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Datasheet for the decision of 24 June 2010

Case Number: T 0950/08 - 3.2.03

Application Number: 01830624.1

Publication Number: 1197279

IPC: B22D 17/20

Language of the proceedings: EN

Title of invention:
Cold chamber die-casting piston

Patentee:
Copromec S.r.l.

Opponent:
ALLPER AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0950/08 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 24 June 2010

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 18 March 2008 rejecting the opposition filed against European patent No. 1197279 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
K. Garnett

Summary of Facts and Submissions

I. European patent EP-B1-1 197 279 concerns a cold chamber die-casting piston, and in particular relates to the sealing band(s) arranged around the piston. Grant of the patent was opposed on the grounds that its subject-matter is not novel and does not involve an inventive step (Article 100(a) EPC). The Opposition Division concluded that none of the cited grounds prejudiced the patent in its granted form and hence decided to reject the opposition.

II. The above decision was posted on 18 March 2008. The Opponent filed notice of appeal on 13 May 2008, paying the appeal fee on the same day. A statement containing the grounds of appeal was filed on 17 July 2008. Oral proceedings were held on 24 June 2010.

III. Requests

The Appellant (Opponent) requests that the decision be set aside and the patent be revoked.

The Respondent (Patent Proprietor) requests that the appeal be dismissed.

IV. Claims

Claim 1 of the granted patent reads as follows:

"1. Piston (10) for cold chamber die-casting machines, comprising a steel body (11) and at least one sealing band (12) in copper alloy mounted around the body in a respective groove (15) rearwardly of a piston head (13),

characterised in that it exhibits

at least two channels (16) obtained on the outside surface of the piston comprised between the head and the sealing band, suitable for placing the piston head in communication with the band groove, for an inflow of the melted metal under the same band which when solidified, creates a thickness that radially pushes the band outwards, thus compensating its wear."

Dependent claims 2 to 4 describe preferred embodiments of the piston of claim 1.

V. Prior Art

EP-B-0 423 413 (D1) was filed with the notice of opposition. Documents DE-U1-90 14 033 (D2) and US-A-5 233 912 (D3) were filed outside the nine month period referred to in Article 99(1) EPC and were not admitted into the proceedings by the Opposition Division.

VI. Submissions of the Parties

(a) Late-Filed Documents

The Appellant argues that D2 and D3 were filed during opposition proceedings in response to the views aired by the Patent Proprietor and the Opposition Division. Unlike D1, document D2 shows sealing bands mounted in grooves to the rear of the piston head. Concerning D3, Figure 6 shows an embodiment in which liquid metal enters a gap between the sealing ring and the piston. Since D2 and D3 disclose important features that are

not present in D1 and which *prima facie* question the validity of the disputed patent, it is appropriate to admit these documents into the proceedings.

The Respondent considers that in refusing to admit documents D2 and D3, the Opposition Division had exercised correctly its discretion under Article 114(2) EPC. In particular, the essential features of the invention are clearly set out in the claims, so the Opponent should not have been surprised by the submissions of the Patent Proprietor. D3 concerns a patent granted to the Opponent, so should have been known to the Opponent when the opposition was filed. Since neither D2 nor D3 suggest channels for allowing molten metal to flow under the sealing band, validity of the granted patent is *prima facie* not in doubt.

(b) Inventive Step - Document D3

The Appellant's Case:

Document D3 discloses a die-casting piston having a sealing band. The inner surface of the sealing band has a groove that engages a collar on the piston, and an annular gap between the sealing band and the piston allows molten metal to flow into an undercut beneath the sealing band, where it solidifies.

D3 states that the effect of the solidified metal in the undercut is to spread the sealing ring apart and thereby increase the sealing effect. Thus D3 teaches that a sealing ring that is too small can be expanded by solidified metal in the undercut.

When the outer surface of the sealing band experiences wear and its diameter reduced, this process would be repeated, especially as liquid metal subjected to the high pressures of die-casting would be capable of penetrating into every crack and crevice; the high temperatures involved would also ensure that the liquid metal would weld onto metal that had already solidified beneath the sealing band. Although the undercut shown in Figure 6 does not appear to be very large compared with the sealing band, it nevertheless has the effect of forcing out the sealing band to increase the sealing effect, and consequently would also act to compensate for wear.

So, although improving the life of sealing bands is not expressly mentioned in D3, the effect is implicit, and would be immediately recognised as such by the skilled person. Improving the sealing effect must mean reacting to wear of the sealing band and hence improving the wear resistance.

D3 refers to sealing bands of the type described in D1, which are made from high-temperature, wear-resistant alloys. Nevertheless, compensation for wear by using the mechanical effect of expanding the sealing band using solidified metal is also present in the arrangement disclosed in D3.

Consequently, the Appellant identifies the following differences between the piston of claim 1 and that of D3.

Firstly, claim 1 specifies the materials for both the piston and the sealing band.

Secondly, the sealing band is defined as being mounted in a groove with at least two channels connecting the groove to the piston head to allow liquid metal to flow under the sealing band.

The Appellant argues that these differences relate to two mutually exclusive problems.

Concerning the first difference, the materials are disclosed in D1 (claims 3 and 4), and given that there is a direct reference to D1 in D3, the choice of these materials is evident for the skilled person.

Starting from D3 the objective problem to be solved by the second group of features is how to simplify the sealing band whilst maintaining the effects described in D3.

A sealing band positioned in a groove is commonplace in the art and the skilled person would realise that that this would provide a simplification of the arrangement shown in D3.

According to D3 molten metal is fed beneath the sealing band by means of the annular channel. In the case of a sealing band situated in a groove, the only way to direct molten metal to beneath the sealing band would be to provide channels leading into the groove; although one would be sufficient, D3 requires a homogenous distribution of metal beneath the sealing band, hence at least two are required.

Since compensating the wear of the sealing band is an automatic consequence of the above arrangement, the subject-matter of claim 1 lacks an inventive step.

The Respondent's Case:

The disputed invention requires the sealing band to be located in a groove cut radially into the piston and which is open to the inner surface of the cylinder; communicating channels connect the base of the groove to the front face of the piston. In contrast, D3 shows a sealing band located on the piston by means of a collar; the sealing band is open to both the inner surface of the cylinder and the front face of the piston. D3 therefore concerns a completely different sealing arrangement to that of the patent, and as such does not provide an appropriate starting point for inventive step.

Should the document D3 be taken as the closest prior art, the claimed piston differs in terms of the features identified by the Appellant. However, D3 is not concerned with wear of the sealing band over repeated cycles, and the effect of improving the seal as described in D3 is not the same as compensating for wear.

In the arrangement shown in Figure 6 of D3, the front face of the sealing band must be open to the liquid metal, because the seal is created by applying the high pressure of the liquid metal both axially and radially to the sealing band. The small amount of metal retained in the undercut is insufficient to compensate for band wear, and should new liquid metal penetrate the

undercut, it would be at the top, between the previously solidified metal and the sealing band; this metal would inevitably be removed with the "biscuit" (solidified metal left in the cylinder) at the end of the casting cycle. Permanent thickening of solidified metal which could progressively compensate the wear of the sealing band is therefore not possible.

According to the disputed invention, the groove in which the sealing band is located is (except for the channels) closed to the front face of the piston; the groove is also larger than the undercut of D3. Thus, there is greater capacity for retaining metal beneath the sealing band. Liquid metal is fed via the channels to the space beneath the solidified metal, rather than above it (as is the case with the undercut of D3), which means that solidified metal can grow progressively. The front side of the groove between the channels positively retains the solidified metal below the sealing band, and thereby prevents it from being withdrawn when removing the piston, in contrast to the possibility of withdrawing some of the solidified metal through the annular gap of D3.

It is also the intention that the claimed sealing band is subjected to wear, in order to conform to the shape of the cylinder. In contrast, the approach in D3 is to avoid wear, as indicated by the choice of wear and temperature resistant materials for the sealing band (see claim 2 of D1). The groove cut into the sealing band of D3 means that less wear can be tolerated before the sealing band fails - a further indication that wear is to be avoided.

For these reasons, a piston having the features of claim 1 cannot be derived in an obvious manner starting from D3.

(c) Inventive Step - Document D1

In the written procedure the Appellant also submitted that the claimed subject-matter lacks an inventive step in light of D1.

The Appellant argued that D1 concerns a piston for a cold chamber die-casting machine, and in particular discloses an annular V-shaped groove between the sealing band and the body of the piston (located between surfaces (128) and (130)) into which molten metal can flow and solidify, thereby compensating any wear of the sealing band.

The claimed piston differs from that of D1 only in that the annular channel is replaced by at least two channels for placing the piston head in communication with the space beneath the sealing band.

D1 teaches that the sealing effect is increased by feeding molten metal under the sealing band. If this teaching is applied to a conventional piston, in which the piston is located in a groove, the only way to supply liquid metal to beneath the sealing band would be by means of channels, and in doing so the skilled person would derive the piston of claim 1.

The Respondent replied by pointing out that D1 makes no mention of the problems of compensating for wear and extending the life of the piston, other than requiring

that the sealing band should be made of wear resistant material. It is not possible for metal to solidify in the V-shaped groove beneath the sealing band and consequently no compensation for wear of the band occurs. Any metal solidifying in the V-shaped groove would be removed together with the biscuit after each casting cycle. Figure 3 of D1 shows an inner groove (103) that also accommodates part of the sealing band, but since liquid metal cannot reach this groove, it cannot be considered as a groove (15) in the sense of the disputed patent.

Reasons for the Decision

1. The appeal is admissible.

2. Late-Filed Documents

2.1 The granted patent was opposed for lack of novelty or inventive step with respect to the die-casting piston shown in Figures 3 and 6 of D1. In response to the opposition, the Patent Proprietor argued that this embodiment does not allow molten metal to flow under the sealing band, which means that any metal that has solidified in front of the sealing band is removed together with the biscuit. According to the invention, on the other hand, an annular ring of solidified metal under the sealing band remains after the biscuit has been extracted. The provisional opinion of the Opposition Division concurred with this view. As a reaction to this argument, the Opponent (now the Appellant) filed documents D2 and D3.

2.2 Document D2:

The Appellant argues for the introduction of D2 on the basis that, unlike D1, it shows sealing bands mounted in grooves to the rear of the piston head. The Opposition Division was of the view that D1 already showed a sealing band mounted in a groove to the rear of the piston head, so D2 was no more relevant than the existing prior art. The Opposition Division thus exercised its discretion under Article 114(2) EPC not to admit D2 into the opposition proceedings. In addition, both parties agree that sealing bands mounted in grooves are well known in the art and form part of the general knowledge of the skilled person. For these reasons D2 is also not admitted into the appeal proceedings.

2.3 Document D3:

Figure 6 of D3 shows an embodiment in which liquid metal enters a gap between the sealing ring and the piston. Since D3 was filed in response to the views aired by the patent proprietor and the opposition division, and it shows a potentially very important feature that is not disclosed in D1, it is appropriate to admit this document into the proceedings.

3. Inventive Step (Article 56 EPC)

Document D3

3.1 D3 discloses a piston for pushing liquid metal out of a cylinder in a die-casting machine. A ring or band (108) creates a seal between the piston and the cylinder, and

is located on the piston by means of a groove (106) on its inner surface which engages an annular projection (104) on the piston. D3 states that the sealing band is of the type disclosed in D1 (see D3, column 2, lines 3 to 6).

Forward of annular projection (104) there is a second, smaller annular projection (114) on the piston, and the space between these two projections forms an undercut (112). The inner surface of the sealing band (108) is distanced from projection (114), so that an annular gap is formed between the sealing band (108) and the piston. During the casting process liquid metal flows through the annular gap and into the undercut (112) where it subsequently solidifies (D3, column 3, lines 55 to 64).

3.2 The purpose of the solidified metal in the undercut (112) is to force the sealing band (108) outwards and thereby enhance the sealing effect (D3, column 2, lines 13 to 18).

3.3 The Board agrees with the analysis of the Appellant, that the piston of claim 1 differs from that of D3 in that, firstly, claim 1 specifies the materials for both the piston and the sealing band, and secondly, the sealing band is defined as being mounted in a groove with at least two channels connecting the groove to the piston head to allow liquid metal to flow under the sealing band.

3.4 Regarding the choice of materials for the piston and sealing ring (steel and copper alloy respectively), these are disclosed in D1, and besides, are standard materials in the art for such applications. Hence, this

distinguishing feature cannot lead to recognition of an inventive step.

3.5 The principal difference between the claimed piston and that of D3 therefore relates to the way the sealing band is mounted on the piston. In D3 the sealing band has a groove that engages a projection on the piston, whereas in claim 1 the sealing band sits in a groove cut into the piston. This means that liquid metal is fed to beneath the sealing band via at least two channels (claim 1) compared with the annular gap of D3.

3.6 Starting from D3, the Appellant formulates the objective technical problem as being the simplification of the seal arrangement, and submits that positioning the sealing ring in a groove is commonplace for the skilled person. In order to achieve the improved sealing effect by having solidified metal beneath the sealing band, as required in D3, the skilled person must replace the annular gap by at least two channels.

3.7 A desire to simplify the seal arrangement of D3 is a reasonable objective for the skilled person, and positioning a sealing band in a groove is indeed well known in the art. However, the Board is not convinced that this would be an evident option for the skilled person.

Consider how the seal of D3 functions.

During the casting process, liquid metal presses on the front face of the sealing band. The pressure of the molten metal forces the front face of the groove (106) cut into the sealing band onto the front face of

annular projection (104) situated on the piston; this prevents liquid metal from flowing over the annular projection.

At the same time molten metal is forced through the annular gap into the undercut, thereby forcing the sealing band radially outwards to improve the sealing effect with the cylinder. Once the casting cycle has been completed, the metal in the gap and undercut freezes.

What happens to metal in the gap and undercut during subsequent casting cycles is not known. The Appellant argues that solidified metal remains in the undercut after each casting cycle, and the high casting pressures ensure that liquid metal always penetrates crevices to build up the solidified layer; thus, improving the sealing effect in the manner of D3 inevitably means that there is a compensation for wear. The Respondent argues that the solidified metal is withdrawn after each casting cycle together with the biscuit, so there is no steady build up of solidified metal as the sealing band wears.

Although the views of the Appellant and the Respondent differ on this point, it is clear that some of the metal between the sealing band and the piston will be removed together with the biscuit. However, to what extent the solidified metal would be removed is unknown.

3.8 Whether the solidified metal in the undercut of D3 gradually thickens with repeated casting cycles to compensate for wear of the sealing band is therefore

mere speculation. On the other hand, this effect is clearly derivable from the claimed subject-matter.

It is clear that in D3 the sealing band must be open to liquid metal in order for it to function properly (see above), with liquid metal in the annular gap supplementing the solidified metal in the undercut to push the sealing band outwards. This is in contrast to the arrangement of claim 1, in which the sealing band is in a groove, whose front wall positively retains a greater quantity of solidified metal below the band and prevents it from being withdrawn when the piston is removed; D3 has the possibility that some of the solidified metal is withdrawn through the annular gap.

3.9 In summary, whereas simplification might be the aim of the skilled person, there is no motivation to simplify the seal arrangement of D3 by positioning the sealing band in an annular groove in the piston. To do so would require abandoning the manner in which the seal of D3 is achieved, in particular by not having the sealing band open to the liquid metal, and by losing the advantages D3 associates with this feature. Any modification that involves putting the sealing band into a groove supplied by channels requires more than mere adaptation of the piston and sealing band of D3. Of course, with knowledge of the advantages of invention, the skilled person might be encouraged to adopt a completely new approach, but such hindsight does not render the invention obvious.

Document D1

3.10 D1 concerns a piston for cold chamber die casting machines. According to the embodiment shown in Figure 3, a sealing band (108) is mounted around the piston, and an inner part of the sealing band sits in a groove (103). At the front of the piston head there is an annular V-shaped channel, formed between surfaces (128) and (130).

3.11 The Opposition Division and the Respondent see the difference between the claimed piston and that of D1 as the replacement of the annular channel by at least two channels that provide communication between the piston head and the groove containing the sealing band, so that molten metal can flow under the band. The Appellant argues that D1 also discloses the concept of liquid metal flowing into an annular gap between the sealing ring and piston where it solidifies, thereby compensating any wear of the sealing band.

3.12 The Board agrees with the Respondent that it is groove (103) that corresponds to the groove of claim 1, as the front part of the seal (108) does not sit in a channel. It is clear that liquid metal does not penetrate groove (103), as D1 states that the metal freezes before it reaches this groove(column 2, lines 51 to 52).

3.13 Starting from D1, the problem to be solved can be seen as how to extend the life of the piston (see paragraphs [0006] and [0007] of the disputed patent). The proposed solution is the arrangement of channels as defined in the characterising part of claim 1.

3.14 According to D1, molten metal enters the V-shaped channel formed between the front faces of the piston and sealing band. The pressure developed during casting thus acts on the surfaces of V-shaped channel (128) and (130) to force the sealing band outwards against the internal surface of the casting cylinder, thereby improving the seal and to a certain extent compensating for at least some wear of the sealing band.

However, the effect of the channels defined in claim 1 is that molten metal actually solidifies in the groove beneath the sealing band to provide a continuous thickening that radially pushes the band outwards, progressively recovering its wear and conforming it to possible deformations of the container of the piston. It is apparent that the solidified metal of D1 does not remain in place in the V-shaped groove, but is removed after casting along with the biscuit; thus the claimed effect is not present when casting using the piston of D1. Since there is no indication in D1 of directing metal to solidify and remain under the sealing band, the claimed piston is inventive in respect of D1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Counillon: U. Krause