BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 751/90 - 3.4.1

Application No.: 82 110 386.8

Publication No.: 0 096 730

Title of invention: Gas-target method for the productions of iodine 123

Classification: G21G 1/10

D E C I S I O N
of 23 January 1992

Proprietor of the patent: NORDION INTERNATIONAL, INC.

Opponent: Kernforschungszentrum Karlsruhe GmbH

Headword:

EPC Article 56

Keyword: "Inventive step (denied)"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 751/90 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 23 January 1992

Appellant : (Opponent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 11 September 1990 rejecting the opposition filed against European patent No. 0 096 730 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : G.D. Paterson
Members : Y. van Henden
U. Himmler

Summary of Facts and Submissions

I. European patent No. 0 096 730 was granted to Atomic Energy of Canada Limited and assigned to the Respondent.

Claim 1 reads as follows:

"A method of indirectly producing high-purity radioactive iodine-123 by means of the decay of 123-chain precursors thereof obtained by low energy proton bombardment of xenon-isotopes contained in a gas-target assembly, said method being characterized by the following combination of production steps:

providing said gas-target assembly (5) with a deposit region of its interior surface for deposition of iodine-123 and filling said gas-target assembly with a xenon-gas enriched in the xenon-124 isotope,

providing at least one gas decay vessel (9) having at least one further deposit region located therein, said gas decay vessel being remotely disposed from the gas-target assembly,

performing the following steps during a first predetermined period:

bombarding the gas within the gas-target assembly with a beam of protons of incident energy in the range of 15 MeV to 45 MeV to produce build-ups of both iodine-123 and xenon-123, and depositing the iodine-123 on said deposit region in the gas-target assembly;

transferring the irradiated xenon gas from the gas-target assembly to said gas decay vessel at the termination of

said first predetermined period; and, during a second predetermined period, performing the following steps:

retaining the irradiated xenon gas in said decay vessel while the xenon-123 therein decays to iodine-123, and

washing said gas target assembly deposit with an aqueous solution to recover therefrom the iodine-123".

Claims 2 to 7 are appended to Claim 1.

II. The patent was opposed by the Appellant on the grounds mentioned in Article 100(a) EPC, referring inter alia to the prior art which can be derived from documents

D1: P. Grabmayr et al "Statistical-Model based evaluations of reactions producing ^{123}I and ^{127}Xe", International Journal of Applied Radiation and Isotopes, Vol. 29 (1978), pages 261 to 267, Pergamon Press Ltd., UK

D2: B. Nordell et al "Production of ^{123}I by photonuclear reactions on Xenon", International Journal of Applied Radiation and Isotopes, Vol. 33 (March 1982), pages 183 to 187.

III. Notice of opposition was also filed by Cygne Cyclotrontoepassingen in de Geneeskunde Nederland B.V. (Opponent II), Eindhoven (NL), citing, besides (D1) and (D2), the further documents

D3: SU-A-671 194

D4: G.A. Brinkman "Isotope production with bremsstrahlung beams in comparison with proton beams", International Journal of Applied Radiation and Isotopes, Vol. 31 (1980), pages 85 to 90

D5: R.A. Schwind et al "Stable isotope enrichment by thermal diffusion, chemical exchange and distillation", Proceedings of the symposium on radio pharmaceuticals and labelled compounds "IAEA-SM. 171/47" (Vienna 1973), Vol. II, pages 255 to 266,

and requesting the patent to be revoked on the grounds mentioned in Article 100(a) and (b) EPC.

IV. The Opposition Division rejected the oppositions.

In its decision, the Opposition Division took the view that, albeit nearly all features of the patented method are known from documents (D1, D2, D3), the subject-matter of Claim 1 could not be deduced from said documents because the teachings of (D1) would be directly away from those of (D2) and (D3). Documents (D2), (D3), as well as (D5), deal indeed with basically different reactions, to wit photonuclear reactions on xenon to produce iodine-123. Furthermore, having regard to the rather theoretical nature of (D1), the skilled person would not find there a real hint at using the method based on the reactions

$$^{124}Xe(p,2n)^{123}Cs \quad + \quad ^{124}Xe(p,pn)^{123}Xe.$$

V. The Appellant lodged an appeal against the decision, citing the additional document

D6: R. Weinreich et al "Production of ^{123}I via the $^{127}I(d,6n)^{123}Xe(\beta^+,EC)^{123}I$ process", International Journal of Applied Radiation and Isotopes, Vol. 25 (1974), pages 535 to 543.

In a later submission, he furthermore expressed the view that the grounds mentioned in Article 100(c) EPC too are a bar to the maintenance of the patent in suit.

VI. Oral proceedings were held before the Board at the end of which the Appellant requested that the decision under appeal be set aside and that the patent be revoked, whereas the Respondent requested that the appeal be dismissed.

VII. In support of his request, the Appellant substantially argued as follows:

Document (D1) reveals that iodine-123 can be produced by bombarding xenon with protons having from 15 MeV to 30 MeV energy, the advantages of using a gas target assembly with xenon enriched in the isotope 124 being furthermore pointed out. It is acknowledged that this document is mainly a theoretical one, but it may not be inferred from the wording of Article 54(2) EPC that such documents should not be taken into consideration. The purpose of theory is indeed to orient experimental investigations in the right direction. It is now stated in (D4) that isotopes obtained by proton irradiation can also be produced by means of electron beams (used for generating bremsstrahlung), high photon energies being however required to lead to the same isotopes as (p, xn) reactions. It is also stated there that proton irradiation provides higher gains and that most isotopes are produced through reactions induced by protons having from 20 to 50 MeV energy. Considering that it lies within the ability of the skilled person to design a target assembly in relation to the type of radiation used, a hint is thus given to said person to also inquire about methods and devices for producing iodine-123 through photon reactions and, therefore, to take such documents as (D2) and (D3) into consideration.

The arrangement represented in Figure 1 of (D2) comprises a target assembly to be filled with xenon and having a region where iodine isotopes deposit as well as a gas decay vessel - cf. "glass vial" - disposed remotely from said target assembly and having a further deposit region. The irradiated xenon is kept for six hours in the glass vial where xenon-123 decays to iodine-123. The deposit in the glass vial is then washed with an aqueous solution to recover iodine-123, which solution is basic since its pH is 9. As a matter of fact, it is true that a contamination of the deposit in the target assembly, as well as a loss of iodine-123 through adherence or bonding to parts other than the glass vial, are reported in (D2). Nevertheless, this latter document also reveals the possibility of reducing the contamination by using a target enriched in xenon-124, whereas document (D3) and (D5) reveal that the use of such a target provides a higher iodine-123 yield. With regard thereto, no inventive step is then required to envisage washing the target assembly in order to optimize iodine-123 production. The skilled person knows indeed that the iodine-123 formed during irradiation and which is readily available would otherwise decay. Finally, considering that the range of proton energies can be determined by performing routine experiments, no inventive step can be perceived in the subject-matter of Claim 1. Besides, how the features mentioned in the characterising part of said claim could alleviate the shortcomings of the known methods as set out in the preamble to the description is not perceived. In particular, the expensive xenon does not become cheaper by providing such features - see column 1 of the patent, up to line 16.

Bearing in mind the conclusions of Decision T 315/88, the Respondent's objection that documents (D1) to (D3) would form a mosaic is irrelevant, since the present invention has for its object to solve technical problems which are

independent of one another. Furthermore, all said documents pertain to the indirect production of iodine-123 through decay of xenon-123. Now, the Respondent's contention that the use of a gas target for bombarding xenon with protons would not have been envisaged is not credible. Document

D7: J.W. Blue et al "^{123}I production from spallation reactions", Journal of Nuclear Medicine, vol. 12, No. 6 (1971)

already cited in the European Search Report confirms that, at the priority date of the patent in suit, the difficulties in connection with the design of such targets had been overcome and that the advantages of the latter were known to the skilled person.

No inventive step either can be perceived in the subject-matter of the appended claims, since recycling of the xenon, enrichment thereof to a level of 1% or more xenon-124 by volume and use of liquid nitrogen as cryogenic agent are known from the cited documents. As regards washing the gas target deposit, the attention may also be drawn to (D3), in particular example I, and to (D6).

The grounds mentioned in Article 100(c) EPC also form a bar to the maintenance of the patent. It appears indeed from page 10 of the application as filed that the steps of Claim 1 were exclusively disclosed in relation with an optimised process designed for the build-up and subsequent removal of xenon-123 from the target assembly.

VIII. The Respondent requested the appeal to be dismissed and the patent in suit to be maintained as granted.

IX. The Respondent submitted a Historical Review summarising docments D1 to D7 in chronological order. His argumentation can be summarised as follows:

Having regard to the historical context in which the invention was made as summarised in the Historical Review, the Appellant's reliance upon document D1 when contending lack of inventive step should be considered as based upon ex post facto analysis. The object of (D1) is not to teach a method of producing high-purity iodine-123 by means of the decay of 123-chain precursors thereof but to show how to calculate an unknown excitation function, whereby methods of producing iodine-123 and xenon-127 were chosen as examples. Concerning iodine-123 production by low energy proton bombardment of xenon isotopes, (D1) concludes that the disadvantages of such a method are obvious. The prior art would consequently not teach the above method of producing iodine-123. Furthermore, the consideration of Figure 5 in (D1) would lead away from choosing a proton energy of 45 MeV, for it shows a rapid decrease of the excitation function when proton energy becomes superior to 25 MeV.

According to (D2), the iodine generated in the target assembly remains attached or bound to the walls of copper tubes or to silver wool in filters. It is not washed and, therefore, not available for further processing. Only the glass vial is used and the iodine deposited therein is not washed but binds to human serum albumin to label said albumin. At best, (D2) thus teaches to discard rather than to recover iodine dissolved in an aqueous solution. Now, nuclear reactions caused by bremsstrahlung lead to results which, in particular as regards by-products, are different from those of reactions induced by proton bombardment, even if iodine-123 is generated. The reason therefor would be that commercially available xenon-124 is contaminated with

xenon-126, which leads to the formation of the undesirable iodine-125. Besides, the bremsstrahlung reaction is very slow and must be run for a long time to obtain appreciable amounts of iodine-123, so that large amounts of iodine-125 are produced. Therefore, no method using bremstrahlung will be considered as relevant by the person skilled in the art.

Document (D3) does not give a hint at transferring the irradiated xenon to a decay vessel, nor at the use of such a vessel to retain xenon while washing the gas target assembly. Furthermore, the quartz ampulla used there would not withstand the action of the proton beam and may consequently not be considered as a gas target assembly. Besides, even if a vacuum pump with a cooling trap is used, high losses of expensive xenon-124 take place since said ampulla is broken after irradiation. As a matter of fact, the detrimental effects of such losses are also mentioned in section 4.3 of (D1) and, before the invention was made, all scientists would have considered gas targets in relation with proton bombardment as a source of troubles. In this respect, having discovered that the claimed method nonetheless works should be regarded as evidence of an inventive step.

In (D4) the person skilled in the art would only find the teaching that bremsstrahlung reactions are not comparable to proton bombardment reactions. Moreover, this document states that (p, xn) reactions form the exception to the rule that all isotopes which can be produced by proton beams can also be produced by electron beams, which leads away from the invention. Therefore, the closest prior art is based on the indirect process $^{127}I(p,5n)^{123}Xe \rightarrow ^{123}I$ using 64 MeV protons and all constructions of the Appellant are based on an ex post facto analysis of the cited documents.

Finally, the Appellant's objection under Article 100(c) EPC does not hold, since Claim 1 of the application as originally filed covered any combination of the two modes of operation disclosed on page 10 of said application.

X. At the conclusion of the oral proceedings, the decision was announced that the impugned decision was set aside and that European patent No. 0 096 730 was revoked.

Reasons for the Decision

1. Novelty

1.1 The Board first observes that, albeit Claim 1 does not mention this feature, xenon-123 is maintained in its frozen state while decaying to iodine-123 in the gas decay vessel (9) - see from line 57 of column 5 to the first line of column 6. With respect to what might be called a "decay vessel", the designation "gas decay vessel" consequently means at the utmost that such a gas decay vessel is suitable for receiving and retaining a substance which, at room temperature, is a gas. In the Board's judgment, therefore, any container in which irradiated xenon is retained while decaying to iodine-123 is a "gas decay vessel" within the meaning of Claim 1. Likewise, in the Board's judgment, any container allowing irradiation of xenon retained therein is a "gas-target assembly" within the meaning of Claim 1.

The Board now observes that "providing a gas-target assembly (5) with a deposit region of its interior surface for deposition of iodine-123" is not a real method step but a reference to means needed for carrying out the claimed method and to the result to be achieved thereby. Both generation and decay of radioactive xenon and cesium

isotopes are indeed gradual processes, which entails that during the irradiation process iodine isotopes are continuously produced within the target assembly. If the latter is at a temperature lower than the melting point of iodine, which both parties admitted to be the rule during the oral proceedings, said iodine isotopes deposit on the inner surface thereof. The presence of a "Deposit region for deposition of iodine isotopes" thus does not appear as featuring special target assemblies, and any target assembly suitable for irradiating xenon isotopes may be considered as provided with such a deposit region. Now, if a plurality of iodine isotopes are simultaneously produced, no possibility is afforded to make iodine-123 to separate from the other iodine isotopes and to deposit on a particular region of the inner surface of the target assembly. As a matter of fact, for such a region to exist, only iodine-123 must be produced. This, however, depends on the choice of the xenon isotopes to be irradiated and of low energy protons as irradiating agent, and not on a special design of the target assembly.

In the Board's judgment, therefore, any target assembly suitable for irradiation of xenon with a beam of low energy protons is provided with a "deposit region of its interior surface for deposition of iodine-123". Likewise, and for the same reasons, the Board takes the view that any vessel in which xenon isotopes can be retained while decaying to iodine isotopes is "provided with at least one (further) deposit region located therein". Finally, the Board still observes that providing such a gas decay vessel is here a reference to means needed for carrying out the claimed method and not a step thereof.

Document (D1) pertains to the production of radioactive isotopes and gives account of computational evaluations of excitation functions and yields of nuclear reactions - see

abstract. Part 4. of this document relates to the production of iodine-123 and section 4.3 of said part 4. to the reactions

$$^{124}Xe(p,2n)^{123}Cs \rightarrow ^{123}Xe \rightarrow ^{123}I$$
$$^{124}Xe(p,pn)^{123}Xe \rightarrow ^{123}I,$$

i.e. those contemplated in the patent in suit - see column 4 of the latter, lines 37 to 42. Concerning these reactions, it is reported in (D1) that "a production regime for a natural Xe target (thickness of 30 MeV) of 5h irradiation with 20μA protons and a consecutive decay period of 5h delivers an activity of 1.42 mCi iodine-123" and that, "As anticipated, these yields are rather low" - see page 265, last paragraph of the right hand column, and page 266, line 4 of the left hand column.
There being only one way to rate the validity of a theory, namely comparing its predictions to experimental results, it may thus be inferred from section 4.3 of (D1) that, before the latter was issued, iodine-123 had been produced through proton irradiation of natural xenon and consecutive decay thereof. Furthermore, considering that the theoretical evaluations referred to in section 4.3 of (D1) correspond to proton energies in the range of 15 to 30 MeV, said yield appears to have been achieved through low energy proton bombardment - see: first paragraph of section 4.3 and Figure 5; page 264, lines 10 to 12 of the left hand column.

Document (D1), therefore, establishes that

"a method of indirectly producing radioactive iodine-123 by means of the decay of 123-chain precursors thereof comprising the step of bombarding xenon isotopes during a first predetermined period with a beam of protons having a low energy comprised within the range of 15 MeV to 30 MeV

to produce build-ups of both iodine-123 and xenon-123 and, at the termination of said first predetermined period, the step of allowing the xenon-123 to decay to iodine-123 during a second predetermined period"

had actually been carried out and made available to the public before the priority date of the patent in suit.

1.3 In the Board's judgment, therefore, the method according to Claim 1 distinguishes over the prior art known from (D1) in that

- a gas-target assembly is filled with xenon gas enriched in the xenon-124 isotope;

- the incident energy of the protons is in the range of 15 MeV to 45 MeV;

- iodine-123 is deposited on a deposit region of the inner surface of the gas-target assembly;

- the irradiated xenon gas is transferred from the gas-target assembly to a gas decay vessel disposed remotely from said gas-target assembly and having at least one further deposit region, and in that

- the gas-target assembly deposit is washed with an aqueous solution to recover therefrom the iodine-123.

2. Inventive step

2.1 It is a matter of obviousness that no significant comparison between experimental results and theoretical evaluations would have been possible if, while carrying out the experiments reported in (D1), the natural xenon used there had not been retained in at least one or in two

successive containers during the periods of irradiation and decay. For the reasons explained in section 1.1 of the present decision, such container(s) may be called "a gas-target assembly having a deposit region of its interior surface for deposition of iodine-123" and/or "a gas decay vessel having at least one (further) deposit region located therein". It is therefore obvious to the skilled person that, besides those explicitly disclosed in (D1), the method known from this document unquestionably comprised the further steps of

- filling with xenon gas a gas-target assembly having a deposit region of its interior surface for deposition of iodine-123, and

- retaining the irradiated xenon gas in a decay vessel having at least one (further) deposit region located therein while the xenon-123 decays to iodine-123.

2.2 According to document (D1), drawbacks of the method of indirectly producing iodine-123 through low energy proton bombardment of xenon might be perceived in the price of xenon and the scarcity of the isotope xenon-124 - see page 264, lines 13 to 16 of the left hand column. Moreover, the teachings disclosed there as regards the potential interest of deviating from the conditions met while carrying out the experiments are theoretical ones. The question to be answered here is, therefore, to know whether these considerations are or are not liable to deter the skilled person from inquiring about the possibility of improving said method.

In the present case, the skilled person is a nuclear physicist. Such a person, therefore, is able to analyse critically the teachings of a document in the light of his general professional knowledge, to weigh the pros and cons

of each specific measure, in particular to examine whether an increase in production balances extra costs, and to make technical choices in relation with results to be achieved and means available therefor. He knows that, albeit theories are not always quite reliable, especially in the case of such complex processes as nuclear reactions, theoretical considerations are nonetheless highly helpful for circumscribing the field of experimental investigations. As a matter of fact, the Respondent did not contest this during the oral proceedings. The skilled person is furthermore able to understand that any research worker having to carry out experiments will attempt to keep the costs thereof within acceptable limits, and that the object of document (D1) is not to disclose methods suitable for achieving high iodine-123 production yields. He also is able to understand that the Respondent's extrapolation regarding the curves of Figure 5 in (D1) is irrelevant. It is indeed clear that, the yield being essentially a positive function of proton energy, if a decrease in yield takes place after a maximum when said energy increases indefinitely, the curve representing yield versus proton energy necessarily exhibits an inflexion point. With regard thereto, it may not be inferred from Figure 5 of (D1) that the yield at 45 MeV proton energy should necessarily be too low.

At the priority date of the patent in suit, the skilled person also knew about the possibility of bombarding xenon gas with protons through metallic windows of a gas target assembly, and about the advantages which gas targets exhibit over solid targets - see document (D7), lines 10 to 13 of the second column and last paragraph. Therefore, the Respondent's objection that all scientists would have considered a gas target as a source of trouble does not convince the Board.

In the Board's judgment, therefore, and contrary to the opinion of both the Respondent and the Opposition Division, a skilled person involved in the production of iodine-123 would take into consideration the further teachings of (D1) as regards the results that might be expected from, inter alia, the reactions $^{124}Xe(p,pn)^{123}Xe \rightarrow ^{123}I$ and $^{124}Xe(p,2n)^{123}Cs \rightarrow ^{123}Xe \rightarrow ^{123}I$. As a matter of fact, the hint at doing so would be the stronger as document (D4) lays stress on the advantages of proton bombardment versus photon bombardment - see Title and section headed "Discussion" - and as the Respondent himself laid stress on the drawbacks of the latter method.

2.3 The skilled person learns from (D1) that, by using xenon with an enrichment of xenon-124 to 1% and by increasing the intensity of the proton beam bombarding the target, the yields actually achieved while carrying out the experiments reported there could be improved by a factor of 50 - see the last paragraph of section 4.3. He also learns that xenon irradiation with protons can lead to a radionuclidic purity similar to that obtained with other production methods, that xenon exhibits all advantages of a gas target, there being in particular the possibility of efficient heat dissipation, cryo pumping of target and reaction products, as well as that of good target recovery, and that xenon irradiation could be performed with a much larger ranges of machines than the $^{127}I(p,5n)^{123}Xe \rightarrow ^{123}I$ reaction - see page 264, lines 16 to 30 of the left hand column.

It is acknowledged that one of the conditions set to an increase in yield is the use of xenon enriched in its isotope 124. Nevertheless, as was already explained, the skilled person will accept this additional expense if it is compensated by an increase in yield. As a matter of fact, document (D3) proposes the use of xenon with enrichments of

about 3% to 4.5% xenon-124, which is more than the 1% envisaged in (D1) - see the lines 4 to 8 of column 3. Thereby, despite the less efficient application of photon bombardment, iodine-123 with 98.8% purity grade is obtained - see the lines 23 to 25 of column 2 - and the contamination by iodine-125 can be rendered as low as 0.2% - see example 1. Such a low contamination being of decisive importance in medical applications, it is consequently evident that, at the priority date of the patent in suit, neither technical nor economical prejudices could deter the skilled person from using xenon enriched in xenon-124 for producing radio-active iodine-123. This is actually confirmed by the appendix to document (D5), which shows that the skilled public involved in the production of iodine-123 was eager to know about progress achieved in separating xenon-124, and that enriching xenon to 20% xenon-124 was already a matter of routine - see W.G. Myers' question and R.A. Schwind's answer thereto.

In the Board's judgment, therefore, envisaging to produce high-purity iodine-123 by carrying out the method known from section 4.3 of document (D1) with xenon enriched in xenon-124 instead of natural xenon as gas target would not have required from the skilled person any display of inventive talent at the priority date of the European patent. Subsidiarily, the Board also takes the view that, contrary to the opinion of both the Respondent and the Opposition Division, the closest prior art is not based on the indirect process $^{127}I(p,5n)^{123}Xe \rightarrow ^{123}I$.

2.4 The contamination of iodine-123 by other isotopes being low if xenon enriched in xenon-124 is used and, moreover, exposed to proton bombardment, any deposit on the inner walls of the gas-target assembly will consist of a mixture of caesium-123 and high-purity iodine-123. The latter being radioactive, it would obviously be irrelevant not to

recover it for immediate use, for instance through washing with an alkaline solution - see page 540 of document (D6), lines 3 to 10 of the right hand column; see also example 1 in (D3).

The Board, therefore, shares the Appellant's view that no inventive step can be perceived in "depositing iodine-123 on the deposit region in the gas-target assembly", nor in "washing the gas-target assembly deposit with an aqueous solution to recover therefrom the iodine-123".

2.5 The Board now observes that xenon-123 decay to iodine-123 does not depend on how xenon-123 has been produced. Therefore, it readily becomes evident that, to the skilled person envisaging to carry out a method of producing iodine-123 which involves the decay of xenon-123 generated through proton bombardment of xenon gas target, any documents disclosing installations where xenon-123 decays to iodine-123 will be of interest. This applies in particular to document (D2).

Document (D2) discloses a method and apparatus for producing iodine-123 by the reaction $^{124}Xe(\ ,n)^{123}Xe \rightarrow ^{123}I$. Said apparatus comprises a xenon-target vessel and a glass vial - see Figure 1. After target irradiation, xenon is evacuated towards the glass vial, which glass vial is cooled with liquid nitrogen. The irradiated xenon condenses in the glass vial and is retained there for six hours to build up the maximum activity of iodine-123. Then, by warming up the glass vial and cooling the target vessel, xenon returns to said vessel and condenses there, whereas iodine-123 is left on the walls of the glass vial - see page 184, paragraph bridging the columns.

Bearing in mind that the patent in suit teaches to keep xenon frozen during the decay period - see from line 57 of column 5 to the first line of column 6 - the glass vial is, within the meaning of Claim 1, a "gas decay vessel having at least one further deposit region located therein". Furthermore, it results from the preceding that document (D2) also discloses the steps of "transferring the irradiated xenon gas from the target assembly to the gas decay vessel at the termination of a first predetermined period" - i.e. the period during which irradiation takes place - and of "retaining the irradiated xenon gas in the decay vessel during a second predetermined period while the xenon-123 therein decays to iodine-123". Envisaging to perform such steps after irradiation of a xenon gas target with low energy protons and providing for this purpose a gas decay vessel, however, does not require the exercise of inventive ingenuity.

2.6 According to (D2), and to the patent in suit as well, xenon-123 is allowed to decay while being in its frozen state. A high radioactivity has thus to be expected: as a matter of fact, this is the very reason why the patent in suit teaches to dispose the gas decay vessel (9) in a so-called "shielded facility (14)", hence remotely from the gas-target assembly (5). It follows therefrom, however, that allowing the xenon-123 to decay remotely from the gas target assembly aims at solving a technical problem different from that of achieving higher yields while producing 123-chain precursors of iodine-123 via proton bombardment of xenon. Starting from the state of the art which can be derived from (D1), the teachings of document (D3) show how to enhance the iodine-123 yield, whereas those of (D2) show how to solve the problems bound to xenon-123 decay. No unexpected combinatory effect being provided thereby, the situation is substantially the same as in the case to which Decision T 315/88 pertains. The

Board, therefore, cannot share the Respondent's view that documents (D1) through (D3) would form a mosaic.

2.7 In the Board's judgment, therefore, Claim 1 lacks an inventive step.

3. Claim 1 of the patent in suit is not allowable - Article 52(1) EPC in relation to Article 56 EPC.

4. The grounds of opposition mentioned in Article 100(a) EPC thus prejudice the maintenance of the patent.

Hence, there is no need to examine whether the grounds of opposition mentioned in Article 100(b) and (c) EPC also prejudice the maintenance of the patent.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. European patent No. 0 096 730 is revoked.

The Registrar The Chairman

M. Beer G.D. Paterson