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**Datasheet for the decision
of 2 October 2025**

Case Number: T 1549/23 - 3.4.01

Application Number: 18178212.9

Publication Number: 3584808

IPC: H05B3/24, H01C7/02, H01C1/14,
F24H3/04

Language of the proceedings: EN

Title of invention:
PTC HEATING MODULE FOR HEATING A FLUID

Patent Proprietor:
Mahle International GmbH

Opponent:
Eberspächer catem GmbH & Co. KG

Headword:
PTC heating module / Mahle

Relevant legal provisions:
EPC Art. 100(a), 52(1), 54, 56

Keyword:
Main Request, Auxiliary Request 1 - novelty (no)
Auxiliary Requests 2, 3 - inventive step (no)



Beschwerdekammern
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Case Number: T 1549/23 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 2 October 2025

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 13 July 2023 rejecting the opposition filed against European patent No. 3584808 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chair P. Scriven
Members: T. Petelski
L. Bühler

Summary of Facts and Submissions

- I. The appeal is of the Opposition Division's decision to reject the opposition.
- II. The opponent (appellant) requested that the decision under appeal be set aside and the patent revoked.
- III. The proprietor (respondent) requested that the appeal be dismissed, which means that the patent would be maintained as granted (Main Request). Alternatively, they requested that the patent be maintained in amended form on the basis of one of three auxiliary requests, filed before the Opposition Division and re-filed with the reply to the appeal.
- IV. In a communication sent with summons to oral proceedings, the parties were informed of the Board's preliminary opinion, according to which the main objections to maintaining the patent were a lack of novelty or inventive step, based on document

D1: EP 0 489 528 A1.
- V. Oral proceedings were held at the request of both parties, during which the parties confirmed their requests.

VI. Claim 1 of the patent reads as follows (reference signs omitted, feature labels added):

A PTC heating module for heating a fluid comprising:

- M1 *at least one first electrically conductive contact electrode and a second electrically conductive contact electrode which are arranged spaced apart from each other,*
- M2 *at least one insulator layer attached to the contact electrodes,*
- M3 *at least one PTC thermistor element of a certain thickness, the PTC thermistor element having a first main surface and a second main surface spaced opposite each other at a distance from the thickness of the PTC thermistor element,*
- M4 *a clearance and/or creepage distance between the first contact electrode and the second contact electrode which is greater than the thickness of the PTC thermistor element, characterized in that*
- M5 *said first main surface is divided into a contact area and a rest area,*
- M6 *said contact area having an electrically conductive coating,*

- M7 *said second main surface having a contact area with an electrically conductive coating,*
- M8 *said first contact electrode is in contact with the contact area of the first main surface and said second contact electrode is in contact with the contact area of the second main surface,*
- M9 *the second main surface is divided into a contact area and a rest area,*
- M10 *the contact electrodes contact the respective contact areas over their entire surface,*
- M11 *the PTC thermistor element is completely or partially made of a ceramic material,*
- M12 *areas of the surface of the PTC thermistor element without an electrically conductive coating as well as the rest area are electrically insulating.*

VII. In claim 1 of Auxiliary Request 1, feature M4 is limited to "a creepage distance". The "clearance distance" is deleted. In addition, some minor changes were made to the claim formulation.

VIII. Claim 1 of Auxiliary Request 2 is identical to claim 2 of the patent. This adds, to claim 1 of the patent, the following definition (reference signs omitted):

... wherein the clearance and/or creepage distance between the first contact electrode and the second contact electrode is at least 1.5 times the thickness of the PTC thermistor element.

IX. Claim 1 of Auxiliary Request 3 is, in effect, a combination of claims 2 and 3 of the patent. Besides the above feature, this further adds the following to the end of claim 1 (reference signs omitted):

... wherein at least two PTC thermistor elements which are arranged at a distance from each other,

wherein the first contact electrode connects the respective contact areas of the first main surfaces of the PTC thermistor elements electrically conductive and the second contact electrode connects the respective contact areas of the second main surfaces of the PTC thermistor elements electrically conductive.

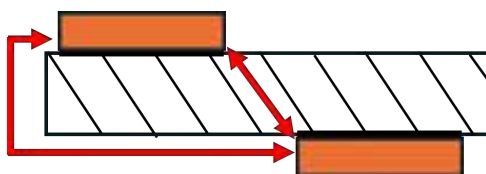
Reasons for the Decision

Main Request - understanding of claim 1

1. Claim 1 defines a heating module with a PTC (positive temperature coefficient) thermistor element made of a

ceramic material. The thermistor element has an electrically conductive coating on either of its two opposing main surfaces, and areas that are not covered by these coatings are electrically insulating. The coated areas are each contacted by an electrode and the "clearance and/or creepage distance" between these electrodes is greater than the thickness of the thermistor element.

2. Assuming a cuboidal thermistor element, which is the most commonly used shape, the skilled person would understand the clearance distance as the shortest distance between the electrodes overall, and the creepage distance as the shortest distance between the electrodes along the surface of the thermistor element. This is in line with the definition in paragraph [0006] of the patent.
3. Hence, a clearance distance (central arrow in the drawing below) greater than the thickness of the thermistor element means that the electrodes (orange) are laterally offset from each other (no overlap), whereas a creepage distance (outer arrow in the drawing below) larger than the thickness of the thermistor element means that the two electrodes do not extend all the way to the same edge of the thermistor.



4. According to the opponent, the condition that the clearance and creepage distances be greater than the thickness of the thermistor element would also be fulfilled if the conductive coatings (black in the above drawing) had a non-negligible thickness.

5. This, however, would be a less realistic interpretation of the claim, since, firstly, coatings typically do not constitute a significant fraction of the thickness of a thermistor element, and, secondly, the coatings would not be considered part of the creepage distance, due to their electrical conductivity (the current does not "creep" through them).

6. Further according to the opponent, the definition that some surface areas were electrically insulating contradicted the definition that the thermistor element was made completely of a ceramic material, because the ceramic material of thermistor elements was known to be conductive to a certain degree. The latter meant that all surfaces of the thermistor element itself were conductive, regardless of whether they were covered with a coating or not. Due to the apparent contradiction with the surface areas being insulating, the insulation feature had to be ignored and could not restrict the claim.

7. Strictly construed, the wording of claim 1 is, indeed, contradictory, as the surface of a PTC thermistor element is not electrically insulating. This renders claim 1 unclear. As a lack of clarity is not a ground for opposition, the feature must be interpreted in its broadest, technically meaningful sense. Since a strictly literal interpretation is obviously nonsensical, the skilled person would understand the claim to be open to (at least) the following two technically meaningful interpretations:
 - (a) According to the first understanding, the "electrically insulating" property of the surface areas would not be understood in its strict sense, but rather as a distinction from the (highly)

conductive surface property of the coating in the contact areas. The PTC thermistor has a resistance that increases with temperature until it reaches extremely high values at its maximum (self-limiting) temperature. Therefore, during operation at a certain temperature, the uncoated surface areas of the thermistor element are relatively "electrically insulating" when compared to the conductively coated surface area. Hence, the feature could be understood to mean that the uncoated surfaces are "electrically insulating" in comparison to the conductively coated areas, although they are conductive to a certain (temperature-dependent) degree.

(b) According to the second understanding, for which the proprietor advocates, as the only meaningful one, the surface areas that are not covered by the conductive coatings are implicitly covered by an electrically insulating coating.

8. The two understandings are not mutually exclusive, and the claim also covers thermistor elements, in which those surface areas that are not covered by the conductive coatings are partially uncoated (understanding a) and partially coated with an electrically insulating coating (understanding b).
9. These possibilities in claim 1, in particular of the "clearance and/or creepage distance" (feature M4), and the "electrically insulating" surface areas (feature M12), form the basis of the following discussion on novelty and inventive step.

Main Request - novelty in view of D1

10. According to the proprietor, the subject-matter of claim 1 of the patent differed from the disclosure of D1 in three points. Firstly, D1 was about cooling a resistor element for a blower motor, which was not a heating module. Secondly, D1 did not disclose the two main surfaces of the PTC thermistor element as having electrically conductive coatings (features M6 and M7). The person skilled in the art would understand the term "coating" to refer to a layer that was thin, in comparison to the thermistor element, and that had been formed by deposition of an unstructured material onto the surface. D1 was silent on the nature of electrodes 1 to 4 on the surfaces of the thermistor element A, on how they were attached to it, or on the conductivity of these electrodes. They could well be independent elements, made of resistive materials that were attached to the thermistor element by a plating process, or merely clamped to it. Therefore, there was no disclosure, in D1, that these electrodes were coatings and that they were conductive. Lastly, D1 also did not disclose that areas of the thermistor element not covered by the electrodes were electrically insulating (feature M12). The electrical insulation, in claim 1, implied the presence of a layer of insulating material, whereas D1 did not disclose any such layer on the thermistor element.
11. However, the skilled person would understand the heating module, the conductive coating, and the electrical insulation in claim 1 in a broader sense than that for which the proprietor argues.
12. The "resistor device" in D1 comprises a resistive PTC element A. The current through the PTC element

generates heat. When the device is placed in the outlet of a blower motor of an air conditioning system, it is cooled by the airflow. However, as soon as the airflow decreases, heat will accumulate in the device, and the resistance of the PTC element will rise. Above a certain threshold temperature, the resistance rises abruptly, thereby limiting the current to the blower motor, in the case of faulty operation (column 1, lines 1 to 54). Just as the resistor device of D1 is cooled by the air, the air is heated by the resistor device, the more so, the more current flows through the resistor. Hence, the device is a "heating module for heating a fluid" within the meaning of claim 1. It is noted that the intended use of the apparatus of claim 1 restricts the apparatus only in so far as it must be suitable for that use, namely, the heating of a fluid. This is clearly the case for the resistor device of D1.

13. As regards the electrically conductive coatings in claim 1, these are nothing more than layers of an electrically conductive material, covering surface areas of the thermistor element. This is the case regardless of how these layers were applied, provided they are thin in comparison to the thermistor element. D1, Figure 1a, shows precisely such "coatings" in the form of electrodes 1 to 4. It is implicit that these electrodes are conductive, as the provision of a good electrical contact is the whole point of an electrode. Therefore, the skilled person would understand that the electrodes were made of the same conductive material, i.e. metal, as the electrodes on the terminal plate (D1, column 3, lines 42 - 47). The electrodes are described as being "formed" on the surfaces of the thermistor element (D1, column 3, line 9 - 16), or "disposed and attached to" the surfaces (D1, column 4, line 17 - 20) or "disposed on" them (D1, column 4, line

34 - 38). This means that they are firmly attached to the thermistor element, which is also clear from Figure 1a, and is supported by the purpose of the invention to reduce the number of parts and enable an easy assembly (D1, column 3, line 27 - 32). As there is no reason to make these electrodes thicker than necessary to establish an electrical contact with their counterpart-electrodes 8, 9, 10, and 13, it is implicit that they are thin compared to the thickness of the thermistor element, as is also suggested by Figure 4. Hence, the electrodes 1 to 4 in D1 have the same structure and serve the same purpose as the conductive coatings in the patent in suit, which makes them "coatings" in the sense of claim 1. Therefore, D1 discloses features M6 and M7.

14. Furthermore, the PTC element A in D1 is made of a ceramic material (column 4, lines 29 to 33; feature M11), and those portions of its surface, which are not covered by electrodes, implicitly remain uncovered. According to the understanding of claim 1 established above, this means that those surface areas are not less "electrically insulating" than those in the patent in suit, in the ambiguous sense of claim 1 (feature M12).

15. Whilst no exact dimensions can be inferred from Figures 1a, 1b, and 4 of D1, these figures clearly show that the electrodes do not extend to the outer edges of the PTC element A. The following drawing, which is based on Figure 4 of D1, shows that the creepage distance (red arrow) between the electrodes (orange) along the surface of the PTC thermistor element (centre), is always greater than the thickness of the PTC element, regardless of whether the comparatively thin coatings are considered to be part of the creepage distance or not.



16. It follows that D1 discloses a heating module with all features of claim 1, including features M6, M7, and M12.
17. Consequently, the Main Request is not allowable for lack of novelty of claim 1 (Article 100(a), together with Articles 52(1) and 54(1), (2) EPC).

Auxiliary Request 1 - novelty in view of D1

18. Claim 1 differs from claim 1 of the patent in that it is only the creepage distance that is defined as being greater than the thickness of the thermistor element, rather than the "clearance and/or creepage" distance.
19. The Board's finding of lack of novelty in view of D1 of claim 1 of the patent relies on the creepage distance, not on the clearance distance. Therefore, the finding applies equally to claim 1 of Auxiliary Request 1.
20. The proprietor merely referred to their arguments they put forward with regard to their Main Request.
21. Hence, Auxiliary Request 1 is not allowable for the same reason as the Main Request (Articles 52(1) and 54(1), (2) EPC).

Auxiliary Request 2 - inventive step in view of D1

22. Claim 1 differs from that of the patent in that the "clearance and/or creepage" distance is defined as being "at least 1.5 times" the thickness of the thermistor element.
23. D1 does not contain any information on the distance between the electrodes 1 to 4 and the edges of the thermistor element, or on the thickness of these electrodes. Hence, the subject-matter of claim 1 differs from D1 in the added feature.
24. In order to determine the technical effect of the difference, it is helpful to consider the teaching of the patent in suit on this topic. According to this, a given operating voltage (and heating power) required a certain minimum creepage distance to prevent short-circuits along the thermistor element's outer surfaces. In the case of electrodes covering the entire surfaces of the thermistor element right up to its edges, the thermistor element had to be at least as thick as the minimum required creepage distance. However, having a thin thermistor element was advantageous, because heat dissipation improved with decreasing thickness. Distancing the electrodes from the edges ensured that the same (minimum) creepage distance could be maintained even for thin thermistor elements (see paragraphs [0006]- [0008] and [0016] of the patent).
25. The skilled person would understand that distancing the electrodes from the edges meant that the electrodes - and their respective contact areas on the thermistor element - became smaller, as they could no longer cover the entire main surfaces of the thermistor element. As smaller electrodes led to disadvantageous current and

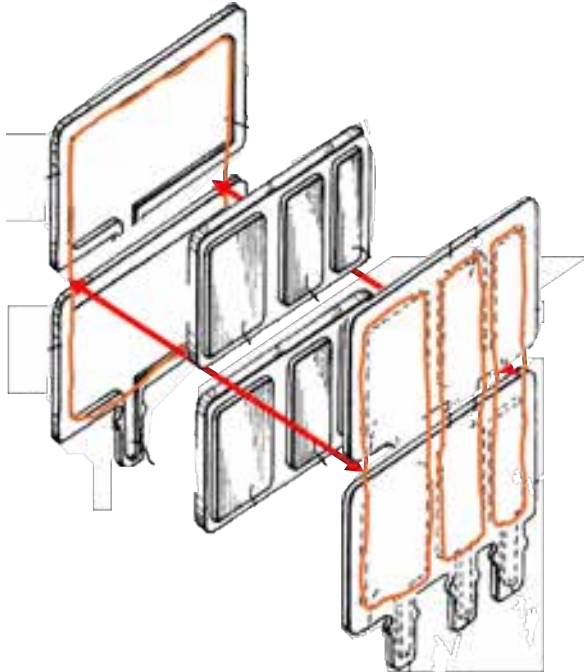
heat gradients within the thermistor element, the skilled person would also understand that there was a compromise between the safety against short-circuits provided by a large distance of the electrode from the edges and the advantages of a large contact area.

26. The proprietor was of the view that a creepage distance of at least 1.5 times the thickness had the technical effect of ensuring a good compromise between the largest possible contact area and the thinnest possible thermistor element (see also paragraph [0020] of the patent).
27. However, as the opponent correctly pointed out, claim 1 does not provide an upper limit for the ratio of creepage distance to thickness. Hence, the claim covers ratios that result in minuscule electrodes. This cannot be regarded as a compromise.
28. Therefore, the technical effect of a creepage distance larger than 1.5 times the thickness of the thermistor element merely lies in reducing the likelihood of an electrical short-circuit (flashover) occurring between the electrodes, along the surface of the thermistor element.
29. The proprietor argued that there was no hint, in D1, to consider the claimed ratio between thickness and creepage distance. On the contrary, the fact that column 2, lines 29 - 33 of D1 said that an electrode covers the "almost entire area" of a side surface of the thermistor element would have led the skilled person away from large spacings between the electrodes and the edges of the thermistor element.

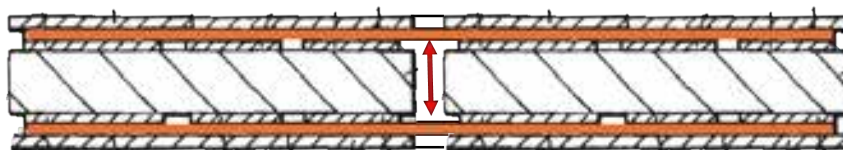
30. However, the proprietor's statement that an electrode in D1 covered the "almost entire area" of a surface of the thermistor element also says that it does not cover the entire area, as is also shown in Figures 1a, 1b, and 4 of D1. For realizing the device of Figure 1a, the skilled person would have had to select the distance of the electrodes to the edges of the surface. Considering the typical dimensions of a thermistor element of a few centimetres in width and a few millimetres in thickness, a distance of one quarter of the thickness, or slightly larger, would have fallen well into the range the skilled person would have considered. For example, for a square thermistor element of two centimetres width and four millimetres thickness, electrodes that covered the entire surface up to a distance of one millimetre from the edges would cover the "almost entire area" of the surface, while having a creepage distance of 1.5 times the thickness of the thermistor element.
31. Hence, the skilled person would have arrived at the subject-matter of claim 1 simply by realizing the device shown in Figure 1. When, additionally, trying to tackle the (well-known) problem of reducing the likelihood of a short-circuit outside the thermistor element, increasing the already existing distance between the electrodes and the edges of the thermistor element to 1.5 times its thickness, or more, would have been a straightforward measure.
32. Consequently, the subject-matter of claim 1 does not involve an inventive step in view of D1 (Articles 52(1) and 56 EPC). For this reason, Auxiliary Request 2 is not allowable.

Auxiliary Request 3 - inventive step in view of D1

33. In addition to claim 1 of Auxiliary Request 2, claim 1 of Auxiliary Request 3 defines that the first electrode connects the contact areas on the first main surfaces of at least two thermistor elements, and the second electrode connects the contact areas of the second main surfaces.
34. D1 does not disclose more than a single thermistor element. Therefore, this feature represents a further difference from D1.
35. The technical problem, related to the differing feature, lies in a simple way of providing a larger heating effect than can be obtained from one thermistor. While this problem is different from that of reducing the likelihood of a short-circuit, which is related to the creepage distance, the problems are not completely independent, since the latter is a boundary condition that must be observed when scaling up.
36. The proprietor argued that, starting from D1, there would have been no motivation, for the skilled person, to add any more thermistor elements. Further, even if the skilled person had considered doing so, they would either have duplicated the entire arrangement of D1, or, at most, stacked two of the elements shown in Figure 1a on top of one another. In the latter case, the electrodes would have extended across the two elements, as shown in the following drawing (electrode outlines in orange).



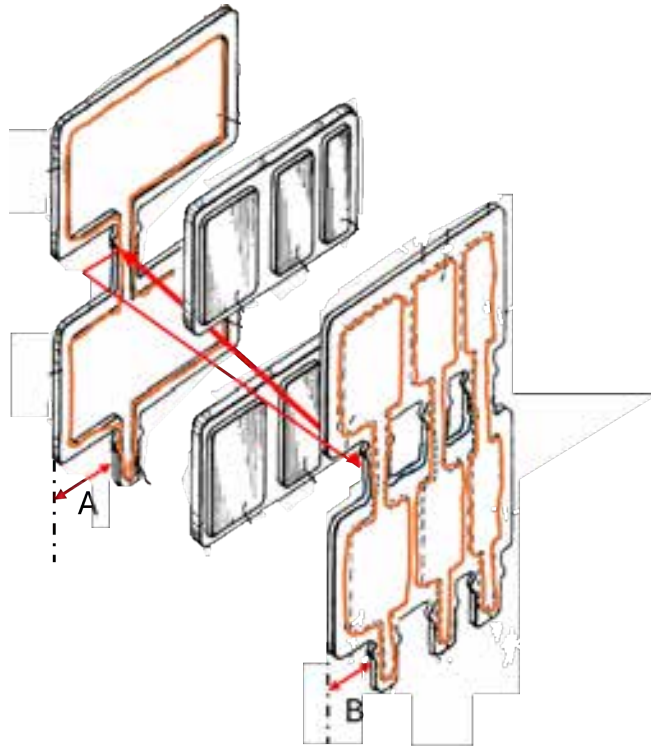
37. In such an arrangement, the central parts of the opposing electrodes, which were located between the thermistor elements, directly faced one another (red arrows in the above drawing). The proprietor concluded that, therefore, their distance was equal to the thickness of the thermistor element plus the negligible thickness of the two conductive coatings (see the following drawing below). This meant that the creepage distance (red arrow) was only slightly greater than the thickness of the thermistor element, and, in any case, less than 1.5 times the thickness.



38. The proprietor therefore concluded that even when considering an upscaling of the thermistor element, the skilled person would not have arrived at the subject-matter of claim 1.

39. These arguments are not persuasive. The proprietor did not show why the skilled person would not consider scaling the device of D1, for example, in order to increase the cooling of the thermistor by multiplying the area exposed to the surrounding air. This might be necessary for the potent air conditioning systems used in large vehicles. Upscaling is a common way to meet increasing power demands. A simple duplication would have been possible, but would have been against the goal of D1, which is to reduce the number of parts and to provide a simple and compact device (D1: column 1, line 49 - column 2, line 3). Therefore, the skilled person would have considered the option, mentioned by the proprietor, of stacking two thermistor elements on top of each other.

40. When stacking two of the thermistor elements of Figure 1a of D1 on top of each other, the skilled person would not necessarily have done so in the way explained by the proprietor. Rather, they would also have considered maintaining the shape of the electrodes and simply connecting them with bridges, similar to the protrusions used as terminals 5, 6, 7, and 12. This would have resulted in electrodes as shown in the drawing below, with orange outlines.



41. To avoid increasing the probability of short-circuits with respect to a single thermistor element, the skilled person would have arranged the bridges with a lateral offset from one another (see offset A - B in the above drawing), similar to what appears to be the case for the terminal protrusions in Figure 1a. Taking into account the typical dimensions of thermistor elements, which have widths of a few centimetres and thicknesses of a few millimetres, distributing the bridges over the width of the thermistor element would have easily resulted in creepage distances (red arrow), along the surface of the thermistor element, larger than 1.5 times its thickness.
42. Hence, the subject-matter of claim 1 does not involve an inventive step in view of D1 (Articles 52(1) and 56 EPC), and Auxiliary Request 3 is not allowable, either.

Conclusion

43. The Main Request and Auxiliary Request 1 are not allowable for lack of novelty in view of D1.
44. The Second and Third Auxiliary Requests are not allowable for lack of an inventive step in view of D1.

Order

For these reasons it is decided that:

- The decision under appeal is set aside.
- The patent is revoked.

The Registrar:

The Chair:



L. Stridde

P. Scriven

Decision electronically authenticated