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Case Number: T 1950/18 - 3.5.02

Application Number: 13817748.0

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Language of the proceedings: EN

Title of invention:
Engine Unit and Vehicle

Applicant:
Yamaha Hatsudoki Kabushiki Kaisha

Relevant legal provisions:
EPC Art. 56
RPBA Art. 12(4)

Keyword:
Inventive step - main request (no)
Late-filed auxiliary requests - requests could have been filed in first instance proceedings (yes)

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Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1950/18 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 17 May 2022

Appellant: (Applicant)	Yamaha Hatsudoki Kabushiki Kaisha 2500 Shingai Iwata-shi, Shizuoka 438-8501 (JP)
Representative:	Stöckeler, Ferdinand Schoppe, Zimmermann, Stöckeler Zinkler, Schenk & Partner mbB Patentanwälte Radlkoferstrasse 2 81373 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 14 March 2018 refusing European patent application No. 13817748.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Lord
Members:	G. Flyng
	W. Ungler

Summary of Facts and Submissions

I. The appeal contests the examining division's decision to refuse European patent application no. 13 817 748.0.

II. In the contested decision, the examining division considered the applicant's main request and first to third auxiliary requests, which were based on sets of claims filed in electronic form on 20 September 2017.

The examining division held that the main request did not meet the requirements of Articles 52(1) and 56 EPC as the subject-matter of claim 1 did not involve an inventive step over the document **D2 = EP 1 505 714 A1**.

The examining division held that the subject-matter of claim 1 of the main request differed from the engine unit described in paragraphs [0003] and [0004] and shown in figure 9 of document D2 only in that the engine was specified to be a four-stroke engine.

In coming to that view the examining division addressed the applicant's argument that document D2 only referred to an integrated starter motor generator ("ISG") in respect of the prior art implementation described in paragraph [0002], but not in respect of the dynamo-electric machine of figure 9 and paragraphs [0003] and [0004] of D2. The examining division did not agree that paragraph [0002] related to a different embodiment to the one described in respect of figure 9, considering it to be a very generic description of dynamo-electric machines, whereas the passages relating to figure 9 concerned a specific implementation. According to the division the skilled person would understand the

generic description as also applying to the specific implementation, particularly as the solution proposed in D2 explicitly entailed ISGs, see paragraph [0044]. According to the division this confirmed that D2 taught the implementation of figure 9 being used as an ISG.

The examining division held that the distinguishing feature solved the objective technical problem of finding a suitable combustion engine for the engine unit. They considered that the skilled person would use a four-stroke engine without implying inventive activity as this is the first thing coming to mind, four stroke combustion engines being the most commonly known combustion engines used in motorcycles.

Using their discretion under under Rule 137(3) EPC, the examining division did not admit the first to third auxiliary requests into the procedure, finding that they did not present any progress in rendering the claimed subject-matter inventive as the features they added were either known from common general knowledge or from the closest prior art, document D2.

III. The contested decision was taken at oral proceedings that were held on 21 December 2017, which the applicant did not attend. The applicant had been informed in a communication dated 5 December 2017 that the examining division maintained the objection of lack of inventive step in view of figure 9 of document D2, and that they intended not to admit the three auxiliary requests under Rule 137(3) EPC. The objection of lack of inventive step in view of figure 9 of document D2 had been set out in a previous communication dated 5 January 2017, see section 3.2.

IV. With the statement setting out the grounds for appeal, filed on 10 July 2018, the appellant (applicant) maintained the pending main request and filed new sets of claims according to new first, second and third auxiliary requests to replace those pending.

V. The appellant requested that the decision be set aside and a communication pursuant to Rule 71(3) EPC be issued. The Board understands this as a request that the decision under appeal be set aside and a patent be granted on the basis of the main request addressed in the impugned decision, or on the basis of one of first to third auxiliary requests filed with the statement of grounds of appeal.

VI. **Claim 1 of the main request** reads as follows:

"1. An engine unit (EU) configured to be mounted to a vehicle, the engine unit (EU) comprising:

a four-stroke engine body (E) having, during four strokes, a high-load region in which a load on rotation of a crankshaft (5) is high and a low-load region in which a load on rotation of the crankshaft (5) is low, the high-load region including a compression stroke, the low-load region including no compression stroke;

a starter motor (SG) including an inner stator (40) and a flywheel (30), the inner stator (40) including a stator core (ST) and windings (W) of plurality of phases, the stator core (ST) having a plurality of slots (SL) arranged at intervals with respect to a circumferential direction, the windings (W) being arranged so as to pass through the slots (SL), the flywheel (30) including a permanent magnet part (37) and a back yoke (34), the permanent magnet part (37) being provided outside the inner stator (40) with respect to a radial direction, the back yoke (34) being

provided outside the permanent magnet part (37) with respect to the radial direction, the flywheel (30) being configured to be rotated along with rotation of the crankshaft (5); and

a control device connected to the windings (W) of the plurality of phases that are provided in the inner stator (40), the control device being configured to supply a current from a battery included in the vehicle to the windings (W) of the plurality of phases,

characterized in that the flywheel (30) includes magnetic pole faces that are provided on inner circumferential surfaces of the permanent magnet parts (37) with respect to a radial direction of the starter motor (SG), the magnetic pole faces being arranged side by side in a circumferential direction of the starter motor (SG), the number of the magnetic pole faces included in the flywheel (30) being more than 2/3 of the number of the slots (SL), the flywheel (30) being configured to, at least at a time of starting the four-stroke engine body (E), rotate with overcoming of the high-load region as a result of the control device changing a current supplied to the winding of each phase,

wherein the flywheel (30) is configured such as to cause the starter motor (SG) to function as a generator at least after the four-stroke engine body (E) is started."

Claim 1 of the first auxiliary request differs from the main request in that it comprises the following additional features at the end:

"wherein the supply of current to the windings (W) is performed at least until the flywheel (30) overcomes the high-load region including a first compression stroke and the high-1oad region including a second compression stroke".

Claim 1 of the second auxiliary request differs from the first auxiliary request in that it comprises the following additional features at the end:

"wherein the stator core (ST) includes teeth (43) each arranged between ones of the plurality of slots (SL), wherein each of the teeth (43) includes an end portion that is opposed to the magnetic pole face of the permanent magnet part (37), and wherein a ratio of a minimum width of the cross-section of the windings (W) to the distance (d) between the end portions of the teeth (43) that are adjacent to each other with respect to the circumferential direction of the starter motor (SG) is 2:10 or more".

Claim 1 of the third auxiliary request differs from the second auxiliary request in that it comprises the following additional feature at the end:

"wherein the distance (d) between the end portions of the teeth (43) that are adjacent to each other with respect to the circumferential direction of the starter motor (SG) is equal to or less than the distance between the winding and the back yoke (34) with respect to the radial direction of the starter motor (SG),

and wherein the distance between the end portions of the teeth (43) that are adjacent to each other with respect to the circumferential direction is set such that the width of the end portion of the teeth (43) with respect to the circumferential direction is equal to or less than the width of one of the magnetic pole faces".

VII. The Board summoned the appellant to oral proceedings, setting out their preliminary observations in a communication pursuant to Article 15(1) RPBA 2020. The Board observed that the main request did not seem allowable under Article 56 EPC.

The Board set out that the questions at issue for the main request were whether the use of the machine in figure 9 as starter motor of a vehicle engine was either implicit to the skilled person in view of the rest of the disclosure of D1 (as was held in the contested decision), or obvious to the skilled person.

For the first question, the Board stated that the first paragraph of the description of D2 seemed to indicate to the skilled reader that the whole document related to machines that could act both as a generator and a starter motor. In that context it seemed that the skilled person would assume that the conventional dynamo-electric machine described in paragraphs [0003] and [0004] and shown in figure 9 would be one that was suitable for both uses. Hence, use of that machine as a starter motor seemed to be implicit.

The Board also observed that, it seemed at the very least to be evident to the skilled person that the machine described in association with figure 9 would be able to perform both functions - generator and starter motor. The skilled person would know that any machine with the structure described (i.e. any permanent magnet synchronous machine) was per se capable of acting both as a generator and as a motor. That the figure 9 machine may suffer from some limitations when operating as a generator (as set out in paragraph [0005]) would not affect its ability to be used also as a starter motor, as set out in paragraph [0001]. Thus, starting

from D2 and seeking a suitable machine to perform both functions the skilled person would have to look no further that the arrangement of figure 9. That seemed to be at least an obvious choice.

Furthermore, the board stated that they were inclined to hold the auxiliary requests inadmissible according to Article 12(4) RPBA 2007, and that the auxiliary requests seemed to be inadmissibly amended in the sense of Rule 137(5) EPC.

VIII. In a letter dated 12 April 2022, which was filed on 13 April 2022, the appellant maintained the pending requests and responded in substance to the Board's preliminary observations.

IX. With a further letter dated 13 May 2022 the appellant informed the Board that they would not be attending the scheduled oral proceedings.

X. With a communication dated 16 May 2022 the Board informed the appellant that the oral proceedings would be held by video conference.

XI. Oral proceedings were held by video conference on 17 May 2022.

As announced, the appellant did not attend. The Board announced the order of the present decision in the oral proceedings.

XII. The appellant's submissions may be summarised as follows.

Main Request

The appellant submitted that the subject-matter of claim 1 of the main request was not obvious in view of document D2, arguing that D2 did not disclose or suggest that the conventional rotary electric machine described in paragraphs [0003] and [0004] and shown in figure 9 was used as a starter-generator. According to the appellant, the explanations in paragraph [0002] of D2 (which mention a starter-generator) related to a first kind of rotating electric machine representing a first prior art, and those in paragraphs [0003] and [0004] related to a second kind of rotating electric machine representing a different second prior art. Since these descriptions were explanations of different rotating electrical machines, they had to be clearly distinguished from each other and could not be combined.

The appellant submitted that in D2, the conventional dynamo-electric machine of figure 9 was described only in paragraphs [0003] to [0006]. Paragraphs [0003] and [0004] merely described the structure of the conventional dynamo-electric machine of figure 9, without any disclosures of how it was to be used. Paragraphs [0005] and [0006] described the technical problems of the conventional machine of figure 9. These problems only related to the operation as a generator, not to the characteristics required for a starter. Therefore, the skilled person would assume that the conventional dynamo-electric machine of figure 9 would only be used as a generator.

According to the appellant the skilled person would understand that the characteristics required for rotating electric machines were different depending on their use. Thus, the skilled person would not believe that the plurality of uses as explained in the general description (paragraph [0002]) were all applicable to the specific implementation as illustrated in figure 9.

Even if there was a superficial disclosure that a generator of the invention described in D2 could be used as a starter-generator, it was not obvious to the skilled person that the conventional dynamo-electric machine of figure 9 of D2 could be used as such.

A skilled person knew that a starter motor had to be capable of rotating a crankshaft upon engine start while functioning as a generator after engine start. Since a crankshaft had a load and did not have any inertia upon starting, a starter motor had to output a torque to overcome such a load without any inertial torque. Not every type of generator would function as a starter-generator so as to rotate a crankshaft from standstill.

Furthermore, a starter-generator configured as a starter capable of outputting a large torque at the time of the engine start was likely to generate excessive electric power in the high-speed rotation region. Where an engine had a high load region and a low load region, as in the present invention, a larger torque was required to overcome such a high load region. For this reason, it was necessary for a starter-generator to realise both improvement of the output torque upon engine start and suppression of the generation current after engine start.

Auxiliary Requests

In the reply to the communication pursuant to Article 15(1) RPBA the appellant submitted with respect to admissibility under Article 12(4) RPBA 2007 that the new auxiliary requests had been filed in view of the objections raised in the decision of the Examining Division for the first time.

Specifically, the present invention was to solve the technical problem "to realize both improvement of output torque as a starter motor and suppression of generation current as a generator at a high level", and provided a solution for solving the technical problem. To be more specific, the features of the independent claim provided effects for solving the technical problem. The amendments in current auxiliary requests 1 to 3 related to the solution of this underlying technical problem and contributed to the solution thereof, i.e., they provide effects to solve this underlying problem. In addition, the amendments further clarified the difference from D2 in comparison to the previous auxiliary requests. The applicant therefore filed the current auxiliary requests 1 to 3 after the oral proceedings of the examining division. The current auxiliary requests 1 to 3 were not intentionally filed late and had been filed in response to the objections raised in the decision refusing the present application for the first time.

Reasons for the Decision

1. *Main Request - Inventive Step - Article 56 EPC*

1.1 For the following reasons the Board finds that the subject-matter of claim 1 of the main request is obvious in view of the disclosure of document D2.

1.2 Document D2 discloses, in the section entitled technical field, paragraph [0001], that the "*invention relates to a dynamo-electric machine connected to, e.g., an engine of a motorcycle and used as a generator or starter motor*".

The Board sees this as a clear indication to the skilled reader that document D2 is to be read in the context of motorcycle engine which has connected to it a dynamo-electric machine that can be used both as a starter motor and as an electrical generator.

1.3 In the section describing the background art, document D2 starts in paragraph [0002] by setting out how a dynamo-electric machine is generally constituted, namely by a wound stator and a permanent magnet rotor. Paragraph [0002] goes on to explain how the dynamo-electric machine can be driven by an engine to act as a generator and also how the windings can be energised so that the dynamo-electric machine acts as a motor. In the last sentence, paragraph [0002] states that the "*above dynamo-electric machine can obtain high output in spite of its simple structure, and therefore are [sic] used as, e.g., a generator for a motorcycle, a starter-generator that acts both as a starter and a generator*".

Thus, paragraph [0002] of D2 gives the skilled reader a clear indication that dynamo-electric machines of this general type, i.e. with a wound stator and a permanent magnet rotor, can be used as a starter/generator for a motorcycle.

1.4 Document D2's description of the background art continues in paragraphs [0003] and [0004] with a detailed description of figure 9, which it describes as "*an explanatory view showing a configuration related to a stator and a rotor of a conventional dynamo-electric machine*".

The dynamo-electric machine has a three-phase wound stator and an outer rotor, which is connected to a crankshaft of an engine. The rotor has a yoke and a plurality of permanent magnets. The structure of the figure 9 machine corresponds to the structure of the starter motor (SG) as defined in the third paragraph of preamble and the first paragraph of characterising part of claim 1 of the main request. That has not been contested by the appellant.

1.5 In paragraphs [0005] and [0006], document D2 discusses some disadvantages that exist when the figure 9 machine is used as a generator for a motorcycle. Thus, the use as a generator as set out in the last paragraph of claim 1 of the main request is disclosed.

1.6 As the appellant has argued, paragraphs [0003] to [0006] of document D2 only disclose the conventional dynamo-electric machine shown in figure 9 being used as a generator, and do not disclose it also being used as a starter for the engine. Nevertheless, given the clear indication in paragraph [0002] that machines of this

basic type can be used for the dual purposes of starter and generator, it would be evident to the skilled reader that the figure 9 machine is suitable for this. In view of its evident suitability, it would be obvious for the skilled person seeking a dual-purpose starter/ generator to use the figure 9 machine from D2.

1.7 The Board has considered the appellant's argument that a starter-generator capable of outputting a large torque at the time of the engine start was likely to generate excessive electric power in the high-speed rotation region, but is not convinced that this would deter the skilled person from using the machine of D2, figure 9 for this purpose. D2 already recognises in paragraph [0005] that the figure 9 machine suffers from excess current generation at high speed. It cannot be seen as inventive to merely accept a known deficiency.

1.8 The Board considers that a four-stroke engine would be an obvious choice, and that such an engine inherently has high-load and low-load regions as set out in the second paragraph of claim 1 of the main request. Furthermore, it would be obvious to the skilled person seeking to use the machine of D2, figure 9, that a control device would be required to supply current from the vehicle battery to the stator windings for the machine to act as a starter, as set out in the last paragraph of the preamble of claim 1 of the main request. These points have not been contested by the appellant.

1.9 For these reasons the main request does not meet the requirements of Article 56 EPC and is thus not allowable.

2. *Auxiliary Requests - Admissibility - Article 12(4) RPBA 2007*

2.1 The auxiliary requests filed on appeal amend claim 1 by adding features which were not claimed in the requests presented in the first-instance proceedings.

2.2 According to Article 12(4) RPBA 2007, which is applicable in this case under Article 25(2) RPBA 2020, the Boards have the power to hold inadmissible requests which could have been presented in the first instance proceedings, but were not.

2.3 In the present case, the appellant (then applicant) was made aware of the objection of lack of inventive step in view of figure 9 of document D2 in the communication dated 5 January 2017, see section 3.2. The appellant had an opportunity in their response to that communication to file amended requests which were apt to overcome the objection. Furthermore, after the appellant filed amended requests on 20 September 2017, the examining division informed them in the communication dated 5 December 2017 that the objection of lack of inventive step in view of figure 9 of document D2 was maintained. The appellant had a further opportunity to file amended requests to address the objection at the oral proceedings, but chose not to attend. Thus, the appellant had ample opportunity to present the requests which were filed on appeal already during the first-instance procedure. In failing to do so the appellant prevented the examining division from coming to a decision on those requests, which in turn has prevented the Board from reviewing such a decision. For these reasons the board decided to hold the auxiliary requests inadmissible according to Article 12(4) RPBA 2007.

2.4 The appellant argued that the new auxiliary requests were filed in view of the objections raised in the decision of the examining division for the first time. This argument is not convincing, as the objection of lack of inventive step in view of figure 9 of document D2 was already set out in the examining division's communication dated 5 January 2017, see section 3.2.

3. *Conclusion*

In the absence of an allowable request, the appeal was dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

L. Stridde R. Lord

Decision electronically authenticated