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

**Case Number:** T 1540/19 - 3.2.05

**Application Number:** 16198131.1

**Publication Number:** 3168505

**IPC:** F16J9/14

**Language of the proceedings:** EN

**Title of invention:**

A top piston ring for a large two-stroke turbo-charged  
compression ignited internal combustion engine with crossheads

**Applicant:**

MAN Energy Solutions,  
filial af MAN Energy Solutions SE, Tyskland

**Relevant legal provisions:**

EPC Art. 56, 84  
RPBA 2020 Art. 13(1), 13(2)

**Keyword:**

Inventive step - main request (no) - auxiliary requests I, Ib,  
II, IIb, III, V, VI (no)  
Clarity - auxiliary request IV (no)  
Late-filed auxiliary requests VII and VIII - requests clearly  
allowable (no)

**Decisions cited:**

T 1077/92, T 0833/99



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Case Number: T 1540/19 - 3.2.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.05**  
**of 8 March 2022**

**Appellant:** MAN Energy Solutions,  
(Applicant) filial af MAN Energy Solutions SE, Tyskland  
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**Representative:** Nordic Patent Service A/S  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 17 January 2019  
refusing European patent application No.  
16198131.1 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** P. Lanz  
**Members:** T. Vermeulen  
C. Brandt

## **Summary of Facts and Submissions**

I. The appeal lies from the decision of the examining division refusing European application No. 16198131.1 ("the application").

II. In the decision under appeal the examining division in particular considered the documents

D1           US 1,475,783;  
D2           GB 744 456;

as well as document WO 02/070926 A1, cited in the application and referred to as document D4.

III. The examining division came to the conclusion that claim 1 according to the main request filed with letter dated 13 December 2018 was not clear, and that its subject-matter lacked novelty in view of document D1 or document D2 and did not involve an inventive step in view of the combination of a "traditional split-ring" with the teaching of document D2. In respect of auxiliary requests I to VI filed during the oral proceedings, the examining division held that claim 1 as amended contained subject-matter which extended beyond the content of the application as originally filed (auxiliary request I), that claim 1 was not clear (auxiliary request IV), that the subject-matter of claim 1 lacked novelty over document D1 (auxiliary requests I, II, III, IV and V) or over document D2 (auxiliary requests I, II, III, V), and that the subject-matter of claim 1 did not involve an inventive step in view of document D2 (auxiliary requests I, II

and III) or in view of a combination of document D4 with document D1 or document D2 (auxiliary request VI).

- IV. With the statement of grounds of appeal the applicant (appellant) filed a main request and auxiliary requests I, Ib, II, IIb, III, IV, V and VI.
- V. A summons to oral proceedings was issued on 17 December 2021.
- VI. In a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal in the 2020 version (RPBA 2020), issued on 20 December 2021, the party was informed of the board's provisional opinion that the subject-matter of claim 1 according to the main request and according to auxiliary requests I, Ib, II, IIb, III, V and VI did not involve an inventive step pursuant to Article 56 EPC, and that the requirements of Article 84 EPC were not met in respect of claim 1 according to auxiliary request IV.
- VII. With a letter dated 2 February 2022 the appellant filed auxiliary request VII.
- VIII. Oral proceedings before the board were held on 8 March 2022. During the oral proceedings the appellant withdrew auxiliary request VII and filed new auxiliary requests VII and VIII.
- IX. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request, or, alternatively, on the basis of the claims of one of auxiliary requests I, Ib, II, IIb, III, IV, V or VI, all requests filed with the statement of grounds of

appeal, or on basis of auxiliary requests VII or VIII dated 8 March 2022 filed during the oral proceedings.

- X. Claim 1 of the main request corresponds to claim 1 of the main request underlying the decision under appeal. It has the following wording (the feature numbering used by the board is introduced in square brackets):

"[a] A top piston ring (4) for use in a piston ring pack together with a plurality of lower piston rings (6) in respective annular ring grooves (3) in the side wall of a piston (1) of a large two-stroke turbo charged uniflow-scavenged compression ignited internal combustion engine with crossheads to seal against the pressure in a combustion chamber (2) above said piston (1), said top piston ring (4) comprising: [b] a ring body with an upper ring face (16), a lower ring face (17), an outer ring face (11), an inner ring face (12) and first- and second engaging end portions (8,9) at a ring partition that allows expansion and contraction of said top piston ring (4), [c] said first engaging end portion (8) comprising a circumferentially extending finger (23), [d] said second engaging end portion (9) comprising a circumferentially extending recess (28) shaped and sized for sealingly and slidably receiving said finger (23), [e] said finger (23) being provided with a radially projecting tongue (51) that extends circumferentially over at least a portion of the circumferential extent of said finger (23), characterized in that [f] said recess (28) is provided with a groove (52) that extends circumferentially over at least a portion of the circumferential extent of said recess (28) with a radial depth (D), [g] said tongue (51) and groove (52) are complementary in shape in the radial and axial direction and said groove (52)

is configured to receive at least a portion of the circumferential extent of said tongue (51)."

- XI. Claim 1 of auxiliary request I corresponds to claim 1 of auxiliary request I underlying the decision under appeal. Compared to claim 1 of the main request, it has the following amendments to features **e** and **f**:

"[e] characterized in that said finger (23) being [sic] provided with a radially projecting tongue (51) that extends circumferentially over at least a portion of the circumferential extent of said finger (23), said tongue (51) projecting radially from said finger (23), characterized in that"

"[f] said recess (28) is provided with a groove (52) that extends circumferentially over at least a portion of the circumferential extent of said recess (28) with a radial depth (D), said groove (52) extending radially from said recess (28),".

- XII. Claim 1 of auxiliary request Ib corresponds to claim 1 of auxiliary request I, albeit with the following amendment to feature **f**:

"[f] said recess (28) is provided with a groove (52) that extends circumferentially over at least a portion of the circumferential extent of said recess (28) with a radial depth (D), said groove (52) ~~extending radially from said~~ forming a radial deepening of the recess (28),".

- XIII. Claim 1 of auxiliary request II corresponds to claim 1 of auxiliary request II underlying the decision under appeal. Compared to claim 1 of the main request, it has the following amendments to feature **g**:

"[g] said tongue (51) and groove (52) are complementary in shape in the radial and axial direction and said groove (52) is configured to receive at least a portion of the circumferential extent of said tongue (51) for providing a mechanical interlock in both opposing axial directions and thus ensure that the first end portion (8) and the second end portion (9) are mechanically secured to one another in both axial directions."

XIV. Claim 1 of auxiliary request IIb corresponds to claim 1 of auxiliary request II with feature **g** reworded as follows:

"[g] said tongue (51) and groove (52) are complementary in shape in the radial and axial direction and said groove (52) is configured to receive at least a portion of the circumferential extent of said tongue (51) ~~for~~ and providesing a mechanical interlock in both opposing axial directions and thus ensures that the first end portion (8) and the second end portion (9) are mechanically secured to one another in both axial directions."

XV. Claim 1 of auxiliary request III corresponds to claim 1 of auxiliary request III underlying the decision under appeal. Compared to claim 1 of the main request, it has the following amendments to features **b**, **e**, **f** and **g**:

"[b] a ring body with an upper ring face (16), a lower ring face (17), an outer ring face (11), an inner ring face (12) and first- and second engaging end portions (8,9) that engage each other at a ring partition that allows expansion and contraction of said top piston ring (4),"



"[e] characterized in that said finger (23) being is provided with a radially projecting tongue (51) that extends circumferentially over at least a portion of the circumferential extent of said finger (23) of said first engaging end portion (8), echaracterized in that"

"[f] said circumferentially extending recess (28) is provided with a groove (52) that extends circumferentially over at least a portion of the circumferential extent of said recess (28) with a radial depth (D),"

"[g] said radially projecting tongue (51) and groove (52) are complementary in shape in the radial and axial direction and said groove (52) ~~is configured to~~ receives at least a portion of the circumferential extent of said radially projecting tongue (51), said tongue (51) and groove (52) form a labyrinth type arrangement that ensures a gas tight seal and engagement between the tongue (51) and the groove (52) and provides a mechanical interlock in both opposing axial directions and thus ensures that the first end portion (8) and the second end portion (9) are mechanically secured to one another in both axial directions."

XVI. Claim 1 of auxiliary request IV corresponds to claim 1 of auxiliary request V underlying the decision under appeal. Compared to claim 1 of the main request, it has the following additional feature at the end of the claim:

"wherein the radial height (H) of said tongue (51) is slightly less than the radial depth (D) of said groove (52)."

XVII. Claim 1 of auxiliary request V corresponds to claim 1 of auxiliary request VI underlying the decision under appeal. Compared to claim 1 of the main request, it has the following amendments to feature **a**:

"**[a]** A large two-stroke turbo charged uniflow-scavenged compression ignited internal combustion engine with crossheads, said engine comprising: a piston (1), a piston ring pack comprising a top piston ring (4) ~~for~~ use in a piston ring pack together with and a plurality of lower piston rings (6) arranged in respective annular ring grooves (3) in the side wall of a said piston (1) of a large two-stroke turbo charged uniflow-scavenged compression ignited internal combustion engine with crossheads to for sealing against the pressure in a combustion chamber (2) above said piston (1), said top piston ring (4) comprising:"

XVIII. Claim 1 of auxiliary request VI corresponds to claim 1 of the main request with the following addition to feature **g**:

"**[g]** said tongue (51) and groove (52) are complementary in shape in the radial and axial direction and said groove (52) is configured to receive at least a portion of the circumferential extent of said tongue (51) with parallel surfaces of the tongue (51) received between parallel surfaces of the groove (52)."

XIX. Claim 1 of auxiliary request VII filed during the oral proceedings corresponds to claim 1 of the main request with the addition of following features **h1** to **h7** at the end of the claim:

"**[h1]** wherein the circumferential extent of said recess (28) is divided in a proximal portion (46) and a distal

portion (47), [h2] the circumferential extent of said finger (23) is divided in a proximal portion (44) and a distal portion (45), [h3] the proximal portion (46) of said recess opening to said outer ring face (11) and to said lower ring face (17), [h4] the distal portion (47) of said recess opening to said outer ring face (11), to said lower ring face (17) and to said upper ring face (16), [h5] the proximal portion (44) of said finger (23) being flush with said outer ring face (11) and with said lower ring face (17), [h6] at least a radially outer portion of said proximal portion of said finger (23) being flush with said upper ring face (16), and [h7] the distal portion (45) of said finger (23) being flush with said outer ring face (11) and with said lower ring face (17)".

XX. Claim 1 of auxiliary request VIII filed during the oral proceedings corresponds to claim 1 of auxiliary request VII filed during the oral proceedings with the following amendment to feature **h6**:

~~"[h6] at least a radially outer portion of said proximal portion of said finger (23) being flush with said upper ring face (16), and"~~.

XXI. The appellant's submissions may be summarised as follows:

*Main request - inventive step*

Document D4 was an appropriate starting point for assessing the presence of an inventive step. The distinguishing features were **e**, **f** and **g**. The acknowledgement of document D4 on pages 2 and 3 of the application implied that a controlled amount of leakage was desirable and also necessary. Hence, complete gas

tightness of the piston ring was not desired. This also followed from the paragraph bridging pages 1 and 2 of document D4 itself. With uniflow scavenging, the reciprocal movement of the piston ring over the scavenging ports created fluctuating pressure conditions that caused the ring to dance up and down in the piston groove. Without a tongue-and-groove interlock, the engaging ends of the ring did not move up-and-down simultaneously, with subsequent excessive wear as a result. The effect of the distinguishing features was thus to improve the control of gas leaking through the ring partition and prevent the resulting excessive wear of the components of the ring partition. The objective technical problem was to reduce wear and to improve the lifespan of a piston ring with a controlled gas tightness. The aspect of mechanical stability should not be mentioned in the problem since it pointed to the solution.

At the priority date of the application, the skilled person starting from document D4 did not have the information about the uncontrolled leakage through the ring partition. The applicant only became aware to the exact nature of the problems years after the date of filing of document D4.

The skilled person would not have turned to document D2 when attempting to solve the problem. Document D2 was over 60 years old at the priority date of the application. It would not have been obvious to the skilled person to combine such an old document with the document reflecting the closest prior art (cf. "Case Law of the Boards of Appeal of the European Patent Office", Ninth edition, July 2019, I.D.9.7 and I.D. 10.3; in particular decisions T 833/99 and T 1077/92). Moreover, document D2 disclosed a ring with a large

number of ring partitions and interconnected sections that made it less robust and inherently mechanically unstable. Even if the expression "split ring" was used in document D2, the different embodiments always foresaw a ring insert, or a ring portion formed by extending a ring insert. Such a segmented ring structure was excluded by feature **b** of claim 1. Unlike the ring of document D4, which had a single ring body resiliently biased outwardly, the ring segments of document D2 were unable to transmit torque and required a separate resilient member in order for it to function properly. In this context, reference was made to document GB 682,452 cited in document D2. Leaf springs provided on the inner side of the piston ring were, however, unimaginable in modern large two-stroke internal combustion engines. The skilled person was also aware that piston rings not specifically designed for use in such engines were not able to handle the fluctuating pressures and the resulting up-and-down movement of the piston ring in the piston groove. Further, document D2 had the objective to increase gas tightness instead of controlling it. To that end, the surfaces forming the gaps at the end of each insert and ring segment were interrupted. Improving mechanical stability was not mentioned in document D2.

Even if the skilled person would have taken the non-obvious step of considering document D2 for solving the objective technical problem, they would not have arrived at the subject-matter of claim 1 without exercising an inventive step. The skilled person would not have considered the teaching of document D2 without also including a ring insert and adding springs to resiliently bias the segmented piston ring outwardly. Page 1, lines 41 to 46 of document D2 would have deterred the skilled person from adding a tongue-and-

groove arrangement since this would have increased the number of engaging surfaces subject to wear. Instead, according to page 1, lines 56 to 60 of document D2, they would have received the teaching to gradually reduce the cross-section of the correspondingly shaped parts of the ends of the segments and, hereby, reduce the risk of fracture. It was only with hindsight that the skilled person would have been able to realise that the wear of the piston ring of document D4 could be reduced by applying an isolated feature of the piston ring disclosed in document D2.

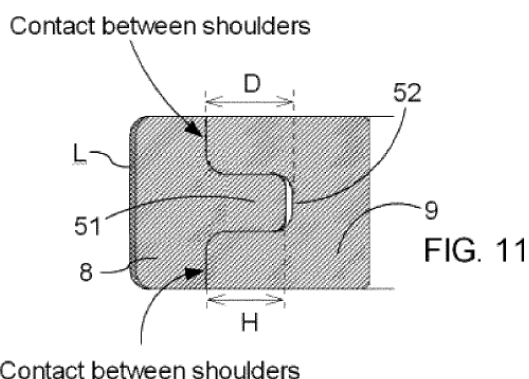
In conclusion, the subject-matter of claim 1 according to the main request involved an inventive step.

*Auxiliary requests I, Ib, II, IIb, III, V and VI - inventive step*

The inventive step arguments submitted for the main request also applied to the auxiliary requests.

*Auxiliary request IV - clarity*

Regarding the additional feature of claim 1 according to the auxiliary request IV, it ensured that the



shoulder(s) of the finger that flanked the tongue and the shoulder(s) of the recess that flanked the groove made contact resulting in a sealing effect, as shown in

the exaggerated, annotated and amended Figure 11 of the application reproduced above.

*Auxiliary requests VII and VIII - admittance*

An inventive step assessment based on a proper problem-solution approach was carried out for the first time in the board's communication. The appellant did not have the opportunity to respond to such an objection at an earlier stage, e.g. by amending the claims. Such an opportunity should be allowed.

The additional features of claim 1 according to auxiliary requests VII and VIII were taken from dependent claim 5 of the main request. Hence, no new subject-matter was introduced.

Compared to dependent claim 5 of the main request, the position of the proximal portion "closest to said ring body" was deleted. This did not result in a lack of clarity. It was clear to the skilled person that the terms "proximal" and "distal" had to be understood with respect to the remaining part of ring body, i.e. the part that was not the finger or the recess. Nothing was added to the scope of protection of claim 1 by the deletion. This was also reflected in the detailed description of the application, where the proximal and distal portions were mentioned starting from the second paragraph on page 12, whereas their relationship with reference to the ring body only appeared in the fourth paragraph on page 15. Similarly, claims 11 and 12 of the application referred to the proximal and distal portions as such.

Further, from the additional features of claim 1 according to the auxiliary request VII it was perfectly

clear that only the radially outer portion of the finger was flush with the upper ring face. The fact that the subject-matter of the claim was hard to draw did not mean that clarity was lacking.

Concerning claim 1 according to auxiliary request VIII, the feature "at least a radially outer portion of" was deleted. The deletion did not result in a restriction of scope; there was no added subject-matter. The skilled person would understand the reference to the finger in the context of the additional features as meaning the radially outer part of the finger excluding the tongue. That part was flush with the bottom surface and with the top surface of the ring body. Nothing else could be understood. It would be nonsensical to interpret the feature in the sense that it should also refer to the bottom surface and the top surface of the tongue.

Hence, claim 1 of auxiliary requests VII and VIII was clear. The auxiliary requests were *prima facie* allowable and should be admitted.

## **Reasons for the Decision**

### *Main request - inventive step*

1. There is no doubt that document D4 is a suitable starting point for assessing inventive step of the subject-matter of claim 1. It discloses a top piston ring conceived for the same purpose as the claimed invention, namely to seal the combustion chamber of a large two-stroke internal combustion engine. Moreover, document D4 is extensively discussed on pages 2 to 4 of the description of the application as background art



for the subject-matter of what essentially corresponds to claim 1 of the main request.

2. The board agrees with the appellant that the subject-matter of claim 1 differs from the top piston ring of document D4 by features **e**, **f** and **g**. In particular Figures 2 and 3 of document D4 illustrate that the finger 13 forming the first engaging end portion of the piston ring 10 does not have a radially projecting tongue. Similarly, the recess 14 formed in the second engaging portion of the prior art piston ring is not provided with a circumferentially extending groove.
3. On page 5, lines 21 to 29 of the description of the application, features **e**, **f** and **g** are said to provide for a mechanical interlock in the axial direction, so that "it becomes possible to construct a piston ring that is both gas tight and mechanically stable". The causal relationship between the tongue-and-groove arrangement, on the one hand, and a gas-tight seal and a mechanical interlock in the axial direction, on the other hand, is reiterated in the paragraph spanning from page 14, line 30 to page 15, line 4 of the description of the application.

The board is unable to identify in the application any reference to another problem solved by the invention, in particular a problem related to wear reduction, as proposed by the appellant. Of course, preventing gas from flowing through a ring partition has many further advantages, such as mitigating thermal load increase, unwanted deformation, poor sealing (cf. page 3, lines 29 to 32 of the application), and any excessive wear of the finger that may result therefrom (cf. page 3, lines 10 to 12 of the application). However, in the board's view, such secondary, indirect consequences do not

qualify as technical effects of the distinguishing features **e** to **g** in the context of the problem-solution approach. First and foremost, it is the prevention of the gas flow, i.e. the gas-tightness of the piston ring, as well as the mechanical stability of the ring partition that are the technical effects of the tongue-and-groove arrangement.

Furthermore, the appellant has not persuaded the board that the invention of claim 1 aims at maintaining a controlled amount of leakage instead of providing gas-tightness of the piston ring. Similarly as in document D4, the controlled leakage of gas from the combustion chamber to the underside of the top piston ring is primarily achieved by pressure relief grooves 15 that extend obliquely on the radially outer surface of the ring (cf. page 11, lines 1 to 8 and Figure 5 of the application). These pressure relief grooves are not part of claim 1. Nor is it clear how the introduction of a tongue-and-groove arrangement at the interface of the engaging end portions can have a regulating effect on the gas flow across the top piston ring.

Accordingly, the objective technical problem is to construct a top piston ring that is both gas tight and mechanically stable.

4. Document D2 discloses various designs for the ring partition of a piston ring. It explicitly addresses the problem of gas-tightness (cf. page 1, lines 32 to 35 and 47 to 58) and also touches on the issue of mechanical stability (cf. "lessen the risk of fracture" on page 1, lines 32 to 35).

The appellant's arguments for not considering document D2 in the problem-solution approach are not found persuasive, for the following reasons.

- 4.1 The fact that the piston rings of document D2 are segmented and thus unsuitable for use in large two-stroke engines is held to be of secondary importance, considering that the problem of gas-tightness is not confined to piston rings used in such a specific field of application. Even if segmented ring structures are excluded by feature **b** of claim 1, the skilled person would have been prompted to take a closer look at how the different solutions of document D2 prevent gas flow through a piston ring gap. By the same token, the arrangement of a separate spring inside the segmented ring of document D2 would not have deterred the skilled person from considering how the problem of gas-tightness was tackled in the various designs shown in the figures.
  
- 4.2 The appellant put emphasis on the fact that document D2 is an old document. The board agrees that the period of 60 years elapsed between its publication and the priority date of the application qualifies the document as old. It should, however, be taken into account that the technical field of sealings is one of small improvements, where the age of a document is not necessarily a hurdle for its consideration in the assessment of obviousness. The board is not aware of any development trends in piston rings over the course of those 60 years that turned away from mechanical interlocks and made a leap in an entirely different direction. Moreover, it is evident from document D1, which predates document D2 by some 30 years, that the ring gap geometry has always been a critical design parameter when preventing gas leakage across piston

rings. These circumstances distinguish the present case from the decisions T 833/99 and T 1077/92 mentioned by the appellant and discussed in chapter I.D.10.3 of "Case Law of the Boards of Appeal of the European Patent Office" (ed. 9, July 2019). In view thereof, the board cannot see that the age of document D2 is of relevance to the question of obviousness of the claimed subject-matter.

5. According to page 3, lines 97 to 113 of document D2, the ring partition shown in Figures 35 to 39 prevents the passage of gas by engaging a web 9" of a first ring portion 25 between a pair of arms 15 of a second ring portion. The engaging web 9" faces downwards in Figure 36, i.e. in the direction of the piston. At its upper end, it is connected to a lug extending from the first ring portion 25 in the circumferential direction. Hence, the engaging web 9" is a radially projecting tongue that extends circumferentially over the circumferential extent of a finger. The cavity 28 formed between the arms 15, on the other hand, is a U-shaped groove that extends circumferentially over the circumferential extent of a recess formed in the second ring portion 26. The complementary shapes of the tongue and the groove follow not only from the figures, but also from page 3, lines 124 to 129 of document D2, which, therefore, discloses features **e**, **f** and **g**.
  
6. In the board's view, this teaching of document D2 would have struck the skilled person as a particularly effective way to construct a top piston ring that is both gas tight and mechanically stable. They would have been prompted to adapt the piston ring partition of document D4 accordingly. In order to do so, the skilled person would have foreseen an engaging web or tongue at the radially inner surface of the finger 13 of document

D4 and a groove of complementary shape in the radially outer surface of the flange 15. On account of this tongue-and-groove arrangement, the axial path between the finger 13 and the flange 15 would have been blocked, thus preventing gas from leaking through the gap. In addition, the resulting mechanical interlock would have secured the engaging ends of the ring to one another, hereby providing mechanical stability.

7. For the above reasons, the board has arrived at the conclusion that the subject-matter of claim 1 according to the main request does not involve an inventive step (Article 56 EPC).

*Auxiliary requests I, Ib, II, IIb, III - inventive step*

8. In the embodiments illustrated in Figures 35 to 39 of document D2, the engaging web or tongue 9" projects radially from the circumferentially extending lug or finger of the first ring portion 25. It is received in the groove 28, which extends radially from the recess formed in the second ring portion 26. The groove 28 effectively forms a radial deepening of the recess. By virtue of the engagement of the engaging web 9" and the groove 28 a mechanical interlock is created in both opposing axial directions (the vertical direction in Figure 35). The engaging ends of the ring portions 25 and 26 are therefore mechanically secured to one another in both axial directions. Moreover, the engaging side walls of the web 9" and the groove 28 force the combustion gas trying to pass through the ring partition to follow a long and difficult path, much in the same way as in a labyrinth seal.
9. It therefore stands to reason that the combination of documents D4 and D2 as set out in point 6. above would

also result in the additional features of claim 1 according to each of the auxiliary requests I, Ib, II, IIb and III. The appellant did not submit any arguments in favour of inventive step that were not already presented for the main request.

10. The board concludes that the subject-matter of claim 1 according to each of the auxiliary requests I, Ib, II, IIb and III does not involve an inventive step (Article 56 EPC).

*Auxiliary request IV - clarity*

11. In claim 1 of the auxiliary request IV the additional feature of claim 2 as originally filed was added to claim 1 of the main request. It introduced the requirement that the radial height of the tongue is slightly less than the radial depth of the groove.
12. The question arises just how much less the height is allowed to be in order to qualify as "slightly less". Only from the wording of the claim it is not clear how this additional feature should be understood.
13. Also the description and the drawings are not helpful when interpreting the additional feature. According to the second paragraph on page 14 of the description of the application, the radial height of the tongue should fill out "substantially or nearly substantially" the complete radial depth of the groove. But what this means in practice is left to guess. Contrary to the "exaggerated, annotated and amended Fig. 11 of the application (amended to illustrate low height H of tongue)" represented on page 29 of the statement of grounds of appeal and reproduced with the appellant's submissions in point XXI. above, the cross-sectional

view of the actual Figure 11 of the application does not reveal any difference between the height of the tongue and the depth of the groove.

14. Therefore, the requirements of Article 84 EPC are not met in respect of claim 1 of the auxiliary request IV.

*Auxiliary requests V and VI - inventive step*

15. The appellant did not dispute that document D4 discloses a large two-stroke turbo charged uniflow-scavenged compression-ignited internal combustion engine with crossheads. Nor was it contested that the prior art document arranged the top piston ring as part of a piston ring pack together with a plurality of lower piston rings arranged in respective annular ring grooves in the side wall of the piston.
16. Furthermore, it is clear from Figures 35 and 37 of document D2 that the engaging web 9" (the tongue) has parallel surfaces which are received between parallel surfaces of the groove 28.
17. Consequently, the piston ring resulting from the combination of documents D4 and D2 as set out in point 6. above would also result in the additional features of claim 1 according to each of the auxiliary requests V and VI. The appellant did not submit any arguments in favour of inventive step that were not already presented for the main request.
18. The board concludes that also the subject-matter of claim 1 according to the auxiliary requests V and VI does not involve an inventive step (Article 56 EPC).

*Auxiliary requests VII and VIII - admittance*

19. Auxiliary requests VII and VIII were submitted during the oral proceedings held before the board.

Pursuant to Article 25(3) RPBA, the provisions of Article 13(2) RPBA 2020 apply here. These implement the third level of the convergent approach applicable in appeal proceedings, according to which any amendment to a party's appeal case made after notification of a summons to oral proceedings is, in principle, not taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.

According to the fourth paragraph of the Explanatory remarks on Article 13(2) RPBA 2020 (cf. document CA/3/19, section VI, page 43/78), at the third level of the convergent approach, the board may also rely on criteria applicable at the second level of the convergent approach, i.e. as set out in paragraph 1 of Article 13 RPBA 2020. One of these criteria requires a party in the case of an amendment to a patent application to demonstrate that the amendment, *prima facie*, overcomes the issues raised by the board and does not give rise to new objections.

20. The last three features of claim 1 according to auxiliary request VII (numbered **h5**, **h6** and **h7** in section XIX. above) attempt to further define the geometry of the finger of the top piston ring. This is done by requiring both the proximal portion and the distal portion to be flush with the outer ring face and the lower ring face (features **h5** and **h7**), whereas at least a radially outer portion of the proximal portion should be flush with the upper ring face (feature **h6**).



In the present context, the board interprets the expression "being flush with" as "lying in the same plane as". Accordingly, the first part of features **h5** and **h7** is understood in the sense that the (radially) outer face of the finger must lie in the same plane as the outer ring face. In other words, the outer ring face extends all the way along the finger.

In contrast, the remaining part of features **h5** and **h7** is not immediately clear, for the following reasons. By virtue of the wording "at least a radially outer portion of said proximal portion" feature **h6** seems to imply that the second condition of feature **h5** ("the proximal portion (44) of said finger (23) being flush ... with said lower ring face (17)") and the second condition of feature **h7** ("the distal portion (45) of said finger (23) being flush ... with said lower ring face (17)") refer to the radially outer *and* the radially inner portion, i.e. the *entire* radial extent of the finger. Inevitably, this includes the tongue, which is defined as part of the finger in feature **e**. If the tongue is flush with the lower ring face, however, it is unclear how it can be received in a groove of complementary shape.

21. On the face of it, this issue is not resolved by the amendment in claim 1 according to the auxiliary request VIII. Instead, the reader of claim 1 is left to speculate whether the finger in features **h5** to **h7** excludes the tongue, as alleged by the appellant, or refers to the entire element forming the first engaging end portion. The appellant's argument that the second interpretation would be nonsensical given that the top and bottom surfaces of the tongue could not possibly be flush with the upper and lower ring faces, respectively, did not convince the board. After all,

feature **e** fails to specify over which circumferential portion of the finger the tongue extends. The tongue may thus be limited to the distal portion of the finger, in which case it would not fall under the requirement of feature **h6**. Hence, the top surface of the tongue may or may not lie in the same plane as the upper ring face. The second interpretation can therefore not be excluded. As with claim 1 of auxiliary request VII, however, it gives rise to doubts concerning the tongue-and-groove arrangement.

22. Having regard to the above considerations, the board found that the appellant did not demonstrate that the amendments to claim 1 according to the auxiliary request VII or the auxiliary request VIII *prima facie* overcome the issues raised by the board without giving rise to new objections. Irrespective of whether the amendments were triggered by exceptional circumstances justified with cogent reasons by the appellant, the board therefore exercised its discretion under Article 13(2) RPBA 2020 in conjunction with Article 13(1) RPBA 2020 not to admit auxiliary requests VII and VIII into the appeal proceedings.

### *Conclusion*

23. As there is no allowable request, the appeal must be dismissed.

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:



A. Pinna

P. Lanz

Decision electronically authenticated