Purpose and extent of the examiners’ report

The purpose of the present examiners’ report is to enable candidates to prepare for future examinations (cf. Article 6(6) of the Regulation on the European qualifying examination for professional representatives).

1. General considerations

It is noted that any references in this text to the Guidelines for Examination at the European Patent Office (GL) refer to the version valid at the date of the examination.

1.1 Introduction

The paper relates to cooking using solar radiation (“solar cooking”). In the conventional solar cooking presented by the application as prior art (D1), solar radiation is concentrated by a parabolic mirror on a plate on which the food to be cooked is placed. The plate absorbs the concentrated solar radiation and heats up, cooking the food. However, solar cooking as in the prior art of D1 does not function on cloudy days or during the night, because the cooking process is quickly interrupted in the absence of solar radiation.

Therefore, the application emphasises the need to store heat for continuing the cooking process also in the absence of solar radiation. Storing heat simply by raising the temperature of the cooker is disadvantageous in that the system has to sustain a wide temperature range.

The application presents the principle of heat storage based on the change of phase of a material. When the material is heated to its melting temperature, additional heat supplied to the material during melting does not increase its temperature but instead induces the phase change from solid to liquid. The amount of heat necessary to complete the change of phase (the “heat of fusion”) is released back by the material upon solidification. The invention concerns solar cooking with heat storage based on
change of phase. As material subject to the change of phase, the invention uses salt compositions having an appropriate melting temperature.

1.2 The invention as presented in the application as filed.

The application initially claims a cooking process wherein solar radiation is concentrated on a heat storage unit to heat it (claim 1), and a heat storage unit for use in said process, having the features of claim 2. The heat storage unit of the original claims comprises a box with heat-insulating walls and an opening in which a light absorbing plate is fitted, the box containing a salt composition in thermal contact with a cooking surface.

Dependent claim 3 is directed to protect the embodiment of Fig. 2, wherein the cooking surface is provided by a cooking plate which is fitted in a second opening of the box, i.e. the cooking plate is different from the light absorbing plate. Dependent claim 4 requires that the heat storage unit is portable by means of handles. Dependent claim 5 is directed to the second embodiment of Fig. 3, in which the cooking surface is a surface of the light absorbing plate, i.e. no separate cooking plate is necessary. Claim 6 defines the solar cooker comprising a heat storage unit as in independent claim 2 and a parabolic mirror concentrating solar radiation on the heat storage unit.

1.3 The prior art

Three documents are cited against the application: D1, D2 and D3. D1 is the document cited in the application and discloses a solar cooker comprising a parabolic mirror concentrating solar radiation on a solid metal plate on which the food to be cooked is placed. In a second example, the plate is substituted by a stand for mounting a pot and light is concentrated directly on the bottom surface of the pot.

D2 discloses a cooking pot with a reserve of kitchen salt (sodium chloride) in a sealed container. Sodium chloride ensures a good thermal flow from the bottom of the container, subject to heating, to the top of the container where food is placed. Sodium chloride is stated to store heat when brought to high temperatures, but melting is not desired and in fact occurs at temperatures (800°C) far higher than
normal cooking temperatures. Therefore, although D2 discloses gaps between the salt grains, they are not disclosed to be dimensioned to allow the salt to expand upon melting.

D3 discloses a portable radiator capable of storing heat during daytime and releasing it in the evening. The heat storage is based on melting a phase-change material (PCM). It comprises a heat-insulating box fitted with a light-absorbing plate and containing the PCM. For storing heat, the light absorbing plate is exposed to sunlight by opening hinged covers, heats up and melts the PCM. For releasing heat, the covers are closed, and the heat of fusion is released by the PCM to air in conduits obtained in a metal block. D3 makes two examples of PCM for use in the radiator: stearic acid (a fatty acid) having a melting temperature of 70°C and the salt composition MgCl2.6H2O (melting temperature of 115°C). The latter composition however requires a long exposure to sunlight and poses the risks of burns or fires.

1.4 The communication

The examining division raises an objection of lack of novelty of claim 1 with respect to D1, noting that the metal plate of D1 stores a certain amount of heat when heated.

Furthermore, the heat storage unit of claim 2 is found not novel with regard to both D2 and D3. In D2, the salt composition is sodium chloride, which also stores heat when heated. D3 discloses, in its second example, the salt composition MgCl2.6H2O which is also used in the invention (composition A of Table 1). The examining division notes that the device disclosed by D3 is suitable to be used as in the second embodiment of the application (Fig. 3), i.e. the surface of the light absorbing plate of D3 could be a cooking surface on which food to be cooked could be put.

The examining division also raises an objection of lack of clarity (Art. 84 EPC) due to missing essential features (Rule 43(3) EPC) in independent claim 2. An empty space dimensioned to allow the salt composition to expand upon melting is found to be essential for the functioning of the heat storage unit.
Dependent claims 3-5 are also not new with respect to D2 and/or D3. The solar cooker of dependent claim 6 does not involve an inventive step in view of the obvious combination of the pot of D2 with the solar cooker of D1 (Fig. 2).

1.5 The client’s letter

The client proposes a set of claims addressing the objections raised by the examining division. In this set of claims, the cooking process of claim 1 is limited by specifying that the heat storage unit comprises a salt composition. The client indicates that a range of melting temperatures is not necessary as long as the process includes melting the salt composition.

The client however acknowledges that a limitation of the melting temperatures seems necessary to overcome the objections against claim 2. Furthermore, the client indicates that after further tests the use of salt composition A (MgCl₂·6H₂O) has been abandoned. The material with the lowest melting temperature planned to be use in commercial products is the salt composition B (melting temperature of 130°C). The client proposes to introduce in claim 2 the range of melting temperatures 120°C to 350°C, in order to exclude salt composition A but including salt composition B and the remaining salt compositions.

Furthermore, the client accepts to include an empty space in claim 2 in order to overcome the clarity objection.

The client has also swapped claims 4 and 5, changing the dependencies, in order to protect a heat storage unit as in the second embodiment (Fig. 3) which is portable by one or more handles.

1.6 The draft set of claims

The client introduces the following deficiencies in the claims of the draft set of claims:

Claim 1 does not involve an inventive step because it would be obvious for the skilled person to use, in the cooking process of D1 (Fig. 2) a pot as in D2, for obtaining the advantages mentioned in D2. Since the pot of D2 is a heat storage unit containing a salt composition, said combination would obtain a process as in claim 1. This
objection is derivable from the objection against claim 6 of the communication (point 5.3).

Claim 2 specifies that the box comprises an “empty space”. However, in the original application ([010], [013]) the empty space is always “dimensioned to allow the salt composition to expand upon melting”. Neglecting the latter feature, which is inextricably linked to the empty space for achieving the function of allowing the salt composition to melt, constitutes an unallowable intermediate generalisation in the sense of Art. 123(2) EPC (Guidelines H-V 3.2.1). Moreover, the lack of essential features would not be completely remedied.

Furthermore, although the range of melting temperatures of claim 2 (120°C- 350°C) proposed by the client recovers novelty over D2 and D3, it infringes Art. 123(2) EPC, because the value 120°C is not disclosed.

Claim 5 does not correspond to the client’s wishes as expressed in the letter because it refers to “handles” rather than “one or more handles”.

1.7 The challenges of the paper

The main challenges of the paper were to:

a) amend the client’s draft claim set to fulfil the requirements of the EPC whilst conforming to the client’s wishes

b) write a reasoned letter of reply

- explaining the basis for the amendments of the claims

- providing convincing arguments that the claims are clear and the amended independent claim is new and involves an inventive step in the light of the cited prior art.

1.8 The marking scheme

Answer papers are marked on a scale of 0 to 100 marks.

Appropriate amendments to the draft set of claims: Max. 30 marks, min. 0 marks.
Again, this year, not the claim set as a whole but the amendments carried out received marks. From the marks awarded for the amendments of a claim, marks were deducted for further unnecessary limitations or for introducing in the claim further non-compliances with the EPC. For instance, a claim that was amended in a way that novelty over the prior art was lost did not attract any mark, i.e. all gained marks were deducted. If however a non-compliance was already present in the claim of the client and was not remedied by the candidate by amendment (e.g. a claim 2 which contravened Art. 123(2) EPC because the range proposed by the client was not modified), the claim was penalised by not receiving the marks for the expected modification, without further deductions (e.g. for infringing Art. 123(2) EPC) that would amount to double penalisation. The overall number of marks per claim could not be negative. However, deductions could be made from the total marks awarded to the claim set in case the candidate worsened the client’s positions in other ways, e.g. by introducing a deficiency or an unnecessary limitation in a claim that was not modified by the client.

As in previous years, the number of available marks corresponds to the difficulties of each challenge or the complexity of the expected amendment. In other words, more difficult challenges were awarded more marks than easier challenges. This year, most of the challenges were in the independent claims.

For the argumentation in the letter of reply: Max. 70 marks and min. 0 marks were available. A large share of these marks, namely 40 marks, was available for the inventive step argumentation, which was expected to be developed separately for each of the independent claims.

No marks were available for formulating a letter to the client setting out reasons why the claim set proposed by the client were further amended.

Unless otherwise stated, the individual marks referred to in the various sections of this document apply to the example set of claims.
2. Example set of claims

1. A cooking process, including the steps:
   providing a heat storage unit (3) containing a salt composition (6);
   concentrating solar radiation (12) onto the heat storage unit (3) to heat it, thereby melting the salt composition (6); and
   cooking food (8) placed on the heat storage unit (3).

2. A heat storage unit (3) for use in the process of claim 1, comprising:
   a box (4) having heat-insulating walls and an opening,
   the box (4) containing a salt composition (6) and comprising an empty space (7) dimensioned to allow the salt composition (6) to expand upon melting,
   a light-absorbing plate (5) fitted in the opening and in thermal contact with the salt composition (6), and
   a cooking surface (9) in thermal contact with the salt composition (6),
   characterised in that:
   the salt composition (6) has a melting temperature from 130°C to 350°C.

3. Heat storage unit according to claim 2, wherein the cooking surface (9) is a surface of a cooking plate (2) fitted in a second opening of the box (4) and in thermal contact with the salt composition (6).

4. Heat storage unit according to claim 2, wherein the cooking surface (9) is a surface of the light-absorbing plate (5).
5. Heat storage unit according to any of claims 2 to 4, wherein the heat storage unit (3) is portable by means of one or more handles (10).

6. A solar cooker (1) comprising:

a heat storage unit (3) according to any of claims 2 to 5;

a parabolic mirror (11) for concentrating solar radiation (12) on the light-absorbing plate (5) of the heat storage unit (3).

A claim set with highlighted amendments is given in the appendix.

3. Expected amendments in the claims (up to 30 marks available)

The draft set of claims proposed by the client contains features which result in a claim, or claims, which are considered not to be consistent with the EPC. Marks were awarded for making appropriate amendments to the draft set of claims for bringing it into accordance with the EPC.

No marks are awarded for merely filing the claim set proposed by the client or for the formulation of additional dependent claims.

Apart from the claims explicitly requested by the client, drafting additional claims was not expected. The client states in the last sentence of his letter that he expects no further independent or dependent claims.

It is noted that full marks could be awarded for amendments that differ from those of the example claim set, provided that their scope is equivalent. This is considered on a case by case basis. Marking of the dependent claims was adapted accordingly.

It proved efficient that amendments were made by handwriting on the sheet of the client's claims or using parts thereof.
3.1 Independent claim 1 (max. 10 marks)

The expected solution for claim 1 comprises adding “thereby melting the salt composition” ([009] of the application), which was awarded 10 marks. The client’s letter indicated that this aspect is fundamental for the invention. This amendment makes the claim inventive over the combination of D1 and D2.

3.2 Independent claim 2 (max. 18 marks)

The expected solution for claim 2 comprises the amendments:

- specifying that the empty space is dimensioned to allow the salt composition to expand upon melting (8 marks), to remedy the lack of compliance with Art. 123(2) and 84 EPC;

- limiting the range of melting temperatures to 130°C-350°C (10 marks). This restriction complies with the client’s indication that the material with the lowest melting temperature for use in commercial products has a melting temperature of 130°C. This restriction is allowed under Art. 123(2) EPC because it is obtained from the range 110°C-350°C ([006]) in combination with the value 130 °C of composition B of Table 1. The test to be applied is whether the isolated value 130 °C is not so closely associated with the other features of the example, i.e. the particular salt composition B, in order to determine the effect of this example (T 201/83, Case Law Book E-II 1.3.2). In this case the test is passed because the application discloses ([007]) that other salts are known having the same melting temperatures of those of Table 1, and would thus have the same effect. The temperatures of Table 1 are thus not inextricably associated to the respective salts. This amendment merely represents a quantitative reduction of the original range to a value already envisaged in the application, without a new technical effect or new information being presented to the skilled person.

3.3 Claim 5 (max. 2 marks)

It was expected that claim 5 was amended by specifying “one or more” handles (2 marks), as in the original application at [012], [013].
4. Claims differing from the example claims

4.1 Deductions for too “narrow” claims or inferior solutions

Where an independent claim of an answer paper differs from that of the example solution and results in a claim which is considered to be inappropriate for protecting the client’s invention, marks were deducted.

4.1.1 Independent claims

Claims that were inappropriately limited, with respect to the client’s wishes and to what could be claimed whilst respecting the requirements of the EPC, were penalised.

Amendments different from the expected ones - examples:

A) Claim 1 defined in terms of a range of melting temperatures, e.g.

1. A cooking process, including the steps:

   providing a heat storage unit (3) containing a salt composition (6), wherein the salt composition has a melting temperature of 130°C to 350 °C [or 110°C to 350°C];
   concentrating solar radiation (12) onto the heat storage unit (3) to heat it,
   cooking food (8) placed on the heat storage unit (3).

For claim 1, an answer that specified a range of melting temperatures instead of the step of melting the salt composition was awarded only 5 marks out of the available 10. Such answer is inferior to the expected claim 1 because it has a narrower scope with respect to the wishes of the client in terms of the salts that may be used in the process. Furthermore, in such a case it remains uncertain whether or not the salt composition actually melts during the process and thus whether the technical effect of storing the heat of fusion is obtained.
B) Claim 1 defined in terms of a range of melting temperatures and of a step of melting the salt composition, e.g.

1. A cooking process, including the steps:
   
   providing a heat storage unit (3) containing a salt composition (6), wherein the salt composition has a melting temperature of 130°C to 350 °C [or 110°C to 350°C];

   concentrating solar radiation (12) onto the heat storage unit (3) to heat it, thereby melting the salt composition,

   cooking food (8) placed on the heat storage unit (3).

A process claim containing the melting step and the range of melting temperatures could obtain more marks (max. 7 marks), since the melting step, necessary for obtaining the technical effect, was present.

C) Claim 2 disclaiming the salt composition A, e.g.

2. A heat storage unit (3) for use in the process of claim 1, comprising:

   a box (4) having heat-insulating walls and an opening,

   the box (4) containing a salt composition (6) and comprising an empty space (7) dimensioned to allow the salt composition (6) to expand upon melting,

   a light-absorbing plate (5) fitted in the opening and in thermal contact with the salt composition (6), and

   a cooking surface (9) in thermal contact with the salt composition (6), characterised in that:

   the salt composition (6) has a melting temperature from 110°C to 350°C and it is not MgCl₂·6H₂O.

For claim 2, answers containing a disclaimer of the salt composition A, in combination with a broader range of melting temperatures 110°-350°C, were awarded a maximum of 5 marks out of the 10 available for this issue. These answers were inferior to the expected one because they did not consider the indication of the client that the lowest melting temperature of commercial interest is 130°C. The EPO Guidelines at H-V 3.3 treat the deletion of claimed subject-matter and indicate that
"wherever possible, the claim should be limited by a positive indication of what subject-matter remains instead of stating what is being deleted from the subject-matter (as a disclaimer would do)". In the present case it was indeed possible to limit positively the range of the claim to a lower value of 130°C satisfying the wishes of the client and the requirements of Art. 123(2) EPC.

Moreover, a claim as in example C) was, although arguably new, less convincing in terms of inventive step, because the skilled person might arrive at the claim by substituting the salt composition of D3 with another one having the same or slightly lower melting temperature.

Further unnecessary limitations - examples

If, in combination with the expected amendments, further unnecessary limitations were added, the marks gained from the amendments could be reduced.

In claim 1, it was not necessary to add a parabolic mirror because it was not disclosed as inextricably linked to the step of melting a salt composition. The cooking process described in [011] and [013] does not require a parabolic mirror but only concentrated light. [006] also provides a generic disclosure of melting a salt composition not necessarily in combination with a parabolic mirror. However, since no other alternative is envisaged by the application, only 2 marks were deducted.

However, no marks were deducted if claim 1 contained features related to the empty space for allowing the expansion of the salt composition upon melting (provided that the claim complied with Art. 84 and 123(2) EPC). The client’s letter suggests that no useful embodiment would lose protection by this amendment.

In claim 2, adding features that were clearly indicated as optional in the description (fins, particular materials for the plates) caused a deduction of 5 marks per feature.

Equivalently, claim 2 as in the expected answer wherein the range of melting temperatures was 130°C to 348°C instead of 130° to 350°C was considered unnecessarily limited and thus attracted only 5 marks out of the 10 available for the amendment of the range.
Furthermore, claim 2 amended to specify the list of salt compositions B-G instead of
the range of melting temperatures 130°C-350°C was considered to be severely
limited and thus attracted 0 marks out of the 10 marks available for the amendment
of the range.

If, for any claim, an unnecessary limitation would cause one of the two embodiments
(Fig. 2 or 3) to lose protection, half of the marks gained for that claim were
deducted.

4.1.2 Dependent claims

If unnecessary limitations were introduced on the dependent claims, deductions
could be made from the total marks of the claim set, on a case-by-case basis.

4.2 Deductions for non-compliance with the EPC

Marks were deducted if, in addition or in substitution of the expected amendments,
the claims were modified so that a new deficiency was introduced.

A) Claim 2 based on the broad range of 110°C to 350 °C

Claim 2 as in the expected solution, wherein the range of melting temperatures was
defined from 110°C to 350°C was considered not new over D3 (for the same reasons
as in point 3.2 of the communication) and thus attracted 0 marks overall.

The same applied in general to versions of claim 2 that included salt composition A
without further distinguishing features over D3.

B) Further examples

If further features were introduced which violated e.g. Art. 123(2) or 84 EPC, marks
were deducted. For example, if claim 1 contained a step of "raising the temperature
of the salt composition to the melting temperature" (description. [011]), without
explicitly stating that the salt composition melts, 10 marks were awarded as if the
step of "melting" was present but 2 marks were deducted for lack of clarity. Other
issues were evaluated case-by-case.
For dependent claims not complying with the EPC, marks could be deducted from the total marks of the claim set.

4.3 Formal matters

For an answer paper having an independent claim 1 according to the example solution it is considered appropriate to use the one-part form. Independent claim 2 can be drafted in the two-part form wherein the range of temperatures 130°C-350°C is in the characterising portion and the features of the preamble are disclosed by D3. According to the Case Law, it was not expected that the preamble is limited by the features of the closest prior art basing the argumentation for inventive step. However, no marks were deducted for absence of the two-part form. A wrongly subdivision of the features in the two-part form caused a deduction of 1 mark per claim.

For missing or very incomplete reference signs in the claims, 1 mark is lost.

4.4 Other solutions not based on the client’s draft claim set

For dependent claims in addition to the dependent claims provided by the client, no marks were available, because the client explicitly requested not to add new, i.e. further, dependent claims.

For amendments to the description, no marks are available.

5. Letter of Reply to the EPO (up to 70 marks available)

5.1 General remarks

It was necessary to provide arguments demonstrating that the objections raised by the examining division have been overcome, providing a basis for all the amendments made, and explaining why the subject matter is both novel and inventive.

It is noted that the examples for sections of a letter of reply given in the following are, unless otherwise stated, appropriate for the example claim set. For an answer paper having a different claim set, the letter of reply may differ and the answer paper is considered accordingly.
No marks are available for a letter to the client or for a letter to the marker.

All the necessary information should be contained in the letter of reply to the examining division.

A total of 70 marks was available for the arguments. The arguments were assessed on the basis of the actual set of claims submitted. Thus, for example, if additional claims are formulated, a full basis needs to be provided for all the claims.

5.2 Basis for the amendments (max. 18 marks)

A full basis had to be provided for all amendments. It was necessary to identify all the amendments made in the set of claims filed as compared to the original set of claims. The basis needed to be provided irrespective of whether or not the amendment was proposed in the client's letter or is a further amendment to the draft set of claims. Amendments proposed by the client, but which are not present in the set of claims submitted should not be discussed.

Arguments were required if features were combined from different parts of the application. Similarly, if the wording used in the application was modified, if a feature was taken from an example, detailed arguments were needed in support of these amendments.

If the same amendment was done in both independent claims, the marks for the discussion of said amendment were awarded only once.

5.2.1 Independent claim 1 (max. 5 marks)

For indicating and explaining a basis for claim 1, 5 marks were available. For the example claim 1, these marks were awarded to the following scheme:

1 mark for indicating [009] as the basis for the heat storage unit "containing a salt composition";

2 marks for indicating [009] as the basis of "melting the salt composition";
2 marks for arguing that the added features are not inextricably linked to other features of the description (e.g. the temperature range is only optional, see [006] or original claim 2).

5.2.2 Independent claim 2 (max. 9 marks)

The challenge posed by Art. 123(2) EPC on claim 2 was more difficult and thus more marks were available. A total of 9 marks were awarded under the following scheme:

2 marks for indicating [010] and [013], applying to each embodiment, for the "empty space dimensioned to allow the salt composition to expand upon melting".

7 marks in total for justifying the range 130°C-350°C, e.g. by indicating that said range is obtained from the range 110°C-350°C of [006] (2 marks) limited by the particular value of 130 °C of salt composition B of Table 1 (2 marks). It should also be discussed that the value of 130°C is not so closely associated to the particular salt B for determining the effect of the invention at 130°C, as other salt compositions having the same melting temperature are known ([007]) and would equally work. The test set out in T201/83 for amending a range based on an individual value is thus satisfied. The amendment merely limits the original range to a point already envisaged by the application and thus equates to disclaiming part of the original range (Guidelines H-V 3.3, last paragraph and T433/86) (3 marks, explicit citation of the decisions was not necessary, as long as the principles were discussed).

Alternatively, a maximum of 4 marks were available for convincingly arguing the compliance with Art. 123(2) EPC of a range 110°C-350°C disclaiming the salt composition A: 2 marks for indicating [006] as the basis of 110°-350°C, 2 marks for discussing the allowability of disclaiming disclosed subject-matter (G2/10). Arguments related to undisclosed disclaimers (G1/03) were not awarded marks.

5.2.3 Claims 3,4 and 6 (max. 1 mark)

1 mark was awarded for indicating that features basing the amendment of claim 2 are disclosed in combination with the additional features of claim 3 ([see [006] and
[10]), claim 4 ([006] and [013]) and claim 6 (implicit in [009]) Claims 3,4, 6 thus comply with Art. 123(2) EPC after the amendment of claim 2.

5.2.4 Claim 5 (max. 3 marks)

The discussion of the amendment of claim 5 was expected and awarded a maximum of 3 marks.

Example:

Claim 5 contains the additional feature of original claim 4 (portable heat storage unit) also in combination of those of original claim 5, defining the second embodiment of the heat storage unit ([013]; Fig. 3). Since the heat storage unit of this embodiment contains handles and can be turned upside-down ([013]) it is implicitly portable (2 marks). Claim 5 has also been amended to cover the case of only one handle ("one or more handles") as disclosed in pars. [012] and [013] for both embodiments (1 mark).

5.3 Clarity (Art. 84 EPC) (max. 2 marks)

The letter of reply should indicate that the objection of lack of clarity has been overcome by including the empty space dimensioned to allow the salt composition to expand upon melting" (2 marks). This may have been presented in combination with an argument for justifying the basis for the amendment.

Answers not containing said amendment but instead arguing that said empty space was not essential could receive 1 mark.

5.4 Novelty (max. 10 marks)

5 marks per claim were awarded for showing the novelty of each independent claim 1 and 2. It was expected to indicate at least one technical feature which renders claims 1 and 2 novel with respect to each of D1, D2, and D3.
Examples:

- Claim 1 is novel over D1 because D1 does not disclose a heat storage unit containing a salt composition (3 marks);
- Claim 1 is novel over D2 because D2 does not disclose a step of melting a salt composition (1 mark);
- Claim 1 is novel over D3 because D3 does not disclose a cooking process (1 mark);
- Claim 2 is novel over D1 because D1 does not disclose a heat storage unit containing a salt composition (1 mark);
- Claim 2 is novel over D2 because D2 does not disclose a salt composition with a melting temperature in the range 130°C-350°C (2 marks);
- Claim 2 is novel over D3 because D3 does not disclose a salt composition with a melting temperature in the range 130°C-350°C (2 marks).

If a part of the argumentation was not correct, full marks were not awarded.

5.5 Inventive step argumentation for the independent claims (max. 40 marks)

It is appropriate to provide arguments which are structured to follow the problem-solution approach (see GL G-VII 5).

This year, arguments for each of the independent claims 1 and 2 were expected. **20 marks** for the argumentation of each claim were available.

Argumentations that treated both claims using a single problem-solution approach attracted less marks. The closest prior art for the process of claim 1 of the expected solution is considered to be different from that of the device of claim 2. Therefore, an argument based on a single choice of the closest prior art could not be equally convincing for both claims. For these "grouped" arguments, marks were awarded to the extent that the argument convincingly justified the inventive step of each one of claims 1 and 2, based on the subdivision of marks given below.
In general, inventive step arguments for claims that were clearly not new were considered fundamentally flawed and thus received very few marks. For instance, an inventive step argument for a claim that was not new could attract at most 5 marks.

Arguments in support of the inventive step of claim 6 were not expected and thus received no marks. The inventive step of claim 6 is automatically demonstrated by the inventive step of the heat storage unit of claim 2 contained in the cooker of claim 6.

5.5.1 Claim 1 (max. 20 marks)

5.5.1.1 Identifying the closest prior art (max. 4 marks)

In selecting the closest prior art, the first consideration is that it should be directed to a similar purpose or effect as the invention, or at least belong to the same or a closely related technical field as the claimed invention.

For claim 1 such as the example claim presented above, D1 is considered to be the closest prior art according to GL G-VII, 5.3, since it addresses the same field of solar cooking as the process of claim 1 and is the best starting point for the most convincing problem-solution approach in favour of inventive step. For stating that D1 is the closest prior art with respect to this independent claim, 1 mark was awarded.

For a statement identifying D2 or D3 as closest prior art, no marks were awarded.

Reasoning why D1 was chosen as closest prior art could attract 2 marks, reasoning why neither of D2 or D3 is chosen 1 mark.

Example:

D1 is considered to be the closest prior art to the process of claim 1 (1 mark) because it discloses a cooking process based on solar radiation, i.e. having the same purpose of the process of claim 1 (2 marks). Neither D2 nor D3 concern solar cooking and are thus less promising starting points to arrive at the invention process of claim 1 (1 mark).
5.5.1.2 Formulation of the objective technical problem (max. 6 marks)

The next stage is to establish in an objective way the technical problem to be solved. This requires the steps of:

1. Identifying, in terms of technical features, the difference between the claimed invention and the closest prior art, that is, the distinguishing features of the claimed invention (1 mark);
2. stating the technical effects or advantages of the difference (2 marks); and
3. formulating a technical problem which is solved by these technical effects (3 marks).

Example:

The process of claim 1 differs from D1 in that the heat storage unit contains a salt composition, and the cooking process includes a step of melting the salt composition (1 mark).

The technical effect of this difference is that heat of fusion is stored by the salt composition, at a constant temperature. The heat of fusion is released back when solar radiation is interrupted and the salt composition solidifies (2 marks).

The technical problem to be solved is therefore: how to reduce temperature variations in the process of solar cooking even if the solar radiation is interrupted, in order to continue cooking (3 marks).

5.5.1.3 Arguments in support of inventive step (max. 10 marks)

Arguments should support the features of the independent claim. They should be convincing and well-structured. In order to obtain full marks in this section, arguments should have been presented which fully answer the question as to why the skilled person, knowing the teaching of the prior art as a whole, would not arrive at the claimed subject matter. Such arguments can be structured to consider the following aspects:
• Would the skilled person arrive at the subject matter of the claim by considering the teaching of the closest prior art on its own?

• Would the skilled person consider combining the teaching of the closest prior art with that of other prior art documents in order to solve the objective technical problem?

• If the skilled person were to combine the teaching of the closest prior art with other items of prior art, would (s)he arrive at the subject matter of the claim?

Considering D1 alone (2 marks available). Example:

D1 provides no hint whatsoever of melting a salt composition in order to store heat for solving the technical problem; in particular, D1 does not suggest to replace the single-piece metal plate, described as advantageous, with a heat storage unit such as that disclosed in D3, which has a complicated structure and internal gaps.

Considering D1 and D2 (3 marks available). Example:

The skilled person might look for a solution to the technical problem in D2, which D2 relates to cooking while storing heat with a salt composition, but the salt composition of D2 does not melt at cooking temperatures; on the contrary, in D2 it is desired that the salt composition maintains its granular state; the skilled person using in D1 the heat storage unit of D2 would not obtain a process wherein the salt composition is melted as in claim 1.

Considering D1 and D3 (5 marks available). Example:

D3 is the only document disclosing a heat storage unit including a salt composition (MgCl₂ . 6H₂O) which melts to store the heat of fusion. However, the skilled person does not receive any suggestion of combining this disclosures of D3 into the method of D1, at least for the following reasons:

D3 relates to the different technical field of heating and thus would not be taken into consideration by the skilled person seeking a solution to a technical problem of a cooking process;
The salt of D3 is presented as an unsatisfactory material for the purpose of D3, which does not give to the skilled person any hint towards using it in a cooking process;

Should the skilled person attempt to use in D1 the stearic acid of D3, described as a convenient and non-toxic PCM, he would not obtain a process based on a salt composition;

The temperatures reached in the solar cooker of D1 are outside the usual working range of D3; The skilled person would not know how to use the heat storage unit of D3 with the solar cooker of D1. Should the skilled person attempt to store the heat generated by the concentrated solar radiation of D1, he might indeed illuminate the light-absorbing plate of D3, facing down, with the concentrator of D1. He would however find no indication of where to place the food to be cooked: there is absolutely no suggestion in D3 to use either the light absorbing plate or the openings of the radiator as a cooking surface on which to put food to be cooked.

Arguments based on D2 as the closest prior art were marked out of a maximum of 10 marks, because the reasoning in support of inventive step was less convincing. Analogously, arguments relating to a process claim relying only on a range of melting temperatures (see example A of section 4.1.1) were marked out of a maximum of 10 marks, if it was uncertain that the technical effect of melting the salt composition was achieved.

Arguments merely referring to those of claim 2 were awarded a maximum of 3 marks.

5.5.2 Claim 2 (max. 20 marks)

5.5.2.1 Identifying the closest prior art (max. 6 marks)

For claim 2 as in the example solution, the identification of the closest prior art was more challenging. D2 is considered as the appropriate choice of the closest prior art.
Example:

D2 is considered as the closest prior art since it relates to the same general purpose of cooking and has the most features in common with claim 2 (1 mark for stating D2, 2 marks for the reasoning).

The radiator of D3 is a less promising starting point for the skilled person to obtain the invention, because any modification of the device of D3 would be made by the skilled person with the purpose of obtaining a device of the same type (T570/91, T749/11), i.e. a radiator. D3 leads the skilled person away from using a salt composition with a high melting temperature ([004]) above 115°C in a radiator (2 marks).

The heat storage unit of D1 is an aluminium plate and thus has fewer features in common with the invention as compared to D2 (1 mark).

5.5.2.2 Formulation of the objective technical problem (max. 6 marks)

Example:

The heat storage unit of claim 2 differs from D2 at least in that it includes:

- a salt composition having a melting temperature of 130°C to 350 °C (NaCl of D2 melts at 800 °C) (1 mark).

The technical effect of this feature, in combination with an appropriately dimensioned empty space, is that the salt composition melts at cooking temperatures, thereby storing heat in the form of heat of fusion. D2 stores heat by raising a temperature of the salt (2 marks).

The objective technical problem to be solved may therefore be regarded as: increase the amount of heat stored without an excessive temperature increase (3 marks).
5.5.2.3 Arguments in support of inventive step (max. 8 marks)

Considering D2 alone (3 marks available). Example:

D2 itself gives no hint to the skilled person towards adopting a salt that would melt at a cooking temperature. On the contrary, it appears necessary in D2 that the salt remains in solid granular form in order to permit air circulation and thus a uniform heat distribution ([002]).

Considering D2 and D1 (1 mark available). Example:

D1 does not disclose any salt composition and therefore does not provide any meaningful suggestion of the invention.

Considering D2 and D3 (4 marks available). Example:

D3 discloses a salt composition as a phase-change material for storing heat as heat of fusion. However, D3 deals with storing solar heat for heating a tent, which has no relationship with the cooking pot of D2, that does not rely on solar heat. The skilled person would be reluctant to adopt in a cooker any composition not disclosed within the same context, to avoid contaminating the food with possibly toxic compositions. Furthermore, the salt composition of D3 is mentioned as an unsatisfactory choice. The skilled person has therefore no realistic incentive to adopt this teaching of D3 into D2. Moreover, since the salt composition of D3 has a melting temperature of 115°C outside the range of claim 2, even adopting said salt composition in D2 would not obtain the heat storage unit of the claim.

Arguments based on D3 as the closest prior art were marked out of a maximum of 10 marks. Because an argument based on D3 as closest prior art is anyway bound to conclude that the solution of the invention is not obvious (see section 5.5.2.1 above), such an argument cannot be taken as a convincing proof of inventive step when the remaining documents provide a more promising starting point.
An even less promising starting point is provided by document D1 (max 5 marks for arguments based on D1 as the closest prior art). This was for example the case when the same argument for claims 1 and 2 was based on D1 as closest prior art.

Arguments in defence of the inventive step of claim 2 disclaiming salt composition A from a range of melting temperatures of 110°C-350°C (see example C of section 4.1.1) were less convincing were thus marked out of a maximum of 10 marks.
Appendix

Expected claims with both the amendments, made by the client and expected from the candidate highlighted.

1. A cooking process, including the steps:

providing a heat storage unit (3) containing a salt composition (6);

concentrating solar radiation (12) onto the heat storage unit (3) to heat it, thereby melting the salt composition (6); and

cooking food (8) placed on the heat storage unit (3).

2. A heat storage unit (3) for use in the process of claim 1, characterised by comprising:

   a box (4) having heat-insulating walls and an opening,

   the box (4) containing a salt composition (6) and comprising an empty space (7) dimensioned to allow the salt composition (6) to expand upon melting;

   a light-absorbing plate (5) fitted in the opening and in thermal contact with the salt composition (6), and

   a cooking surface (9) in thermal contact with the salt composition (6),

   characterised in that:

   the salt composition (6) has a melting temperature from 130°C to 350°C.

3. Heat storage unit according to claim 2, wherein the cooking surface (9) is a surface of a cooking plate (2) fitted in a second opening of the box (4) and in thermal contact with the salt composition (6).
4 5. Heat storage unit according to claim 2, wherein the cooking surface (9) is a surface of the light-absorbing plate (5).

5 4. Heat storage unit according to any of claims 2 or 3 to 4, wherein the heat storage unit (3) is portable by means of one or more handles (10).

6. A solar cooker (1) comprising:
   a heat storage unit (3) according to any of claims 2 to 5;
   a parabolic mirror (11) for concentrating solar radiation (12) on the light-absorbing plate (5) of the heat storage unit (3).
Revendications modifiées

1. Un procédé de cuisson comprenant les étapes de :

fourniture d'une unité de stockage de chaleur (3), contenant une composition saline (6) ;

concentration du rayonnement solaire (12) sur l'unité de stockage de chaleur (3) pour la chauffer, faisant ainsi fondre la composition saline (6) ; et

cuisson de la nourriture (8) placée sur l'unité de stockage de chaleur (3).

2. Une unité de stockage de chaleur (3) destinée à être utilisée dans le procédé de la revendication 1, caractérisée par qui comprend :

un caisson (4) ayant des parois d'isolation thermique et une ouverture,

le caisson (4) contenant une composition saline (6) et comprenant un espace vide (7), dimensionné pour permettre à la composition saline (6) de se dilater lors de la fusion,

une plaque photo-absorbante (5) insérée dans l'ouverture et en contact thermique avec la composition saline (6), et

une surface de cuisson (9) en contact thermique avec la composition saline (6), caractérisée en ce que :

la composition saline (6) a une température de fusion de 130°C à 350°C.

3. Unité de stockage de chaleur selon la revendication 2, dans laquelle la surface de cuisson (9) est une surface d'une plaque de cuisson (2) insérée dans une seconde ouverture du caisson (4) et en contact thermique avec la composition saline (6).
4 5. Unité de stockage de chaleur selon la revendication 2, dans laquelle la surface de cuisson (9) est une surface de la plaque photo-absorbante (5).

54. Unité de stockage de chaleur selon l'une quelconque des revendications 2 ou 3 à 4, dans laquelle l'unité de stockage de chaleur (3) est portative au moyen d'une ou plusieurs poignées (10).

6. Une cuisinière solaire (1) comprenant :

une unité de stockage de chaleur (3) selon l'une quelconque des revendications 2 à 5 ;

un miroir parabolique (11) pour concentrer le rayonnement solaire (12) sur la plaque photo-absorbante (5) de l'unité de stockage de chaleur (3).
Geänderte Ansprüche

1. Kochverfahren, das folgende Schritte umfasst:

Bereitstellung einer Wärmespeichereinheit (3) enthaltend eine Salzzusammensetzung (6).

Bündelung der Sonnenstrahlung (12) auf die Wärmespeichereinheit (3), um diese zu erwärmen, wodurch das Schmelzen der Salzzusammensetzung (6) erfolgt, und Kochen von Lebensmitteln (8), die auf die Wärmespeichereinheit (3) platziert werden.

2. Wärmespeichereinheit (3) zur Verwendung in dem Verfahren nach Anspruch 1, gekennzeichnet durch umfassend:

- eine Box (4) mit wärmeisolierenden Wänden und einer Öffnung, wobei die Box (4) eine Salzzusammensetzung (6) enthält und einen leeren Raum (7), der so dimensioniert ist, dass sich die Salzzusammensetzung (6) beim Schmelzen ausdehnen kann, aufweist,
- eine lichtabsorbierende Platte (5), die in die Öffnung eingepasst ist und mit der Salzzusammensetzung (6) in Wärmekontakt steht, und
- eine Kochfläche (9), die mit der Salzzusammensetzung (6) in Wärmekontakt steht, dadurch gekennzeichnet, dass:

  die Salzzusammensetzung (6) eine Schmelztemperatur von 130 °C bis 350 °C hat.

3. Wärmespeichereinheit nach Anspruch 2, bei der die Kochfläche (9) eine Oberfläche einer Kochplatte (2) ist, die in eine zweite Öffnung der Box (4) eingepasst ist und mit der Salzzusammensetzung (6) in Wärmekontakt steht.
4.5. Wärmespeichereinheit nach Anspruch 2, bei der die Kochfläche (9) eine Oberfläche der lichtabsorbierenden Platte (5) ist.

5.4. Wärmespeichereinheit nach Anspruch einem der Ansprüche 2 oder 3 bis 4, bei der die Wärmespeichereinheit (3) mittels eines oder mehrerer Griffen (10) tragbar ist.

6. Solarkocher (1) umfassend:

   eine Wärmespeichereinheit (3) nach einem der Ansprüche 2 bis 5,

   einen Parabolspiegel (11) zur Bündelung von/der Sonnenstrahlung (12) auf der lichtabsorbierenden Platte (5) der Wärmespeichereinheit (3).
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