus GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123

Keyword:
"Admissibility of amendments (yes)"
"Novelty (yes)"
"Inventive step (main and first auxiliary requests - no)"

Decisions cited:
-

Catchword:
-

Case Number: T 1089/06 - 3.2.07

D E C I S I O N
of the Technical Board of Appeal 3.2.07
of 2 July 2009

Appellant: (Patent Proprietor)	BEKAERT VDS E3 Laan 75-79 BE-9800 Deinze (BE)
Representative:	Setna, Rohan P. Boult Wade Tennant Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Respondent: (Opponent)	W. C. Heraeus GmbH & Co. KG Heraeusstraße 12-14 D-63450 Hanau (DE)
Representative:	Staudt, Armin Walter Patentanwalt Auf der Mauer 8 D-63674 Altenstadt (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 19 May 2006 revoking European patent No. 0871794 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman:	I. Beckedorf
Members:	H. Hahn
	K. Poalas

Summary of Facts and Submissions

I. The patent proprietor (appellant) lodged an appeal against the decision of the Opposition Division of 19 May 2006 to revoke European patent No. 0 871 794.

II. In the present decision the following documents are cited:

D1 = JP-A-07-233469 (and English translation)
D4 = DE-A-41 15 663
D5 = EP-A-0 586 809
D7 = EP-A-0 852 266
D8 = JP-A-05-214525 (and English translation)
D10 = "Electrical conductivity of plasma-sprayed titanium oxide (rutile) coatings", A. Ohmori et al., Thin Solid Films, 201 (1991), pages 1-8.

III. An opposition had been filed against the patent in its entirety under Article 100(a) EPC, for lack of novelty and inventive step, and under Article 100(c) EPC, that the patent extends beyond the content of its application as originally filed.

IV. The Opposition Division held that claim 1 of the main request (i.e. patent as granted) lacked novelty over the Article 54(3) and (4) EPC document D7. Claim 1 of the second auxiliary request dated 7 February 2006, which replaced the first auxiliary request that had been withdrawn during the oral proceedings, was considered to lack an inventive step with respect to D1 and D4 taking account of common general knowledge as identified in D10.

As an *obiter dictum* the Opposition Division considered that the subject-matter of claim 1 of the auxiliary request likewise lacked an inventive step in view of D1, D4 and D5, or in view of D1 and D10, or D1, D10 and D5, or in view of D1 and D5. Furthermore, the subject-matter of claim 12 of the main request was considered to meet the requirements of Article 123(2) EPC but at the same time was considered to lack novelty over D1 and this conclusion also applied to claim 10 of the auxiliary request. Likewise D7 was considered to be novelty destroying for claims 1, 3-6, 8, 11 and 12 of the main request. It also considered that the priority of the patent in suit is not valid for not disclosing the resistivity value of less than 0.5 ohm.cm. Eventually it stated that the late filed D7 was introduced into the procedure under Article 114 EPC for being relevant.

V. Claim 1 of the main request as filed together with the grounds of appeal dated 19 September 2006 - which is identical with claim 1 of the auxiliary request underlying the impugned decision - reads as follows:

"1. A process for the preparation of a sputtering target which comprises sub-stoichiometric titanium dioxide, TiO_x, where x is below 2 having an electrical resistivity of less than 0.5 ohm.cm, optionally together with niobium oxide, which process comprises plasma spraying titanium dioxide, TiO_2, optionally together with niobium oxide, onto a rotatable target base in an atmosphere which is oxygen deficient and which does not contain oxygen-containing compounds, the rotatable target base being coated with TiO_x which is solidified by cooling under conditions which prevent the substoichiometric titanium dioxide from combining with oxygen, and wherein the rotatable target base is water cooled during the plasma spraying."

VI. With a communication annexed to the summons dated 28 January 2009 the Board arranged for oral proceedings and presented its preliminary opinion based on claims 1-11 of the single request as filed together with the grounds of appeal dated 19 September 2006.

It stated amongst others that the subject-matter of process claim 1 appeared to be novel over D1 and D7. The subject-matter of product claim 10, however, appeared to lack novelty for the Designated Contracting States BE, DE, FR and GB with respect to example 26 of the Article 54(3) EPC document D7.

With respect to the issue of inventive step the Board indicated - provided there would be a request of which the claims would be considered to be formally admissible and novel - that the problem-solution approach had to be considered. Thus starting from the closest prior art and taking account of the problem to be solved - based on the effect of the distinguishing features - it had to be discussed at the oral proceedings whether or not the available prior art, particularly D5 or D10 renders the subject-matter claimed obvious when either combined with another teaching in the prior art or the common general knowledge of the person skilled in the art.

In this context the Board indicated that the comparative tests made by the patent proprietor do not appear to have been made in full agreement with the preferred conditions of D1 so that the hot-pressed TiO_x layer according to D1 appears to be substantially homogenous over its thickness. It appeared that either D1 or D5 represented the closest prior art with respect to both independent claims.

VII. With letter dated 2 June 2009 received by fax the appellant submitted sets of claims as a corrected main request together with first and second auxiliary requests in combination with arguments concerning the allowability of the amendments made therein and the patentability of their claims, taking account of the Board's communication.

VIII. Oral proceedings before the Board were held on 2 July 2009.

At the start the appellant withdrew its main request and made the first and second auxiliary requests the new main and new first auxiliary requests, respectively. Since novelty of claim 1 of the new main request was admitted by the respondent only inventive step of process claim 1 of the new main request was discussed, but considered by the Board to be obvious. The discussion of inventive step was then continued with respect to the process claim 1 of the new first auxiliary request.

(a) The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the new main request (originally filed as first auxiliary request with letter of 2 June 2009) or, alternatively, on the basis of the new first auxiliary request (originally filed with the letter of 2 June 2009 as the second auxiliary request).

(b) The respondent (opponent) requested that the appeal be dismissed.

At the end of the oral proceedings the Board announced its decision.

IX. The new main request is restricted to the process claims 1 to 9.

X. The subject-matter of process claim 1 of the new first auxiliary request differs from claim 1 of the new main request in that the open range of x and the electrical resistivity of the sub-stoichiometric TiO_x has been restricted to "**where x is in the range of from 1.55 to 1.95 having an electrical resistivity of less than 0.1 ohm.cm**", that the optional feature "**optionally together with niobium oxide**" has been omitted and that the feature "**and wherein the titanium dioxide which is plasma sprayed has a particle size in the range of from 1 to 60 micrometers**" (emphasis added by the Board) has been added at the end of the claim.

XI. The appellant argued essentially as follows:

New main request - claim 1: Inventive step (Article 56 EPC)

The respondent mentioned several documents: D1, D4, D5, D8 and D10 in order to arrive at the subject-matter claimed with the benefit of hindsight. Two differences were acknowledged by the respondent. D1 is specifically related to a hot-pressing/sintering process which is alleged not to be suitable for manufacturing a rotatable sputtering target. The respondent has not submitted any evidence in this respect. The person skilled in the art could hot-press a tubular product without any metallic substrate. It is admitted that a metallic substrate has to be present to which the TiO_x has to be bound. The person skilled in the art could modify this hot-pressing/sintering technique but would still apply its basic teaching. It is conceivable to apply the hot-pressing/sintering for manufacturing rotatable targets and it is denied that only plasma spraying can be used. D10 represents a scientific paper according to which TiO_x was deposited onto SUS 304 steel substrates (see page 2, section 2) without mentioning any sputter target or water cooling during the plasma spraying. The respondent's allegation that an oxygen-deficient atmosphere would be typical is incorrect because it depends on what the person skilled in the art is trying to achieve in a particular field. Furthermore, there are inconsistencies between the mentioned documents. There remains also the question as to why the authors of D1 (published in 1995) did not mention D10 (published in 1991). Hot-pressing/sintering and plasma spraying are completely different processes and to change from one to the other involves a quantum jump.

Therefore claim 1 of the new main request involves an inventive step.

New first auxiliary request - claim 1: Inventive step (Article 56 EPC)

It is not disputed that the additional feature concerning the stoichiometry of the TiO_x is known from the prior art. The electrical resistivity of the plasma sprayed TiO_x is not known from D1 since it relies on the hot-press/sintering process. The value of less than 0.1 ohm.cm is the result of the plasma spraying process in oxygen deficient atmosphere in combination with water cooling.

The coating according to D10 is a multi-phase product since no water cooling has been used whereas the product of claim 1 has a homogeneous layer of TiO_x. D10 does not describe a process for the preparation of a sputtering target. It mentions a particle size of 10-44 µm and it states that if the particle size of the titanium dioxide powder is greater than 60 µm then it is difficult to obtain a homogeneous layer.

D5 shows that also particles having a size of up to 100 µm can be used for the plasma spraying of a powder whereby said particles are, however, based on silicon.

Therefore the subject-matter of claim 1 of the new first auxiliary request is directed to a non-obvious alternative which is not derivable from D1, D5 and D10.

XII. The respondent argued essentially as follows:

New main request - claim 1: Inventive step (Article 56 EPC)

D1 represents the closest prior art. It discloses a planar sputter target comprising sub-stoichiometric TiO_x which is manufactured using a hot-pressing/sintering process. Thus process claim 1 of the new main request is distinguished from the process of D1 in that
i) a different process, i.e. plasma spraying, is used for
ii) forming a sputter target on a different, i.e. rotatable, substrate.

There exist either planar targets or rotatable targets. The metallic substrate of the sputtering target is necessary for the heat transfer and the power transfer during its use. It is known that cylindrical or tube-like targets provide a greater surface area and thus allow obtaining higher sputter rates at higher power levels. It is clear to the person skilled in the art that the process of D1 is not suitable for manufacturing a rotatable target. Upon cooling - due to the different thermal expansion coefficients of the substrate and the coating material - the coating would separate from the substrate. Plasma spraying for manufacturing rotatable targets is known from D4, D5 or D8.

The provision of a rotatable target is an objective problem which is dependent on the needs.

Thus the person skilled in the art has to look for a process which is suitable for manufacturing such a rotatable target. Thereby the person skilled in the art would select the plasma spraying process. D10 proves that plasma spraying of TiO_x is possible and that a high electrical conductivity is obtained (compare example 3 of the patent in suit). The oxygen deficient atmosphere is typical for such a process. Furthermore, the cooling of the substrate will be foreseen by the person skilled in the art if necessary; as admitted by the appellant thick layers of about 6 mm thickness require cooling (see the grounds of appeal dated 19 September 2006, point 4.14). Furthermore, D5 discloses water cooling of the substrate during the plasma spraying (see page 6, lines 17 to 23 and page 5, lines 3 to 6). Water is the cheapest cooling medium which additionally is from the chemical standpoint most suitable for this purpose due to its environmental properties.

Therefore claim 1 of the new main request lacks an inventive step.

New first auxiliary request - claim 1: Inventive step (Article 56 EPC)

The additional feature concerning the sub-stoichiometric composition of TiO_x is known from the prior art (see patent specification, paragraph [0010]). From Table 1 of D1 an x-value of about 1.9 can be calculated based on the disclosed oxygen loss of about 2 wt.% (compared to example 1) and the oxygen content of 38.0 wt.% of example 7. D10 mentions a composition range based on the formula Ti_nO_{2n-1} with n = 4-10 (see page 2, second paragraph), which corresponds to x-values of 1.75 (for n=4) to 1.9 (for n=10). With respect to the value of 0.1 ohm.cm the person skilled in the art would always try to provide a low electrical resistivity. According to the experiments of D10 electrical conductivities in the range of 10^3 to 10^4 $ohm^{-1}.m^{-1}$ were obtained by plasma spraying in air or by low pressure plasma spraying (LPPS) (see Figures 7 and 8) which transform into electrical resistivity values of 0.0001 to 0.00001 ohm.cm, respectively. The particle size of from 1 to 60 μm is selected to allow the melting of the plasma sprayed particles and this range represents a standard particle size. In the patent in suit the particle size is simply mentioned without any reasoning. If the particles would be greater than 60 μm then they cannot be melted by the plasma so that an inhomogeneous layer would be obtained. According to D10 the particle size was 10-44 μm (see page 2, section 2), whereas according to D5 80% of the particles should be between 10-100 μm, particularly 20-75 μm (see page 3, line 37). Since the plasma spray process according to D10 (10-44 μm) uses almost the same particle size as the patent in suit (see examples 1 and 2: 10-40 μm) the properties of the coating obtained should be the same as that according to the patent in suit, i.e. an electrical resistivity which is less than 0.1 ohm.cm. If the appellant's arguments with respect to the water cooling were true then the results of D10 should be worse than those according to the patent in suit. This is, however, not the case (see Figures 7 and 8) and it is evident that the water cooling is not responsible for the electrical resistivity of the deposited layer. There exists also no evidence that according to D10 a multi-phase coating is obtained. Moreover, claim 1 does not contain any corresponding limitation which would exclude such a product.

Therefore the subject-matter of process claim 1 of the new first auxiliary request also lacks an inventive step.

Reasons for the Decision

The appeal is admissible but not allowable.

1. *Admissibility of amendments (Articles 123(2) and (3) EPC)*

The Board is satisfied that the amendments of claim 1 of the new main request - which are based on a combination of claims 1, 2 and 5 as granted being identical with claims 1, 2 and 5 of the application as originally filed (corresponding to the published WO-A-97 25451) - and claim 1 of the new first auxiliary request - which compared to claim 1 of the main request has been further restricted by additional features having a basis at page 3, lines 26 to 28, page 4, lines 17 and 18 and page 5, lines 4 and 5 of the application as originally filed - comply with Articles 123(2) and (3) EPC since claim 1 as granted has been restricted by these amendments.

2. *Inventive step (Article 56 EPC)*

Main request

2.1 The Board comes to the conclusion that claim 1 of the main request lacks inventive step over the disclosures of D1 and D5 and the common general knowledge available to the skilled person for the reasons that follow:

2.2 Both parties agree to consider D1 as the closest prior art for process claim 1 of the new main request. The Board has no reason to object to the selection of this document since D1 - also from the Board's view - represents the most promising springboard towards the invention (see Case Law of the Boards of Appeal of the European Patent Office, 5th edition, 2006, section I.D.3.4). D1 had already been identified as a starting point in the description of the application as originally filed underlying the patent in suit (see patent specification, paragraph [0005]) and the technical problem to be solved in view of D1 has been defined in paragraph [0007] of the patent specification as being the provision of "an improved process for the production of sputtering targets comprising sub-stoichiometric TiO_2 which does not involve the hot-pressing and sintering route of JP-A-07-233469 (=D1) and which can be used to produce such targets which have a high enough electrical conductivity to be used as large size targets with complex shapes at high power levels".

2.3 D1 relates to the manufacturing of a sputter target for DC sputtering having a specific resistivity of not more than 10 ohm.cm. D1 states that the target "**can** be prepared" by hot-pressing TiO_2 powder (see page 9, paragraph [0015]). The described process includes hot-pressing of a titanium dioxide powder in a non-oxidizing atmosphere and sintering the resulting compact so that the resulting sputtering target comprises TiO_x with ($1< x < 2$), which preferably is metal-bonded to a copper-backed plate (see claims 1 to 7; pages 5-6, paragraph [0005]; page 8, paragraph

[0011], page 10, paragraph [0017]; page 12, paragraph [0021]). The target material may comprise less than 50% by weight of metal oxides other than TiO_x (see page 9, paragraphs [0013] and [0014]). The sintering in atmosphere having an extremely small oxygen partial pressure results in a sintered oxide having an oxygen defect (see page 11, paragraph [0019]). According to the examples 1-7 high purity TiO_2 powder was hot-pressed at a temperature of from 1100-1400°C in an Ar atmosphere for 1 hour at 50 kg/cm^2 (see pages 11-12, examples 1-7). According to examples 14 and 23 to 25 targets comprising mixtures of TiO_x and 20% by weight Nb_2O_5 were produced at 1200°C in Ar atmosphere at 50 kg/cm^2 (see pages 14-15, paragraph [0026]). The targets had resistivities of between 0.35 and 0.12 ohm.cm (TiO_x) and 0.37 ohm.cm (TiO_x and Nb_2O_5), respectively (see Tables 1 and 3).

D1 neither discloses a rotatable sputter target nor plasma spraying.

2.4 The subject-matter of process claim 1 of the main request differs from the process according to D1 in that i) plasma spraying (including the use of an oxygen-deficient atmosphere and water cooling of the substrate during the plasma spraying) is used for forming a sputter target on ii) a rotatable target base, i.e. a different process is used to coat a different (non-planar) substrate.

2.4.1 Feature i) allows the (simple) preparation of targets having a large size and complex shapes (see patent specification, paragraph [0007]).

In this context the Board remarks that it was well known to the person skilled in the art before the priority date of the patent in suit that it is particularly difficult to produce large targets via the hot-pressing/sintering technique and that the resulting sintered targets easily develop fractures and cracks, see D6, English translation, page 3, first paragraph. It is also difficult and expensive to manufacture sintered ceramics in the shape of a cylinder and join those as a target to a target electrode-holder metal, see D8, page 2, paragraph [0013].

Feature ii) allows that the resulting rotatable target provides a greater surface area and thus allows to apply higher DC power levels to thereby obtain a higher sputtering rate (see patent specification, paragraph [0014]; see D5, page 2, lines 24 to 26).

2.4.2 The objective problem is therefore considered to be the provision of a process for preparing DC sputter targets which allow obtaining higher DC sputtering rates at higher power levels.

2.5 This problem is solved by the process as defined in claim 1 of the main request. It is credible that the claimed measures provide a solution to said technical problem.

2.6 It belongs to the common general knowledge of the person skilled in the art that rotating targets compared to planar targets allow a higher sputtering rate at higher DC power levels. This fact was not contested by the appellant.

2.6.1 In order to solve the aforementioned objective technical problem starting from document D1 the person skilled in the art would therefore first select a rotatable target base, such as a cylindrical or tube-like target base to provide the higher DC sputtering rate at higher power levels.

2.6.2 Secondly, at least when trying to apply the described hot-pressing/sintering technique according to D1 for providing a TiO_x sputter target on such a rotatable target base made of e.g. Cu or Al metal the person skilled in the art would realize that this method is **not** suitable for this purpose.

First of all, it is clear to him that the TiO_x material when directly applied to the Cu or Al target base would separate therefrom when it is cooled to room temperature after the sintering step due to the different thermal expansion coefficients of said ceramic coating material and said metallic substrate. In this context it is also remarked that the person skilled in the art would additionally have to foresee measures in the hot-pressing/sintering method of D1 in order to protect the e.g. Cu or Al metallic target base to withstand the applied pressure and temperature in the hot pressing and sintering steps. On the other hand it is likewise obvious to the person skilled in the art that if the cylindrical or tube-like TiO_x target is manufactured by hot-pressing and sintering without any metallic target base that thereafter the sintered target has to be bonded in a reliable manner with said Cu or Al substrate in order to provide for a good electrical contact and a good cooling of the target during its intended use at high power levels. Although the appellant argued that such a modified process would be **conceivable** - which is interpreted by the Board that the appellant itself has not tried such a modified process according to D1 for whatever reason - it is not considered to be commercially feasible due to high production costs, see D8, page 2, paragraph [0013].

2.6.3 Taking account of the aforementioned difficulties with respect to the process described in D1 the Board considers that the person skilled in the art would look for suggestions in a neighbouring field to learn how a rotatable target base can be coated in a technically and commercially feasible manner in order to solve the technical problem as defined in point 2.4.2 above.

According to the available prior art (see e.g. D4, D5, etc.) such rotatable target bases are coated by plasma spraying the material to be sputtered.

2.6.4 The Board therefore holds that the person skilled in the art would apply a plasma spraying process, such as e.g. described in document D5, to prepare rotatable sputter targets comprising electrically conductive TiO_x material. According to D5 the plasma spraying of the coating material is carried out in a practically oxygen-free space, a vacuum for example, using a plasma gas of argon and hydrogen, preferably under a controlled pressure of between 150 and 1500 mbar, see page 5, line 56 to page 6, line 2, i.e. low pressure plasma spraying (LPPS). Furthermore, in order to deal with the different thermal expansion coefficients of the rotatable target base material, e.g. Al or Cu, and the deposited material - in order to avoid cracking of the applied coating layer - D5 suggests to provide a temperature gradient during the plasma deposition by keeping the inner side of the target base at a constant temperature, preferably by water cooling, see page 5, lines 3 to 6; page 6, lines 17 to 22.

2.6.5 The person skilled in the art also knows from D1, see page 10, paragraph [0015] and page 11, paragraph [0019], and from his general knowledge in chemistry that heating the TiO_2 material in a low oxygen pressure or hydrogen environment will cause an oxygen loss and thereby form electrically conductive sub-stoichiometric TiO_x, see also D10, page 1, chapter "Introduction" referring explicitly to this available knowledge.

2.6.6 By applying the manufacturing process taught by D5, i.e. to use LPPS including argon and hydrogen as plasma gas in combination with water cooling of the rotatable target base the person skilled in the art would therefore arrive at the subject-matter of claim 1 of the new main request without any inventive skill.

2.6.7 The appellant argued that no evidence has been provided by the respondent that the process of D1 is not suitable for manufacturing said rotatable targets and that the person skilled in the art would stick to the hot-pressing/sintering process. Furthermore, it argued that rotatable targets could be manufactured by hot pressing.

These arguments cannot hold taking account of the technical problems mentioned in point 2.6.2 above which make it plausible that the method of D1 is actually not suitable. Furthermore, due to the following passage in the description of D1 "The target of the present invention **can** be prepared, e.g. by the following manner. The target of the present invention, if it is made of titanium oxide, **can** be prepared by hot-pressing (high temperature-high pressure pressing) a titanium oxide powder" (see page 9, last paragraph; emphasis added by the Board) the disclosure is actually not restricted to the hot-pressing/sintering route.

The appellant further argued that plasma spraying is not the only possibility for manufacturing such rotatable sputter targets but, as admitted at the oral proceedings, it failed to submit corresponding evidence in order to prove this allegation.

Moreover the appellant argued that an oxygen-deficient atmosphere would not be typical and that the atmosphere depends on what the person skilled in the art is trying to achieve in a particular field. The Board holds in this respect that the person skilled in the art is aiming to provide a TiO_x coating so that the used starting material - TiO_2 - has to loose some oxygen during the plasma spraying operation to obtain a TiO_x coating. This implies to the person skilled in the art - taking account of his common general knowledge in chemistry - that an oxygen-deficient or reducing atmosphere, similarly as the one described in D1, see point 2.6.5 above, is necessary to reach this goal.

2.7 Claim 1 of the new main request therefore does not comply with the requirements of Article 56 EPC. Consequently, the new main request is not allowable.

First auxiliary request

2.8 The subject-matter of claim 1 of the new first auxiliary request differs from that of claim 1 of the main request in that the range of x is restricted to the range of from 1.55 to 1.95, that the electrical resistivity is restricted to less than 0.1 ohm.cm, that the optional niobium oxide has been omitted and that the titanium dioxide particle size of the plasma sprayed TiO_2 is specified to be in the range of from 1 to 60 µm.

2.8.1 However, the person skilled in the art would arrive in an obvious manner at a plurality of x-values and electrical resistivity values falling in these two ranges when applying the LPPS operation as described in document D5 onto TiO_2 powder. This is proven by the experiments described in the scientific paper D10. According to D10 the plasma spraying was performed either in an ambient air atmosphere or at 100 Torr of argon for LPPS with the plasma gases being mixtures of argon and hydrogen, see page 2, chapter "2. Materials and Experimental Procedure". D10 mentions, based on the formula Ti_nO_{2n-1} with n = 4-10, a composition range for TiO_x which corresponds to x-values of 1.75 (for n=4) to 1.9 (for n=10), see page 2, second paragraph. According to D10 electrical conductivities in the range of 10^3 to 10^4 $ohm^{-1}.m^{-1}$ were obtained, see figures 7 and 8. Since the reciprocal value of the conductivity is the electrical resistivity these values correspond to resistivities of 0.0001 to 0.00001 ohm.cm, respectively.

2.8.2 On the other hand, the selection of a suitable particle size of the TiO_2 powder is considered to reside within the ordinary skills of the person skilled in the art. This holds the more true since the particle size of from 1 to 60 µm is selected to allow the melting of the plasma sprayed particles and this range is considered to represent a standard particle size, as proven e.g. by D10 which discloses a range of from 10-44 µm, see page 2, fifth paragraph. Furthermore, as argued by the appellant, if the particles were greater than 60 µm then they could not be melted by the plasma so that an inhomogeneous layer would be obtained. Consequently, since an inhomogeneous layer is not suitable for a sputtering target it is evident that the person skilled in the art would select an appropriate particle size to obtain a homogenous TiO_x layer.

The Board additionally remarks in this context that no evidence has been submitted which would show that the combination of additional features produces a particular technical effect compared to different ranges of said values. Furthermore, in the application as originally filed no effect is described with respect to these three features.

2.8.3 Since the plasma spraying according to D10 used a particle size of 10-44 µm, which is almost identical with that of the patent in suit, i.e. 10-40 µm according to the examples 1 and 2, it is credible that the properties of the coating obtained should be the same as that according to the patent in suit, i.e. an electrical resistivity which is less than 0.1 ohm.cm.

2.8.4 The appellant argued that the water cooling is responsible for the low resistivity values of the TiO_x coating. This argument cannot hold because if it were true then the results of D10 should be worse than those according to the patent in suit. This is, however, not the case as proven by the experiments according to figures 7 and 8 of D10.

There exists also no evidence that - as argued by the appellant - according to D10 a multi-phase coating is obtained. Moreover, claim 1 does not contain any corresponding limitation which would exclude such a product. Therefore these arguments cannot be accepted, either.

2.8.5 Therefore the Board considers that the person skilled in the art executing the process as disclosed in point 2.8.1 above would arrive at the subject-matter of claim 1 of the new first auxiliary request in an obvious manner when applying the aforementioned teaching of D5 and by applying his common general knowledge and ordinary skills. Therefore the process of claim 1 of the new first auxiliary request lacks an inventive step (Article 56 EPC). The new first auxiliary request is thus not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Nachtigall I. Beckedorf