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**Datasheet for the decision  
of 15 November 2022**

**Case Number:** T 1472/19 - 3.4.01

**Application Number:** 12165499.0

**Publication Number:** 2528414

**IPC:** H05B6/70

**Language of the proceedings:** EN

**Title of invention:**

Electromagnetic heating

**Patent Proprietor:**

Goji Limited

**Opponents:**

Whirlpool EMEA S.p.A.

Haas, Stefan

**Headword:**

Electromagnetic heating / Goji

**Relevant legal provisions:**

EPC Art. 123(2), 76, 83, 100(b), 100(c)

RPBA 2020 Art. 11

**Keyword:**

Amendments - added subject-matter - main request and auxiliary requests 1 - 6 (yes)

Sufficiency of disclosure - main request and auxiliary requests 1, 2, 3, 6 (no)

Remittal - (no)



**Beschwerdekammern**

**Boards of Appeal**

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**Case Number: T 1472/19 - 3.4.01**

**D E C I S I O N**  
**of Technical Board of Appeal 3.4.01**  
**of 15 November 2022**

**Appellant:**  
(Opponent 1)

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**Decision under appeal:**

**Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
11 April 2019 concerning maintenance of the  
European Patent No. 2528414 in amended form.**

**Composition of the Board:**

<b>Chair</b>	P. Fontenay
<b>Members:</b>	T. Petelski
	D. Rogers

## **Summary of Facts and Submissions**

- I. Two oppositions were filed against the European patent. The corresponding European patent application had been filed as a divisional application. The oppositions were based on Articles 100(a), (b) and (c) EPC.
  
- II. The Opposition Division maintained the patent in amended form based on the (then) first auxiliary request.
  
- III. Both opponents, hereinafter referred to as O1 (Whirlpool EMEA S.p.A.) and O2 (Haas, Stefan) lodged an appeal against this decision. O1 and O2 request that the decision be set aside and the patent be revoked.
  
- IV. The proprietor, in its role as respondent, requests that the appeals be rejected and the patent be maintained in the amended form considered allowable by the Opposition Division (main request; designated by the proprietor as "first auxiliary request"). Should the Board set the decision aside, a remittal to the first instance is requested for consideration of one of six auxiliary claim-requests, referred to by the patent proprietor as "second" to "seventh auxiliary request". These requests were submitted during opposition proceedings and resubmitted with the reply to the appeals. They have the same numbering before each instance.

V. In the following, the claim-requests will be designated with the rank they have in the present appeal proceedings and not with the rank they had during the first instance proceedings. Hence, the request designated as "first auxiliary request" by the patent proprietor is the main request, and the second to seventh auxiliary requests, as designated by the proprietor, will be referred to as the first to sixth auxiliary requests, respectively.

VI. Claim 1 of the main request reads (adopting the feature labelling used by the parties and by the Opposition Division):

F1.1: *A method of electromagnetic heating of an object placed in a cavity (10), the method comprising:*

F1.2: *heating the object by feeding input UHF or microwave energy at a controlled heating input power at a plurality of frequencies into the cavity via at least one antenna;*

F1.3: *for each frequency of said plurality of frequencies:*

F1.3.1: *(i) measuring power input into and power output from the cavity through the at least one antenna;*

F1.3.2: *(ii) determining an energy absorption efficiency ( $\eta$ ) as a proportion of the input power that is not output from the cavity through the at least one antenna;*

*characterised in that the method further comprises,*

*F1.3.3: for each frequency of said plurality of frequencies:*

*(iii) automatically adjusting the heating input power to the said at least one antenna in inverse proportion to the energy absorption efficiency ( $\eta$ ) determined at the said frequency.*

The underlined definitions distinguish the claim from claim 1 of the patent as granted. Claims 1 of the following, lower ranking requests are based on claim 1 as granted, namely on the above claim without the underlined definitions.

VII. Claim 1 of the first auxiliary request is based on claim 1 as granted (the above claim 1 of the main request without underlined features), and is amended, with respect to the latter, by additional features in the method steps of "heating" (F1.2) and of "measuring power input" (F1.3.1), such that the steps 1.2 - F1.3.1 read (amendments with respect to claim 1 as granted underlined):

*F1.2: heating the object by feeding input UHF or microwave energy at a controlled heating input power at a plurality of frequencies into the cavity via at least one antenna of a plurality of antennas;*

F1.3: *for each frequency of said plurality of frequencies:*

F1.2: *(i) measuring power input into and power output from the cavity, wherein the power output from the cavity is the sum of reflected power at a first antenna of the plurality of antennas and coupled power to other antennas of the plurality of antennas;* .

VIII. Claim 1 of the second auxiliary request is based on claim 1 as granted and adds, at the end (after feature F1.3.3), the feature:

*... the method including feeding UHF or microwave energy via at least one antenna from a plurality of antennas and wherein the method further comprises determining the energy absorption efficiency ( $\eta$ ) based on a power coupled to other feeds from the plurality of feeds ( $S_{ij}$ ) at each frequency and a return loss to the at least one feed ( $S_{ii}$ ) at each frequency.*

IX. Claim 1 of the third auxiliary request is also based on claim 1 as granted and adds, right after the end of point (ii), a determination of a bandwidth, and a respective reference thereto at the beginning of feature F1.3.3, such that the part of the claim between points (ii) and (iii) reads (amendments underlined):

*... determining a bandwidth of the plurality of frequencies;*



*characterised in that the method further comprises,*

F1.3.3: *for each frequency in the bandwidth of said plurality of frequencies: ...*

In addition, the numbering (i), (ii), and (iii) is deleted.

- X. Claim 1 of the fourth auxiliary request reads (features added with respect to claim 1 as granted are underlined):

*A method of electromagnetic heating of an object placed in a cavity (10), the method comprising:*

*for each frequency of a plurality of UHF or microwave frequencies:*

*measuring power input into and power output from the cavity;*

*determining an energy absorption efficiency ( $\eta$ ) as a proportion of the input power that is not output from the cavity,*

*the method further comprising:*

*selecting frequencies of the plurality of frequencies having a determined energy absorption efficiency greater than a lower limit; and*

*heating the object by feeding input UHF or microwave energy at a controlled heating input power at the selected frequencies into the cavity via at least one antenna,*

*characterised in that the method further comprises, for each selected frequency of said plurality of frequencies*

*automatically adjusting the heating input power to the said at least one antenna in inverse proportion to the energy absorption efficiency ( $\eta$ ) determined at the respective selected frequency.*

The rearrangement of features made with respect to claim 1 as granted (not marked) does not change the claim's subject-matter and is not relevant for the decision.

- XI. Claim 1 of the fifth auxiliary request is based on claim 1 of the fourth auxiliary request and adds, as a first method step:

*... sweeping inputs to the cavity across a plurality of UHF or microwave frequencies between a minimum frequency and a maximum frequency; .*

- XII. Claim 1 of the sixth auxiliary request is identical to claim 1 as granted and corresponds, therefore, to claim 1 of the main request without the underlined features.

- XIII. Initially, oral proceedings were requested by all parties in the event that their respective main request was not followed.
- XIV. After receipt of the summons to oral proceedings issued by the Board, the proprietor announced that they would not attend the oral proceedings. This signifies a withdrawal of the request for oral proceedings.
- XV. Following this announcement, O1 and O2 requested that the oral proceedings be cancelled and that a written decision be issued, if the Board followed O1's and O2's main request (i.e., the revocation of the patent).
- XVI. Subsequently, the oral proceedings were cancelled by the Board.
- XVII. The Board had informed the parties of its preliminary opinion on the case in a communication annexed to the summons to oral proceedings. This opinion was negative on the allowability of all claim-requests. None of the parties has made a submission on the merits of the case after receipt of the Board's preliminary opinion. Accordingly, the parties, and in particular the proprietor, have not given the Board any reason to change its opinion. Nor did the Board itself find any such reason upon re-examining the case. Therefore, the below reasons for the decision largely follow to the Board's preliminary opinion.

## Reasons for the Decision

### *Main Request - Interpretation of claim 1*

1. The parties disagree on the interpretation of claim 1. Based on the parties' statements, the Board understands the claim as follows.
2. Claim 1 defines, in features F1.2 and F1.3.1, that UHF or microwave energy is fed into the cavity as controlled heating input power via "at least one antenna" at "a plurality of frequencies".
3. In the absence of any further restriction, the claim not only encompasses the use of neighbouring frequencies within a frequency band, but also the use of individual frequencies that are separated from each other by certain frequency intervals.
4. Each of the "at least one antenna" is used for heating. It remains open if the antennas are used simultaneously or sequentially.
5. Feature F1.3.1 further defines, for each of the above defined frequencies, "measuring power input into and power output from the cavity through the at least one antenna". This feature defines a measurement of two values (power input "and" power output) through the same, at least one, antenna. Herein, the definite article "*the* at least one antenna" causes a reference to the antenna(s) defined in feature F1.2. Hence, this feature must be understood as a measurement of the complete power input into the cavity via all antennas, and a measurement of the complete power output via the

same antennas. Power that might be output otherwise, for example through the walls, is not measured.

6. The skilled person understands that for three antennas or ports, the total input power at each frequency is the sum of all three input powers  $P_{IN} = P_{IN1} + P_{IN2} + P_{IN3}$ . It remains open, whether more than one input port is used simultaneously (having an input power different from zero). The output power at each frequency consists of the reflected power from the respective port plus the coupled power from the other two ports. The amount of coupling between the ports is determined by the coupling parameters (also known as "scattering parameters" or "S parameters"). The complete measured output power is the sum of the output powers over all three ports at any given time:  $P_{out} = P_{OUT1} + P_{OUT2} + P_{OUT3}$ .
7. Feature F1.3.2 defines an energy absorption efficiency for each frequency as "a proportion of the input power that is not output from the cavity through the at least one antenna". In view of what has been measured, this must be understood as the difference between the complete input power and the complete output power (which is the absorbed power), compared to the complete input power:  $\eta = (P_{IN} - P_{OUT})/P_{IN}$ . It is apparent that this calculation cannot distinguish between absorption in the object and potential power losses through the cavity wall.
8. Feature F1.3.3 defines adjusting the "heating input power" at each frequency in inverse proportion to the absorption efficiency. Again, the input power is the sum of the power input to all ports at any given time. Since the claim does not define similar input powers for different frequencies, this feature might well

signify an adjustment that leads to very different amounts of absorbed powers at different frequencies. This would be the case, for example, if the input power has already been adjusted before, according to the same method.

9. This understanding of claim 1 is applied in the following assessments of added subject-matter and sufficiency of disclosure. Arguments of the parties relying on a claim interpretation that is different from the one given by the Board are not considered.

*Main Request - Added subject-matter*

10. Claim 1 has been amended with respect to claim 1 as originally filed. The amended features extend the scope of the claim to encompass three pieces of subject-matter that were not originally disclosed.
11. First, feature F1.2 encompasses the supply of power to more than one feed (or port) at the same time. In this case, the output signal at each port, when measured according to feature F1.3.1, is composed of the reflection from the same port and the couplings of parts of the input power from the other ports. According to the feature F1.3.2, this measurement is used for determining an energy absorption efficiency  $\eta$ .

This stands in contrast to the application as filed, which only describes providing power to one port at a time for the purpose of calibration (refer to page 34, line 30 - page 35, line 8). According to the original application, the power is provided either by using a common electronic circuit as illustrated by Figure 8, wherein only the part 200 is proprietary to each feed,

or by using three separate circuits as illustrated by Figures 5A and 5B. In both cases, a controller receives the in- and output signals from the directional couplers 120, associated with each feed. Based on a measurement of these signals, the controller performs the calibration, involving the determination of the net power efficiency  $\eta_n$  for each of  $n$  ports separately, as described on page 31, by using the example of port 1. Still according to page 31, the determination of  $\eta_n$  involves the determination of the transfer coefficients. Feeding power to more than one port at the same time is only described in one single passage of the original application, which is found on page 34, lines 30 to 32. Here, all (three) antennas are fed simultaneously (by using three separate electronic circuits as those illustrated in Figures 5A ad 5B). However, this is only for the purpose of heating, and not for calibration. The resulting superimposition of several signal components in the measured output signal would prohibit a straightforward determination of the coupling coefficients, and of the absorption efficiency  $\eta_n$  of one single port. However this would be required for performing a calibration as described previously.

12. Second, feature F1.2, together with feature F1.3.3, encompasses the use of different input powers at different frequencies, for example because the power has already been adjusted previously. In this case, the claimed adjustment might generate or even increase a difference in the power absorbed at different frequencies.

In contrast, the original application consistently and exclusively discloses an adjustment that results in providing a constant absorbed power (also called "net power input") to the cavity or object (refer to page 5,

lines 25 - 27; page 6, lines 9 - 12; page 33, lines 12 - 20; page 34, lines 7 - 9 and 23 - 25; page 36, lines 3 - 7).

13. Third, features F1.2 to F1.3.3 encompass the adjustment of power inversely to the absorption efficiency at frequencies that are not, or only marginally, absorbed within the cavity. Low absorption efficiencies would lead to an adjustment of the heating input power to unrealistic values approaching infinity.

In contrast, the original application only discloses an inverse adjustment of power for frequencies (swept or pulsed) across peaks that show a high absorption efficiency. This is disclosed on page 33, lines 6 - 20, page 35, line 30 to page 36, line 7 and also, more generally, on page 6, lines 9 - 18. According to O2, the even narrower restriction to "sweeping the frequency across a width of the resonance mode that couples the highest net power" would have been required in claim 1. However, in view of the disclosure of pages 6 and 33, this is not necessary.

14. Contrary to the allegations of the proprietor, the claims of the earlier filed parent application P1b (EP 07 706 172) cannot serve as a basis in the considerations regarding added subject-matter. This is because the reference to P1b according to Rule 40 (1) (c) EPC was only made with regard to the description and drawings, not with respect to the claims (refer to points 26.1 and 26.2 of the request for grant of a European Patent dated 25.04.2012).
15. The proprietor's view, that the explicit reference in the request for grant to the description and drawings of the parent application did not exclude the claims,



is not persuasive. Article 123(2) EPC requires that amendments to a claim must derive directly and unambiguously from the original application documents. This implies that the passages referred to as basis for the amendments must be unambiguously identified in the request for grant as being part of the application.

16. Due to the reference to Plb, the description and drawings of the original application as filed are identical to the description and drawings of the parent application. Hence, the above identified subject-matter in claim 1 (and claim 7) extends beyond the application as filed (Article 123(2) EPC), and also beyond the earlier application as filed (Article 76 EPC).
17. The Board recognizes that the physical definition for "power" is different from the definition of "energy". Despite that fact, the Board would find no major fault with the "net power efficiency" being denoted as "energy absorption efficiency" in feature F1.3.2 of claim 1, provided that the respective definitions of how this efficiency was calculated were identical. However, as explained above, the definition of the efficiency in the claim differs from the originally disclosed definition on page 31 for the case of simultaneous power input to more than one port. The original application does not describe the determination of an efficiency of the entire cavity, nor does it describe such a determination for the case that power is fed to more than one port at a time.
18. As a consequence, the main request is not allowable, because claim 1 contains added subject-matter (Articles 123(2) and 76 EPC).

*Main Request - Sufficiency of disclosure*

19. The Board shares O1's and O2's opinion that the skilled person does not know how to realize an adjustment of the input power "in inverse proportion to the energy absorption efficiency", for frequencies with absorption efficiencies approaching zero (feature F1.3.3 of claim 1). The description explains the power adjustment for frequencies that match an absorption peak only (refer to page 33, lines 10 - 20 and transition of pages 35 - 36). Frequencies outside an absorption peak would require adjustments approaching infinity, which is not explained by the description.
  
20. Hence, the main request is also not allowable, because the subject-matter of claim 1 is not sufficiently disclosed to be carried out by a skilled person (Article 83 EPC).

*Remittal*

21. In the event that the Board sets aside the appealed decision, the proprietor requests a remittal to the Opposition Division for consideration of the auxiliary requests.
  
22. According to Article 11 RPBA 2020, the Board considers a remittal to the first instance only if there are special reasons for doing so. The patent proprietor has not provided any such special reasons. The Board also fails to see any special reasons that would justify a remittal, as is explained in the following.
  
23. Although the first to sixth auxiliary requests have not been discussed during opposition proceedings, they do

not, *prima facie*, overcome all of the above identified deficiencies of the main request. This means that the first to sixth auxiliary requests fail for at least one of the reasons for which the main request fails to fulfil the requirements of the EPC.

24. Since the objections against the auxiliary requests do not go beyond those brought forward against the main request, the Board finds itself in a position to decide on the first to sixth auxiliary requests.
25. As a consequence, the proprietor's request for remittal is rejected.

*First to sixth auxiliary requests - allowability*

26. The added subject-matter identified in the main request is caused by claim 1 encompassing
- (a) a simultaneous feeding of power to more than one antenna (above point 11.),
  - (b) the use of different input powers for different frequencies (above point 12.), and
  - (c) the use of frequencies for which the absorption efficiency approaches zero (above point 13.).
27. None of the first to sixth auxiliary requests adds a feature that has an influence on the above items (a) and (b). Further, none of the first to third and sixth auxiliary requests adds a restriction relating to item (c).

28. The third to sixth auxiliary requests comprise the feature of "measuring power input and power output from the cavity", similar to claim 1 as granted. The opposition division found this feature not to be originally disclosed (item 3.2.1 of the decision). The reason being that this feature implied a measurement not only of the power output through the antennas, but also of the power output through the cavity wall. The original application, however, stated on page 32, lines 8 - 12, that the power output through the cavity wall was not measured.
29. The patent proprietor has not presented any argumentation of why the decision erred on this point. Hence, the Board has no reason to deviate from the finding of the opposition division, which it finds persuasive.
30. As a consequence of the above, each of the auxiliary requests contains at least two pieces of subject-matter that extends beyond the application as filed - and also beyond the earlier application as filed (Articles 123(2), 76 and 100(c) EPC), and is not allowable for that reason.
31. Further, each of the first, second, third and sixth auxiliary request suffers from the same insufficiency of disclosure (Article 83 EPC and Article 100(b) EPC) as the main request (refer to points 19. and 20.), and is not allowable for that reason, too.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chair:



D. Meyfarth

P. Fontenay

Decision electronically authenticated