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Datasheet for the decision of 23 September 2021

Case Number: T 1621/14 - 3.4.01

Application Number: 07101003.7

Publication Number: 1951003

IPC: H05B6/12

Language of the proceedings: EN

Title of invention:
Control method for induction cooking hob and induction cooking hob adapted to carry out such method

Patent Proprietors:
WHIRLPOOL CORPORATION
TEKA Industrial S.A.

Opponents:
Kilburn & Strode LLP
Electrolux Rothenburg GmbH Factory and Development

Headword:
Inductive heater / WHIRLPOOL

Relevant legal provisions:
EPC Art. 54, 56, 84, 100(b), 123(2)

Keyword:
Novelty - (yes)
Inventive step - (yes)
Claims - clarity (yes)
Grounds for opposition - insufficiency of disclosure (no)
Amendments - extension beyond the content of the application as filed (no)

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Case Number: T 1621/14 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 23 September 2021

Appellant: (Opponent 1)	Kilburn & Strode LLP Lacon London 84 Theobalds Road London WC1X 8NL (GB)
Appellant: (Opponent 2)	Electrolux Rothenburg GmbH Factory and Development Fürther Strasse 246 90429 Nürnberg (DE)
Representative:	Schröer, Gernot H. Meissner Bolte Patentanwälte Rechtsanwälte Partnerschaft mbB Bankgasse 3 90402 Nürnberg (DE)
Respondent: (Patent Proprietor 1)	WHIRLPOOL CORPORATION 2000 M-63 Benton Harbor Michigan 49022 (US)
Respondent: (Patent Proprietor 2)	TEKA Industrial S.A. Cajo 17 39011 Santander (ES)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on**

30 May 2014 concerning maintenance of the European Patent No. 1951003 in amended form.

Composition of the Board:

Chairman P. Scriven
Members: B. Noll
R. Winkelhofer

Summary of Facts and Submissions

I. Both opponents appealed the Opposition Division's interlocutory decision by which European patent 1951003 was maintained in amended form.

II. The oppositions had been filed against the patent based on the ground for opposition under Article 100(a) EPC (lack of novelty and of inventive step).

III. In preparation for oral proceedings, the Board issued a communication containing its provisional view of the case.

IV. The oral proceedings before the Board were attended by the proprietors and appellant-opponent 2. Appellant-opponent 1 had indicated in advance that they would not attend.

V. The appellants made submissions on clarity, sufficiency of disclosure, added subject-matter, and patentability in view of claim 1 and E2, E3, E11, and E12. The parties' submissions, in so far as relevant to this decision, are given in detail in the reasons, below.

VI. The parties' requests are
- (by appellant-opponent 1) that the decision under appeal be set aside and the patent revoked,
- (by appellant-opponent 2) that the decision under appeal be set aside and the patent revoked,
- (by the respondents-proprietors) that the appeals be dismissed.

VII. Claim 1 reads (feature labelling (a) to (f) by the Board, reflecting the labelling used before the Opposition Division):

(a) Method for activating simultaneously two induction heaters (A,B) of an induction hob (10) or the like,

(b) each induction heater (A,B) being connected to a converter (HB, QR) for the independent regulation of preset power levels (PA_O, PB_0) to be delivered from each heater (A,B) to a superposed cooking utensil (C1 ,C2),

(c) the converters (HB,QR) being driven with adjustable periodic signals (S1, S2, f_{HB}, f_{QR}, T_{ON},T_{OFF}) during a predetermined control period (T), the method comprising the steps of:

(d) - activating simultaneously the induction heaters (A,B) by driving their converters (HB,QR) with adjustable periodic signals (S1, S2, f_{HB}, f_{QR}, T_{ON}, T_{OFF}) presenting an identical first frequency (f1 ,$f1_{OPT}$) during a first fraction (T1) of the control period (T),

(e) - activating only one of the induction heaters (A,B) previously activated during the first portion (T1) by driving its converter (HB, HQ) with a signal (S1, S2, f_{HB}, f_{QR}, T_{ON}, T_{OFF}) presenting a second frequency (f2, $f2_{OPT}$) for a second fraction (T2) of the control period (T),

(f) the other one of the two induction heaters (A,B) being turned off halting its driving signal (S1, S2).

VIII. The following documents are relevant to this decision:

E2: DE 603 03 350 T2
E3': WO 2006/117182 A
E11' JP 08 213163 (English translation)
E12: EP 0724379 A1

Reasons for the Decision

The Patent

1. The patent concerns the simultaneous operation of two induction heaters. Induction heating uses the effect of inducing an electric current in a pan by means of a magnetic field generated by an AC current. The frequency of the current is in the range of about 16 kHz to 100 kHz. The frequency determines the heating power, which is high for lower frequencies, and low for higher.

Claim 1, clarity and interpretation

2. Feature (f) was added to independent claim 1 as granted in the opposition proceedings. It aims at clarifying that, during the second period, only the one of the heaters is active while the other is turned off. It further defines a specific way in which the other

heater is turned off, namely by halting its driving signal.

3. There was disagreement between the parties as to what is expressed by the feature *being turned off halting its driving signal*.

4. Appellant-opponent 2 argued that the driving signal was the electric current injected by the converter into the heater for activating it. The respondents-proprietors argued that it was not, but it was rather the signal which drove the inverter.

5. Appellant-opponent 2's understanding disregards the fact that claim 1 defines a relationship between the adjustable periodic signals defined in feature (d), which are for driving the inverter and thereby activating the heater in question, and the driving signal in features (e) and (f), which, upon driving the converter of one heater, activates it, and, upon halting for the other converter, turns that heater off. The driving signal in feature (f) designates, therefore, an input signal to the inverter which shapes the electric current to be injected into the heater, but it is not itself this current. Thus, feature (f) defines a specific way of turning off the heater, namely by stopping the signal which drives the inverter. As noted by the respondents-proprietors, claim 1 does not, relate to an induction hob for which the adjustable periodic signals for driving the inverters cannot be activated and halted independently of each other, or to a heater in which the electric current into the inductor is interrupting while the inverter is still being driven.

6. Feature (f) is not in conflict with the indication, in feature (a), that the method is for "simultaneously operating two induction heaters". Feature (a) defines the suitability of the method, considering a macroscopic time scale with periods in which both heaters are on. This does not mean that each heater is continuously heated all the time. Features (d) to (f), however, define a short-term operation of the heaters during a particular time interval, i.e. the control period. Turning off one of the heaters during a portion of this control period is not in a conflict with the simultaneous activation of two heaters.

7. In conclusion, claim 1 meets the requirement of Article 84 EPC as regards the amendments.

Claim 1, sufficiently clear and complete disclosure

8. Opponent-appellant 2 argued that the patent did not sufficiently clearly and completely disclose an implementation of the method in relation to a "real" driver circuit. The skilled person was, therefore, not in a position to know what was to be done to put the method in practice.

9. The general knowledge of a person skilled in the field of induction heaters encompasses knowledge about the various driver topologies used in the art. This general knowledge includes the implementation of a driver with independently driven inverters, such that the inverter of one heater is activated by applying its driving signal, while the inverter of the other heater is turned off by halting its driving signal. The skilled person would also know how to set the signal characteristics (e.g. frequency or signal shape) in the

controller for controlling the inverter in a desired manner. It is, therefore, not necessary for the patent specification to describe further details of a control circuit for implementing the method.

10. Therefore, the ground for opposition in Article 100 (b) EPC does not prejudice the maintenance of the patent on the basis of claim 1.

Claim 1, added subject-matter

11. Appellant-opponent 2 argued that claim 1 related to an undisclosed intermediate generalization and so did not comply with Article 123(2) EPC.

12. The Board notes that features (e) and (f) are substantially identical with the wording in paragraph 51 (reference is made to the A-publication). There is no generalization of subject-matter apparent having regard to this paragraph and in combination with the other features of the claim.

13. Therefore, claim 1 complies with Article 123(2) EPC.

Novelty in view of E2

14. E2 discloses an inverter supplying current to four induction coils which are grouped as two heating elements. The inverter can drive one or both coils of one group in a quasi-resonant operation mode (E2, Figure 4) and, alternatively or simultaneously, drive the coils of the other group in a full-bridge mode (E2, Figure 5). Instantaneous power levels can be controlled by setting the frequency of the driving signal

according to the power needed by the heater which is operated at the higher level. The average power of the second heater is controlled by setting the ratio between in-phase and out-of-phase operation intervals.

15. Appellant-opponent 2 argued that the voltage between nodes A and B (E2, figure 7) was the driving signal of the heater with coils IND2, IND2'. When operating the inverter in phase, this driving signal was halted.

16. The Board does not agree. The voltages at points A and B are not a driving signal, in the sense of claim 1, by which the inverter is driven to activate the heater. These voltages are the outputs of the inverter. For driving one heater while turning off the other, E2 requires that all driver signals be kept active and operated either in-phase or out-of-phase. The heaters in E2 cannot be operated by selectively halting the driving signal of one inverter associated with one heater.

17. The method as defined in claim 1 is not disclosed by E2.

Novelty in view of E3'

18. E3' discloses an induction hob with two heaters L1, L2 (E3', Figure 1) each with its own converter 19, 20. E3' is about operating both heaters simultaneously and continually. The frequencies for operating the inverters are set such that their difference is (a) zero or almost zero, (b) less than 1kHz, or (c) between 15 kHz and 25 kHz, i.e in a range inaudible to human beings (E3, page 4, last paragraph). E3' discloses that, by applying these rules of setting the operation

frequencies, any beat frequency that occurs does not disturb the hob's user. The average power provided to each heater is controlled by appropriately setting the durations of first and second periods, and by further setting the operating frequencies to appropriate values , the total power consumption of the heater is kept constant over time (E3', page 9, first paragraph).

19. E3' does not disclose that, when activating the one induction heater for a second fraction of the control period, the other heater is turned off by halting its driving signal. It is apparent, from figure 2, that both driving signals are continuously active, and that both heaters remain on during the two fractions of the control period.

20. Appellant-opponent 2 argued that, by selecting an operation frequency for one heater within the range of 15 kHz to 25 kHz and setting the difference frequency to the same value, the second frequency would be zero and thereby "halted", as claim 1 has it.

21. The Board does not agree. The opponent's reading overlooks the fact that the range in which the frequencies of the driving signals of each of the heaters fall in E3' is 16 kHz to 100 kHz. Therefore, appellant-opponent 2's reading, in which the operating frequency of the second heater is zero when the frequency of the first heater and the difference frequency are chosen to be equal goes against the restriction imposed by the range defined above. Setting one of the frequencies equal to zero is not disclosed in E3', it is only a result of misunderstanding of E3' for mapping it to the wording of claim 1.

22. The method as defined in claim 1 is also novel over E3'.

Novelty in view of E11'

23. E11' discloses a set-up with two heaters 4a, 4b, each supplied with power by a respective inverter 5a, 5b, which can be regulated independently of each other. In the operation mode described in paragraphs 18 to 21, the second heater 4a is initially operated alone at its maximum power of 2kW which is obtained at an operation frequency of 25kHz. Subsequently, the first heater is switched on to operate, likewise, at its maximum power, which is obtained at about the same frequency. E11' does not disclose that the frequency for operating the first heater is identical to that of the second heater. E11' does disclose that, when the power for the second heater is set at a reduced level, the frequency for operating the second inverter 3a is kept as before, but a duty-cycle is used that corresponds to a reduced output setting.

24. E11' does not disclose that the induction heaters are activated at identical first frequencies during the first fraction, and that during the second fraction the other heater is turned off by halting its driving signal.

25. Appellant-opponent 2 argued that the frequency correction applied to the second heater in E11' aimed at setting equal frequencies. Further, a duty-cycle of less that 100% meant that the driving signal of a heater was halted during a portion of the cycle.

26. The Board does not agree.

27. According to E11', paragraph 23, the operating frequencies of the heaters are not set to be identical but are controlled such that their difference is less than 1 kHz.

28. Further, a duty-cycle as described in E11' is not understood by the skilled reader as a mode in which the driving signal of the inverter is temporarily halted. Rather, the skilled reader understands using a duty cycle as meaning that the driving signal is continuously driving the heater and that the ratio of the time spans in which the periodic driving signal is at high or low voltage within a single period is controlled.

29. The method as defined in claim 1 is, therefore, novel over E11'.

Novelty in view of E12

30. E12 discloses an induction hob with four induction coils, 1 to 4, connected in parallel to a single electronic power converter. The power converter consists of two IGBT transistors 32, 33 (E12, figure 1) and is driven by a driver 34. The current through each coil passes a respective relay, 4 to 8, by which the current path through the respective heater is opened or closed. Thus, each heater can be activated or switched off by means of an activation signal controlling the corresponding relay.

31. E12 does not disclose that there is a fraction in which one of the heaters is activated and another turned off by halting its driving signal.

32. Appellant-opponent 2 argued that the signals driving the transistors 32 and 33, together with the signals switching the relays, constituted driving signals of the heaters, in the wording of claim 1. The heater was turned off when its corresponding relay was controlled to interrupt the current. Thus, halting the signal controlling the relay turned the heater off.

33. These arguments, too, are not persuasive. In E12, relays 4 to 8 are not part of the inverter of a heater. Nor is the signal to close or to open the relay a driving signal within the meaning of the patent in suit. The driving signal in E12 is the control signal that drives the electronic power converter, and it is permanently active, regardless of whether an individual heater is switched on or off.

34. The method as defined in claim 1 is, finally, also novel over E12.

Inventive step, starting from E3'

35. E3' relates to independently regulating preset power levels of two induction heaters for activating them simultaneously and continually, by controlling their driving signals.

36. The method of claim 1 of the patent in suit differs from that of E3' in that the other one of the two induction heaters is turned off by halting its driving signal, so that only one induction heater is active

during a fraction of the control period. In E3', since both heaters are operated at frequencies that differ by 18 kHz or more, beat noise is not completely suppressed but only imperceptible to many human beings.

37. The effect of this is that acoustic beat noise is continually suppressed by simple means.

38. The technical problem starting from E3 is therefore reliably to suppress beat noise in a simple manner.

39. The skilled person would not get any incentive, from E3' itself, for completely suppressing beat noise. E3' aims to control not only the respective average power of each heater to be equal to the power as set, but also to keep the total electrical power received by the two heaters together to be constant over time, to suppress flicker noise. E3' does not give any hint that the skilled person might abandon this aim.

40. Appellant-opponent 2 argued that E11' would render obvious the switching off of one heater, while the other remained active.

41. This argument also fails. As explained above, in E11' the driving signal of the driver is kept on, while only the duty cycle of the control signal is modified. The skilled person would, therefore, not arrive at the claimed method by considering E3', and also not in combination with E11'.

42. E12 does not suggest halting the driving signal for turning off the heater, but provides for interrupting the current flowing in the heater by means of a relay. The driving signal of the inverter remains active when a heater is switched off. The skilled person would,

therefore, also not arrive at the claimed method by considering E3' in combination with E12.

Inventive step, starting from E11'

43. Starting from E11', the method of claim 1 is distinguished in that the induction heaters are activated at identical first frequencies during the first fraction, and that during the second fraction the other heater is turned off halting its driving signal.

44. Appellant-opponent 2 argued that the skilled person would have sought a power control which would be more useful than duty-cycle control, for independently controlling two heaters. The skilled person would have considered an interval control as an obvious alternative and would thus have arrived at the method of claim 1.

45. This argument is not persuasive. The Board cannot see how the skilled person could have arrived at these steps without hindsight, taking into account the contested patent.

46. Further, considering E3', the skilled person would not arrive at switching off the other heater, as E3' provides that both heaters are permanently active.

Inventive step, starting from E12

47. Starting from E12, the method of claim 1 is distinguished in that the the driving signal is halted for turning off the heater.

48. Starting out from E12, the skilled person would not consider turning off the driving signal, since all heaters are commonly supplied by a common inverter, and turning off its driving signal would result in that all heaters are switched off. The skilled person would not arrive at the claimed method starting out from E12.

49. In conclusion, the grounds for opposition relied on by the opponents do not prejudice the maintenance of the patent. The appeals can therefore not be successful.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

D. Meyfarth P. Scriven

Decision electronically authenticated