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**Datasheet for the decision  
of 8 December 2022**

**Case Number:** T 2883/19 - 3.5.02

**Application Number:** 12738270.3

**Publication Number:** 2724461

**IPC:** H03F1/02

**Language of the proceedings:** EN

**Title of invention:**

Low-Voltage Power-Efficient Envelope Tracker

**Patent Proprietor:**

Qualcomm Incorporated

**Opponent:**

Apple Inc.

**Relevant legal provisions:**

EPC Art. 108, 56

EPC R. 99(2)

RPBA 2020 Art. 12(3), 12(5), 12(6), 13(2)

**Keyword:**

Admissibility of appeal - appeal sufficiently substantiated  
(yes)

Inventive step - Auxiliary Request (yes)

Late-filed objection - error in use of discretion at first  
instance (no)

Reply to statement of grounds of appeal - reasons set out  
clearly and concisely (no)

Amendment after summons - exceptional circumstances (no)

**Decisions cited:**

T 0717/01



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Case Number: T 2883/19 - 3.5.02

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.02**  
**of 8 December 2022**

**Appellant:** Qualcomm Incorporated  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 14 August 2019  
revoking European patent No. 2724461 pursuant to  
Article 101(3) (b) EPC.**

**Composition of the Board:**

**Chairman** R. Lord  
**Members:** C.D. Vassoille  
W. Ungler

## Summary of Facts and Submissions

- I. This is an appeal of the patent proprietor against the decision of the opposition division revoking European patent no. 2 724 461.
- II. The following documents are relevant for the present decision:
- K8: J. T. Stauth et al.: "Optimum Bias Calculation for Parallel Hybrid Switching-Linear Regulators", Applied Power Electronics Conference, 1 February 2007, pages 569 to 574.
- K9: US 2005/215209 A1
- K13: US 5,905,407
- K26: J. T. Stauth et al.: "Optimum Biasing for Parallel Hybrid Switching-Linear Regulators", IEEE Transactions on Power Electronics, vol . 22, no. 5, 5 September 2007, pages 1978 to 1985.
- III. With letter of 12 February 2021, opponent 2 withdrew their opposition.
- IV. In a communication under Article 15(1) RPBA 2020 annexed to the summons to oral proceedings, the board informed the parties *inter alia* of its preliminary opinion that
- the appeal was admissible,
  - the subject-matter of claim 1 of auxiliary request 1 involved an inventive step under

Article 56 EPC in view of documents K8 and K26,  
and

- the board intended not to admit the objection to auxiliary request 1 under Article 123(2) EPC.

V. Oral proceedings before the board were held on 8 December 2022.

The appellant (patent proprietor) ultimately requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of auxiliary request 1 filed with the notice of appeal, or on the basis of one of the auxiliary requests 1a, 2, 3 or 4, all filed with the statement of grounds of appeal.

The respondent (opponent 1) requested that the appeal be rejected as inadmissible, or that the appeal be dismissed.

VI. With letter of 22 December 2022, the respondent submitted a request for correction of the minutes of the oral proceedings before the board. According to the respondent's request, the minutes should include the instruction that the description should be adapted to the maintained claim in such a way that, *inter alia*, the technical teaching of paragraph [0039] of the description, according to which "An offset may also be added by increasing the pulse width of an output signal from current sense amplifier via any suitable mechanism", was not covered by the claimed invention. As an auxiliary measure, it was requested that the instruction be included in the reasons for the present decision.

VII. The only claim of auxiliary request 1 has the following wording (feature references added in squared brackets):

"**[1]** An apparatus (150) comprising:

**[1.1]** an inductor (162) operative to receive a switching signal and provide a supply current;

**[1.2]** a switcher (160b) operative to sense an input current ( $I_{sen}$ ) and generate the switching signal to charge and discharge the inductor to provide the supply current,

**[1.2.1]** the switcher (160b) adding an offset to the input current to generate a larger supply current via the inductor than without the offset

**[1.4]** an envelope amplifier (170a) operative to receive an envelope signal and provide a second supply current ( $I_{env}$ ) based on the envelope signal,

**[1.5]** wherein a total supply current ( $I_{pa}$ ) comprises the supply current from the switcher (160b) and the second supply current from the envelope amplifier (170a); and

**[1.3]** a boost converter (180) operative to receive a first supply voltage and provide a boosted supply voltage having a higher voltage than the first supply voltage,

**[1.4.1]** wherein the envelope amplifier selectively operates based on the first supply voltage or the boosted supply voltage,

[2.1] wherein the switcher (160b) operates based on the first supply voltage, and wherein

[2.2] the offset is determined based on the first supply voltage."

VIII. Considering the board's favourable decision on auxiliary request 1, it was not necessary to reproduce the wording of the further auxiliary requests here.

IX. The arguments of the appellant, in so far as they are relevant for the present decision, may be summarised as follows:

Admissibility of the appeal

The appeal was admissible in light of the reasons provided in the statement of grounds of appeal regarding auxiliary request 1. The admissibility of the appeal could only be assessed as a whole and since the requirements of Article 108, third sentence, EPC were fulfilled for this request, the appeal as a whole was admissible.

Admittance of the new objection under Article 123(2) EPC

The opposition division was right not to admit the late-filed objection under Article 100(c) EPC concerning the term "selectively" introduced in feature 1.4.1 of claim 1. In particular, the introduction of this feature did not *prima facie* lead to an unallowable intermediate generalisation. Furthermore, the respondent had not shown that the opposition division exercised its discretion erroneously.

Auxiliary request 1 - Inventive step (Article 56 EPC)

Document K8 did not render the subject-matter of claim 1 of auxiliary request 1 obvious. K8 provided a mathematical model for calculating the optimum switcher current  $i_{SR}$  based on the conduction angle of the linear regulator according to equation (8) of K8. Neither the theoretical model nor the experimental model of document K8 involved the envelope amplifier current control loop to control the switcher. The "force to zero" principle also did not imply features 1.2.1 and 2.2 of claim 1.

Equation (8) of document K8 provided an optimum switcher current which comprised a DC current provided to the load and an additional amount of current, which is proportional to the envelope signal taking into account the conduction angle of the linear regulator. Thus, document K8 disclosed choosing an optimum switching regulator current but did not suggest to add an offset, determined based on the supply voltage, to a sensed input current and to generate a larger supply current provided by the switching regulator than without the offset.

Admittance of the objection based on K13

The respondent's objection based on document K13 against auxiliary request 1 should not be taken into account in the appeal procedure. The objection was not sufficiently substantiated in the reply to the appeal. The corresponding objection based on this document and submitted with the letter of 8 November 2022 therefore constituted an amendment to the appeal case within the meaning of Article 13(2) RPBA 2020, which has not been justified with cogent reasons by the respondent.



- X. The arguments of the respondent, in so far as they are relevant for the present decision, may be summarised as follows:

Admissibility of the appeal

The appeal was not admissible because the appellant in the statement of grounds of appeal did not address the reasons for the decision under appeal concerning the main request. Reference was made to the decision in appeal case T 0717/01, according to which an appeal may still be admissible under certain circumstances, even if the grounds for the decision under appeal were not addressed in the statement of grounds of appeal. Corresponding circumstances, however, did not exist in the present case. Nor could the absence of a discussion of the main request in the statement of grounds of appeal be regarded as setting out the extent to which the decision under appeal should be amended within the meaning of Rule 99(2) EPC.

Admittance of the new objection under Article 123(2) EPC

The opposition division's decision not to admit the new ground for opposition under Article 100(c) EPC suffered from an error in the use of discretion and the objection should therefore be admitted into the appeal proceedings. In particular, the opposition division's factual assessment of the objection in view of the application as originally filed was not correct.

Auxiliary request 1 - Inventive step (Article 56 EPC)

The subject-matter of claim 1 of auxiliary request 1 did not involve an inventive step in view of document K8. The core idea of K8, as expressed for instance in section VI, was to provide an optimised switcher supply current, which was greater than the DC current to the power amplifier. Already for this reason K8 implicitly required adding an offset to a sensed input current in order to generate the larger switcher supply current. Furthermore, the teaching of document K8 was based on a known hybrid circuit implementing the "force to zero" principle, as shown in figure 1. In document K8, the DC current  $i_{dc}$  resulted from the "force to zero" principle, which meant that the switcher was controlled such that the complete, i.e. the average, DC current to be supplied to the power amplifier was generated by the switcher, such that the linear amplifier, in terms of supplied current, was almost fully relieved. For this purpose it was necessary to add an offset to a sensed input current.

Admittance of the objection based on K13

The objection based on K13 against auxiliary request 1 was sufficiently substantiated in the reply to the appeal. In particular, all features of claim 1 of auxiliary request 1 were discussed in section 8.4 with regard to auxiliary request 3. Furthermore, the section contained an explicit reference to auxiliary request 1, see page 64 of the reply.

## **Reasons for the Decision**

### *1. Admissibility of the appeal*

1.1 The appeal is admissible within the meaning of Article 108 EPC and Rule 99(2) EPC.

1.2 From the third sentence of Article 108 EPC in conjunction with Rule 99(2) EPC it follows that the appellant in the statement of grounds of appeal shall indicate the reasons for which the decision under appeal is to be set aside.

According to the established case law of the Boards of Appeal, the appeal as a whole is admissible if the admissibility requirements are fulfilled in respect of one request. The reason for this is that a partial admissibility of the appeal does not exist. Rather, an appeal can only be assessed as a whole (see Case Law of the Boards of Appeal, 10th edition 2022, V.A.2.6.3a)).

The decision under appeal was based on the then main request (patent as granted) and on auxiliary request 1, filed during the oral proceedings before the opposition division and corresponding to current auxiliary request 1.

In the statement of grounds of appeal, the appellant explicitly refrained from presenting arguments regarding the then main request, see in particular page 3, first paragraph of the statement of grounds of appeal.

1.3 The appellant's statement of grounds of appeal, on the other hand, contains detailed reasons why the decision

under appeal should be set aside with regard to auxiliary request 1. The appellant has therefore at least set out sufficient reasons why the contested decision should be set aside with regard to auxiliary request 1. This was not contested by the respondent.

- 1.4 In the reply to the appeal, the respondent referred to the decision in appeal case T 0717/01 and argued that none of the specific exceptions mentioned in that decision applied to the present case.

The board notes that the initial situation in that appeal case is quite different from the present case. Instead of addressing the grounds for the decision under appeal with regard to any of the requests underlying the decision under appeal, the appellant in that case with the statement of grounds of appeal had merely submitted new requests.

As stated in decision T 0717/01 under point 2 of the reasons, in order for the appeal to be admissible, the statement of grounds of appeal must address the main reasons of the decision under appeal. However, these principles only apply to unchanged facts underlying the decision under appeal, e.g. if the appeal on the part of the patent proprietor maintains, as in the case at hand, the earlier auxiliary request 1. However, this was not the case in T 0717/01.

The exceptions mentioned in appeal decision T 0717/01 cannot therefore be applied to the present case because they relate to a different situation from that of the present case. Rather, the established principles set out above under point 1.2 apply.

- 1.5 Consequently, the statement of grounds of appeal satisfies the requirements of Rule 99(2) EPC. The appeal is therefore admissible as a whole within the meaning of Article 108 EPC.
  
2. *Auxiliary request 1 - Amendments (Article 123(2) EPC)*
  
- 2.1 The respondent's objection under Article 123(2) EPC concerning the presence of the word "selectively" in claim 1 of auxiliary request 1 is not admitted into the appeal proceedings (Article 12(6) RPBA 2020, applicable under Article 25(1) RPBA 2020).
  
- 2.2 According to Article 12(6) RPBA 2020, the board shall not admit objections which were not admitted in the proceedings leading to the decision under appeal, unless the decision not to admit them suffered from an error in the use of discretion or unless the circumstances of the appeal case justify the admittance.
  
- 2.3 The respondent argued that the opposition division's decision not to admit the new objection under Article 123(2) EPC suffered from an error in the use of discretion. However, the respondent's arguments in support of such an error in the use of discretion in fact address the opposition division's substantive assessment of the objection, and not the procedural question of whether the opposition division applied the correct principles in the exercise of its discretion.
  
- 2.4 Under point 4 of the reasons for the decision under appeal, the opposition division held that the new ground for position was late-filed. With reference to Enlarged Board of Appeal decision G 10/91, the

opposition division further held that a new ground for opposition could only be exceptionally considered by an opposition division in the case that the objection, *prima facie*, in whole or in part would seem to prejudice the maintenance of the European patent (see point 4.2 of the reasons for the decision under appeal). The opposition division under point 4.3 of the reasons went on to explain why it did not consider the objection to be *prima facie* relevant.

2.5 Thus the criterion of *prima facie* relevance of the objection was applied by the opposition division in the present case as a criterion for admittance. *Prima facie* relevance is a recognised criterion for assessing the admissibility of a late-filed objection. Furthermore, it is not apparent to the board that the opposition division under point 4.3 of the reasons for the decision under appeal did not exercise the *prima facie* relevance test correctly. The mere fact that the respondent does not agree with the result of the substantive assessment of the objection by the opposition division does not in any case indicate an error in the exercise of discretion. Furthermore it is not apparent to the board that the *prima facie* relevance evaluation was based on manifestly incorrect technical assumptions.

2.6 The board therefore exercised its discretion under Article 12(6) RPBA 2020 not to admit the objection under Article 123(2) EPC against auxiliary request 1 into the appeal proceedings.

3. *Auxiliary request 1 - Inventive step (Article 56 EPC)*

3.1 *Interpretation of feature 1.2.1*

3.1.1 The board bases the following considerations in the assessment of an inventive step on a skilled person's understanding of feature 1.2.1, according to which an offset to an input current is to be understood as any means to change the sensed input current in such a way that the switcher produces a larger supply current ("switcher supply current") via the inductor than without the offset.

3.1.2 The appellant confirmed the above understanding with regard to the description in paragraph [0039] of the patent during the oral proceedings before the board.

For the sake of completeness, the board notes in this context that an interpretation of feature 1.2.1 according to the second sentence of paragraph [0039] of the patent is thereby excluded. In particular, increasing the pulse width of an output signal from the current sense amplifier via any suitable mechanism clearly cannot be construed as adding an offset to a (sensed) input current to thereby change this input current, as required by claim 1 of auxiliary request 1.

As the respondent has correctly pointed out, the current sense amplifier generates an output signal on the basis of a voltage signal, which is proportional to the sensed input current. For this reason alone, an increase in the pulse width of the output signal of the current sense amplifier cannot correspond to adding an offset to the sensed input current itself.

3.1.3 Hence, the board understands that, as set out in particular in paragraph [0039] of the patent, an increase in the switcher current from a functional point of view can also be achieved by other means, in particular by lengthening the pulse width of the output signal of the current sense amplifier by any suitable means.

However, the wording of feature 1.2.1 of claim 1 is clear in that it requires an offset that is added to the input current itself, and not to any other signal that has been derived from or associated with the input current. Furthermore, in the overall context of claim 1, it is clear that the "input current" refers to the input current that is sensed by the switcher according to feature 1.2. The unambiguous wording "adding an offset to the input current" of feature 1.2.1 can neither be simply ignored nor reinterpreted in such a way that it encompasses any manipulation, even indirect, related to the input current, which functionally generates a larger switcher supply current.

3.1.4 Moreover, the skilled person might well understand that an "offset" can be something other than the physical addition of an offset current to the input current itself. However, they would have no reason to interpret claim 1 unreasonably broadly beyond its unambiguous wording to mean that an offset could be any kind of manipulation, in particular of any signal derived from or related to the input current, that generates a larger switcher supply current.



3.2 *Document K8 as a starting point*

3.2.1 In the light of the interpretation under points 3.1.1 to 3.1.4 above, the subject-matter of claim 1 of auxiliary request 1 is not rendered obvious by document K8 in combination with the common general knowledge of the skilled person.

3.2.2 The appellant did not contest the decision under appeal insofar as it found that features 1.3 and 1.4.1 of claim 1 of auxiliary request 1 were obvious and consequently did not contribute to an inventive step (see point 15.6.2 in connection with point 10.5 of the reasons for the decision under appeal). This part of the decision under appeal is therefore not part of the present appeal proceedings. The appellant did not contest this.

3.2.3 However, it was in dispute between the parties whether document K8 discloses or suggests an offset within the meaning of feature 1.2.1 of claim 1 of auxiliary request 1, the offset being determined on the basis of the first supply voltage according to feature 2.2.

3.2.4 One of the respondent's main arguments concerned the question of what teaching the skilled person would derive from figure 1 of document K8. Figure 1 of K8 forms the starting point for the further considerations of that document. According to the caption of figure 1, it concerns a "Traditional parallel-hybrid configuration of linear and switching voltage regulator". In particular, the respondent argued that figure 1 of K8 was a further development of the embodiment shown in figure 3 of the patent, as it provided not only for the use of a P controller, but

also for a PI controller, thus fulfilling the "force to zero" principle.

3.2.5 The board concludes that the question whether the respondent's submission on figure 1 is correct can remain unanswered, because even if this were the case, figure 1 of K8 still does not disclose an offset added to an input current within the meaning of feature 1.2.1. In particular, adding an integral controller portion to a proportional controller portion cannot be considered to correspond to adding an offset to an input current sensed by the switcher in order to provide a larger supply current via the inductor than without the offset.

3.2.6 The respondent particularly considered the integral portion of a PI controller to correspond to an offset added to a sensed input current to thereby generate a larger supply current.

The board is not convinced by this argument. The integral component of a PI controller serves the purpose of reducing the control error. This fundamental function of the integral controller component was confirmed by the respondent. The integral controller component is in fact added to a P controller component when a PI controller is implemented. However, this does not cause any change in the sensed input current (see in this context the board's further remarks under point 3.3.3 below). Thus, even if a PI controller were implemented in the traditional parallel-hybrid configuration of linear and switching voltage regulator according to figure 1 of K8, it is not apparent to the board how the implementation of an integral controller component could add an offset to the sensed input current itself, such that a larger switcher supply

current is generated via the inductor than without the offset.

To the contrary, when following the respondent's interpretation of figure 1 of K8, it is clear that the sensed input current is input to the PI controller and first compared to a set-point (see also the illustration on page 12 of the respondent's letter of 8 November 2022). The error signal is then input into the PI control loop (in the respondent's view indicated in figure 1 with "Control/PWM"), where it is multiplied by the proportional and integral constants. Thus, depending on the resulting output error signal, the PI controller takes a corrective action and, depending on the PI controller output, the switches are correspondingly controlled by means of Pulse Width Modulation (PWM). This consideration already makes it clear that the sensed input current is not changed in the PI controller structure in order to generate a larger switcher output current. At most, the set-point as such is changed and compared with the sensed input current and/or the error signal effects different actions of the controller components. Furthermore, the error signal of course depends on the sensed input current and on the set-point. However, none of these steps corresponds to adding an offset to the sensed input current within the meaning of claim 1 (see the board's remarks under points 3.1.1 to 3.1.4 above).

3.2.7 Furthermore, it was argued on the part of the respondent that feature 1.2.1 was a purely functional feature and in principle included any means that led to the generation of a larger switcher supply current.

The board does not agree with this argument. As stated under points 3.1.1 to 3.1.4 above, feature 1.2.1

explicitly requires adding an offset to the sensed input current, which implies the presence of means to change the sensed input current such that the generated switcher supply current is larger than without this change of the sensed input current.

Consequently, feature 1.2.1 of claim 1 of auxiliary request 1 is not a purely functional feature, but rather implies physical means that effect a change of the sensed input current, which then functionally results in a larger switcher supply current than it would be without that means.

3.2.8 As regards the further content of document K8, in particular equation (8) of this document, the respondent substantially argued that the skilled person would learn from document K8 that a higher efficiency could be attained by providing an increased switcher current  $i_{SR}^*$ , i.e. a current that was higher than the supply current  $i_{SR} = idc$ , which corresponded to the switcher current in the application of the known "force to zero" principle (see figure 1 of K8).

The board does not contest the respondent's argument as far as document K8 in fact states that a higher efficiency can be achieved by providing an optimised switcher current  $i_{SR}^*$ , wherein  $i_{SR}^*$  is analytically defined according to equation (8), see K8 on page 571. Equation (8) is as follows:

$$i_{SR}^* = idc + ia \cdot \cos \left[ \pi \frac{vdc}{V_{dd}} \right]. \quad (8)$$

However, the board does not agree with the respondent that the skilled person would understand equation (8) such that the first part of the equation, i.e.

*idc*

corresponded to a sensed input current of the switcher within the meaning of claim 1, and that the second part of the equation, i.e.

$$i_a \cdot \cos \pi \cdot \frac{v_{dc}}{V_{dd}}$$

constituted an offset that was to be added to the sensed input current. The skilled person would rather recognise equation (8) as describing an analytical consideration of the optimised switcher current, which takes account of the dynamic characteristics of the envelope signal (see K8 on page 573, left column).

Neither is the skilled person prompted by the overall disclosure of K8 to consider the first part of this equation, i.e. *idc*, in a practical implementation of equation (8) to correspond to a sensed input current of the switcher, nor would they separately consider and interpret the second part of the equation to constitute an offset within the meaning of claim 1.

In particular, the board considers the respondent's interpretation of equation (8) to be the result of an inadmissible *ex post facto* analysis. The reason is that a splitting of equation (8) into two parts, such that it artificially reads on to features 1.2.1 and 2.2, goes beyond what the skilled person would have objectively inferred from the whole of document K8, without the benefit of hindsight knowledge of the invention. In particular, equation (8) in conjunction with the further content of K8 does not give the skilled person any indication that equation (8) could

imply a practical implementation of a control structure involving the addition of an offset to a sensed input current within the meaning of claim 1.

The entire disclosure of document K8 focuses on an optimised switcher current greater than  $i_{dc}$ , which is derived in equation (8) based on a set of idealised assumptions only for specific sinusoidal and two-tone signals. Accordingly, the skilled person would not understand the current  $i_{dc}$  as a measured input current, but as a conceptual and constant value representing the DC current to the load in a periodic waveform of the envelope signal, as the appellant has correctly pointed out.

Furthermore, the second part of the equation, which contains the dependence of the optimised switcher current on the dynamic characteristics of the envelope signal (in particular the amplitude of current swing and the conduction angle), contains a dependence on the supply voltage. However, the person skilled in the art already has no reason to consider the second part of equation (8) separately from the first part of equation (8), and in particular not to interpret it as an offset that is added to a sensed input current.

Feature 1.2.1 is therefore not disclosed or suggested by equation (8) in light of the further disclosure of K8. Accordingly, the determination of the offset based on the supply voltage, according to feature 2.2, is also not disclosed or suggested by equation (8) in light of the further disclosure of K8.

On the other hand, should the person skilled in the art understand the optimised switcher current  $i_{SR}^*$  as a set-point in the context of a PI controller, features 1.2.1

and 2.2 also would not be disclosed or suggested for the reasons already explained in this respect (see also the board's remarks under point 3.3.3 and point 3.2.9 below).

- 3.2.9 Figure 4 of document K8 illustrates an experimental set-up. According to the respondent's argument, figure 4 and the corresponding description implies that the optimised switcher current  $i_{SR}^*$  is provided as the set-point value to the PI controller, which is subsequently compared to the sensed input voltage. As already outlined above, on a reasonable interpretation of claim 1, this does not correspond to adding an offset to an input current within the meaning of claim 1 of auxiliary request 1 (see in particular the board's remarks under point 3.2.6 above).

Thus, even if the respondent's understanding of the experimental set-up according to figure 4 were to be considered correct, in particular concerning the "manual adapt" and the provision of a set-point to the "Current Command Control" section, this would not imply adding an offset in the sense of feature 1.2.1.

- 3.2.10 Nor does the board agree with the respondent that the "core idea" of K8, independent of equation (8) or the experimental set-up of figure 4, would render the subject-matter of claim 1 obvious.

While document K8 clearly suggests generating an optimised switcher current  $i_{SR}^*$  which is higher than a DC current  $i_{dc}$  to the load and which depends on the supply voltage (see for instance section VI), it does not teach or suggest adding an offset to a sensed input current. Furthermore, even if figure 1 were to be considered to imply the use of a PI controller,

document K8 at most suggests changing the set-point value to  $i_{SR}^*$  but does not teach or suggest adding an offset to an input current within the meaning of claim 1 (see the board's remarks in particular under under point 3.2.6 above). Again, the board emphasises that comparing a sensed input current to a set-point or reference value does not correspond to feature 1.2.1, as it does not imply a change in the sensed input current.

3.2.11 The disclosure of document K26 does not provide anything more in this respect. In particular, it does not disclose anything going beyond the disclosure of K8 in terms of a practical implementation of equation (8) and the further disclosure of K8 such that an offset is added to an input current in the sense of feature 1.2.1 of claim 1.

3.3 *Inventive step in view of the "force to zero" principle, especially with hysteretic or PI control*

3.3.1 The respondent further argued that claim 1 of auxiliary 1 was rendered obvious by the so-called "force to zero" principle, for example by using a hysteretic comparator to control the switcher. In particular, they argued that the "force to zero" principle meant that the switcher was controlled in such a way that it provided the full DC current contribution to the power amplifier. In light of this, they considered that a corresponding control for this purpose required a means to ensure the current increase of the switcher. Such a means in the respondent's view was an offset according to feature 1.2.1. Furthermore, the respondent argued that the offset forcibly had to be determined based on the supply voltage according to feature 2.2, as this



was the only possibility to ensure that the switcher provided the full DC current contribution to the power amplifier (in the event that the supply voltage was decreasing).

3.3.2 The board is already not convinced by the objection regarding feature 1.2.1. The respondent's objection is obviously based on the assumption that any measure leading to an increase of the switcher supply current implies an offset in the sense of feature 1.2.1. In particular, the respondent has not explained where exactly in the hysteretic control to fulfil the "force to zero" principle they recognise the addition of an offset to a sensed input current. The above assumption in any case is not correct, because, as explained under points 3.1.1 to 3.1.4 above, claim 1 clearly requires an offset that is added to a sensed input current and not merely any means that are suitable to generate a larger switcher supply current. Claim 1 therefore implies a means to change the sensed input current itself in such a way that the switcher supply current is larger than without this means. The direct and unambiguous existence of corresponding means under the general "force to zero" principle has not been convincingly demonstrated by the respondent.

3.3.3 Moreover, the respondent considered the "force to zero" principle in the specific context of PI controllers to anticipate feature 1.2.1. Again, they understood this principle in such a way that no permanent control deviation occurred with the control objective of controlling the current contribution of the switcher in such a way that the (DC) current contribution of the linear amplifier was driven to zero.

The board is persuaded that the "force to zero" principle, as explained by the respondent, in particular in the light of figure 1 of K8, does not anticipate feature 1.2.1. The board has no doubts that a PI controller is generally suitable to fulfil the "force to zero" principle, as argued by the respondent. Furthermore, a corresponding PI controller comprises a P controller component to which an I controller component is added, such that the linear amplifier DC current is driven to zero. However, it is not apparent to the board how this would imply adding an offset to an input current in the sense of a change of the input current itself such that the resulting switcher supply current is larger than without the offset, i.e. without the change of the sensed input current.

3.3.4 Consequently, the board does not agree with the respondent that the use of a PI controller directly and unambiguously implies an offset being added to the sensed input current, i.e. a change of the sensed input current by means of the PI controller such that the switcher current is larger than without the offset. Adding an offset to the input current in the sense of claim 1 would rather mean that the input current is somehow changed before it is processed in the PI controller and, in particular, before the error signal is generated. This was, however, not argued by the respondent, and is also not apparent to the board from the overall disclosure of document K8.

Hence, neither the "force to zero" principle as such, nor the explicit use of hysteretic or PI control, disclose or suggest features 1.2.1 and 2.2 of claim 1 of auxiliary request 1. Against this background, further discussion of documents E5, K12, K14 and K23,

on which the respondent relied in this context, is not necessary.

### 3.4 *Conclusion*

3.4.1 The person skilled in the art being confronted with the objective technical problem to improve the efficiency of the known parallel-hybrid configuration, in particular one implementing the "force to zero" principle, thus would not have arrived at the invention with the help of the common general knowledge in an obvious manner. In particular, neither document K8 as such nor the related common general knowledge included anything that would have led the person skilled in the art to the subject-matter of claim 1 of auxiliary request 1.

3.4.2 The board concludes that the subject-matter of claim 1 of auxiliary request 1 is neither rendered obvious by document K8 in combination with the common general knowledge nor by the general "force to zero" principle. Consequently, it involves an inventive step over document K8 in the sense of Article 56 EPC.

### 4. *Objection based on K13 - Admittance (Article 13(2) RPBA 2020)*

4.1 In the letter of 8 November 2022, the respondent submitted that the subject-matter of claim 1 did not involve an inventive step under Article 56 EPC based on document K13 in combination with the common general knowledge of the skilled person or in combination with document K9 (see point 5, pages 28 to 30).

- 4.2 According to Article 13(2) RPBA 2020, applicable under Article 25(1) RPBA 2020, any amendment to a party's appeal case made after notification of a summons to oral proceedings shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.
- 4.3 The board considers the respondent's submissions relating to K13 against auxiliary request 1 to constitute an amendment to the respondent's appeal case within the meaning of Article 13(2) RPBA 2020. Contrary to the respondent's view, a corresponding objection based on K13 against auxiliary request 1 was not sufficiently substantiated in the reply to the appeal, as required by Article 12(3) RPBA 2020. This Article stipulates that the statement of grounds of appeal and the reply shall contain a party's complete appeal case. Accordingly, they shall set out clearly and concisely the reasons why it is requested that the decision under appeal be reversed, amended or upheld, and should specify expressly all the requests, facts, objections, arguments and evidence relied on.
- 4.4 The respondent's main arguments were based on the fact that the reply to the appeal contained under section 8.4 a discussion of the features of claim 1 of auxiliary request 1 and in this context expressly referred to the relevance of K13 to auxiliary request 1. It was further argued that the reply to the appeal under paragraph 4. expressly stated that the order of the reply deviated from the canonical order, which was also valid for individual objections.

The board is not convinced by the respondent's arguments. Firstly, it is to be noted that the

deviation from the canonical order in the reply to the appeal does not imply that objections against auxiliary request 1 are distributed through the reply to the appeal. To the contrary, it is clear from paragraph 4. of the reply that the respondent intended to discuss auxiliary request 1 first, because they considered the opposition division's overall decision to be correct and the further requests (main request, auxiliary requests 1a, 2, 3 and 4) in any case not to be sufficiently substantiated.

Furthermore, document K13 is discussed in the context of auxiliary request 3 only at the very end of the relevant section (see paragraph 245. on page 64). It contains the statement that K13 is relevant also regarding the auxiliary request 1 (in the original German version: "...sodass K13/Midya somit auch dadurch hinsichtlich .... der Hilfsanträge 1 und 1a **einschlägig** ist" (emphasis added)).

The appellant has correctly argued that the mere remark that a document is "relevant" (German original version: "einschlägig") as such does not constitute a clearly and comprehensibly substantiated objection. Moreover, in the letter of 8 November 2022, the respondent argued that claim 1 of auxiliary request 1 did not involve an inventive step in view of K13 in combination with the common general knowledge, or also in combination with document K9. However, the cited passage in the reply to the appeal, referring to auxiliary request 3 (section 8.4 of the reply), does not contain a logical chain of arguments which clearly and comprehensibly substantiates a lack of inventive step of claim 1 of auxiliary request 1 in view of K13. It merely contains a discussion of individual features without it being recognisable under which specific objection the

respondent considers document K13 to be "relevant" for the subject-matter of claim 1 of auxiliary request 1.

- 4.5 Furthermore, the discussion of document K13 in the context of the then main request (see section 6.8 on page 50 of the reply to the appeal) does not contain any reference to the additional feature 2.2 of claim 1 of auxiliary request 1. For this reason alone, the relevant passage concerning the then main request cannot be regarded as providing a sufficient substantiation of an objection based on document K13 against auxiliary request 1.
- 4.6 In general, the board notes that the entire structure of the reply letter, in particular with regard to the structure presented in the table of contents and the remark under paragraph 4. of the reply to the appeal, gives the impression that auxiliary request 1 is dealt with completely and exhaustively as the main point in section 5 of the reply. In particular, that section of the reply contains no reference to document K13, let alone mentioning this document as relevant to auxiliary request 1. Against this background, neither the appellant nor the board can be expected to identify a further objection against auxiliary request 1 in other parts of the 65-page reply relating to other requests, where this objection is not clearly and unequivocally set out as such in a comprehensible manner.

The board has therefore come to the conclusion that the objection based on K13 against auxiliary request 1 was not sufficiently substantiated in the reply to the appeal (Article 12(3) RPBA 2020).

- 4.7 It follows that the submissions in the letter dated 8 November 2022 based on K13 in combination with the

common general knowledge or in combination with document K9 against auxiliary request 1 constitute an amendment to the respondent's appeal case within the meaning of Article 13(2) RPBA 2020.

Under this article, any amendment to a party's appeal case is, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.

The respondent has not set out any cogent reasons justifying exceptional circumstances within the meaning of Article 13(2) RPBA 2020. Rather, their submissions were limited to arguing that a sufficient substantiation of the objection to auxiliary request 1 based on K13 had already been presented in the reply to the appeal. These arguments, however, did not convince the board (see the reasons under points 4.3 to 4.6 above).

4.8 The board has therefore exercised its discretion under Article 13(2) RPBA 2020 such that the objection under Article 56 EPC based on document K13 against auxiliary request 1 is not to be taken into account in the appeal procedure.

5. *Request for correction of the minutes of the oral proceedings*

5.1 In the course of the oral proceedings, the question of the interpretation of claim 1 was discussed. In this context, the board further informed the parties that the second sentence of paragraph [0039] had to be deleted. The reasons for this are explained under

points 3.1.2 and 3.1.3 above and are based on the parties' submissions during the oral proceedings.

- 5.2 The respondent's request for correction of the minutes of the oral proceedings is refused (see point VI. above).
- 5.3 Under Rule 124(1) EPC, minutes of oral proceedings shall be drawn up, containing the essentials of the oral proceedings and the relevant statements made by the parties, in particular requests or similarly important procedural statements. It is in the discretion of the minute-writer what to consider "essential" or "relevant" (T 212/97, Reasons 2.2; T 642/97, Reasons 9.3; R 7/17, Reasons 23).
- 5.4 In the present case, the respondent requests that the minutes be corrected to include a substantive statement, namely an instruction to the opposition division of how the description is to be adapted to the maintained claim. As set out above, the minutes are meant to contain the procedural aspects of the oral proceedings but not substantive matters such as arguments of the parties or statements that might be relevant in any subsequent proceedings. For the board, no circumstances are apparent in the present case that could justify an exception to this rule and the respondent has not submitted any arguments in this respect.
- 5.5 In light of the above, the board decided to refuse the respondent's request for correction of the minutes.



6. *Result*

Given that the subject-matter of claim 1 of auxiliary request 1 involves an inventive step starting from document K8, and considering that the further objections against auxiliary request 1 were either not admitted or not taken into account in the appeal proceedings, the board had to accede to the appellant's auxiliary request 1.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of the claim of auxiliary request 1 and a description to be adapted thereto.

The Registrar:

The Chairman:



U. Bultmann

R. Lord

Decision electronically authenticated