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Datasheet for the decision of 4 June 2008

Case Number: T 1527/05 - 3.3.05

Application Number: 00942993.7

Publication Number: 1189686

IPC: B01F 5/06

Language of the proceedings: EN

Title of invention:
Stacked static mixing elements

Patentee:
Sulzer Chemtech AG

Opponent:
Bayer Technology Services GmbH

Headword:
Static mixer/SULZER

Relevant legal provisions:
EPC Art. 54(1)(2), 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Novelty (main request): no"
"Inventive step (auxiliary request): no - obvious combination"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1527/05 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 4 June 2008

Appellant I: (Opponent)
Bayer Technology Services GmbH
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D-51368 Leverkusen (DE)

Appellant II: (Patent Proprietor)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 13 October 2005 concerning maintenance of European patent No. 1189686 in amended form.**

Composition of the Board:

Chairman: G. Raths
Members: J.-M. Schwaller
H. Preglau

Summary of Facts and Submissions

I. The present appeals were lodged by both the opponent and the patent proprietor (hereinafter appellants I and II, respectively) against the interlocutory decision of the opposition division maintaining the patent in amended form on the basis of the 2nd auxiliary request submitted on 7 September 2005 during the oral proceedings before the opposition division with a claim 1 reading as follows:

"*1. A static mixer comprising two saddle elements (10) each said saddle element comprising:*
a generally ring-shaped support structure (12) having a central axis (16), concentric inner and outer, radially spaced, circumferentially extending surfaces (18 and 20), and first and second axially spaced, generally parallel edge surfaces (22 and 24), said inner surface (18) defining a fluid flow path (26) which extends along said axis (16), said edge surfaces (22 and 24) being located in respective generally parallel transverse planes (28 and 30) which are essentially perpendicular relative to said axis (16); and a plurality of mixer components (32) located in said flow path (26), said components (32) having a first end (34) which is closer to the transverse plane (28) of said first edge (22) than to the transverse plane (30) of the second edge (24) and a second end (36) which is closer to the transverse plane (30) of said second edge (24) than to the transverse plane (28) of the first edge (22), said mixer components (32) being arranged in at least two separate intersecting oblique planes (38, 40, 42 or 44), each of which intersecting oblique planes (38, 40, 42 and 44) is disposed at an angle

relative to said axis (16), said mixer components (32) comprising crossbars (32a-d), with at least two of said crossbars (32a-d) arranged in each of said intersecting oblique planes in laterally spaced relationship, at least said mixer components (32) are formed by casting as a single monolithic unit, said saddle elements (10) being arranged with the second edge surfaces (24) thereof disposed in mated, contacting relationship, characterised in that said saddle elements comprising mating tab and notch elements at the edge surfaces for aligning the element with the adjacent element and being separately mounted in a stack on the central axis (16) to permit individual removal of said saddle elements from each other."

II. During the opposition procedure, the parties relied *inter alia* upon the documents:

O1: Czech utility model No. 1707 (PUV 1428-93) and its translation into English (O2)

O5: US-A-4614440

III. In its decision, the opposition division concluded that the subject-matter of claim 1 of both the main and the 1st auxiliary request then on file (corresponding in essence to that of the main request of the present decision) was not novel over O1/O2.

The subject-matter of claim 1 as maintained by the opposition division was considered as involving an inventive step, the reasoning being summarised as follows:

Starting from O1/O2, the technical problem was to provide a suitable way of facilitating easy and efficient cleaning.

The patent in suit suggested solving this problem by providing the mixer structure elements with registration means in form of corresponding notches and tabs and by allowing individual removal of the elements.

Documents O1/O2 and O5 were silent about cleaning problems and even if the skilled person would have consulted O5 as a source for solution concepts, he would have considered a number of more obvious possibilities and found different suitable solutions before coming to O5. This conclusion was supported by the fact that the notches and tabs were not described in O5 as means for facilitating cleaning procedures, but mainly for securing correct indexing.

IV. With its grounds of appeal dated 08 February 2006, patentee/appellant II filed three sets of claims as main request and auxiliary requests 1 and 2, respectively.

V. With its grounds of appeal dated 17 February 2006, opponent/appellant I submitted three new documents O6 to O8 and argued that the subject-matter as upheld by the opposition division lacked an inventive step over O1/O2 taken in combination with O5.

VI. In a letter dated 26 June 2006, patentee/appellant II *inter alia* requested that documents O6 to O8 not be admitted into the proceedings.

VII. In response to the summons to oral proceedings, patentee/appellant II submitted with a letter dated 2 May 2008 six new sets of claims as main request and auxiliary requests 1 to 5, respectively, to replace the requests then on file.

Claim 1 of the main request reads:

"*1. A saddle element (10) for a static mixer comprising: a generally ring-shaped support structure (12) having a central axis (16), concentric inner and outer, radially spaced, circumferentially extending surfaces (18 and 20), and first and second axially spaced, generally parallel edge surfaces (22 and 24), said inner surface (18) defining a fluid flow path (26) which extends along said axis (16), said edge surfaces (22 and 24) being located in respective generally parallel transverse planes (28 and 30) which are essentially perpendicular relative to said axis (16); and a plurality of mixer components (32) located in said flow path (26), said components (32) having a first end (34) which is closer to the transverse plane (28) of said first edge (22) than to the transverse plane (30) of the second edge (24) and a second end (36) which is closer to the transverse plane (30) of said second edge (24) than to the transverse plane (28) of the first edge (22), said mixer components (32) being arranged in at least two separate intersecting oblique planes (38, 40, 42 or 44), each of which intersecting oblique planes (38, 40, 42 and 44) is disposed at an angle relative to said axis (16), said mixer components (32) comprising crossbars (32a-d), with at least two of said crossbars (32a-d) arranged in each of said intersecting oblique planes in laterally spaced relationship, at*

least said mixer components (32) are formed by casting as a single monolithic unit and characterised in that said saddle element (10) comprises at the edge surfaces (22 and 24) registration means for aligning the element with an adjacent element in a stack of elements being separately mounted on the central axis (16) to permit individual removal of said saddle elements from each other."

VIII. At the oral proceedings, which took place on 4 June 2008 in the presence of both appellants, patentee/ appellant II abandoned the previous auxiliary requests 1 to 5 and submitted a new and unique auxiliary request, claim 1 of which reads:

1. A static mixer structure (60) comprising two saddle elements (10) each said saddle element comprising: a generally ring-shaped support structure (12) having a central axis (16), concentric inner and outer, radially spaced, circumferentially extending surfaces (18 and 20), and first and second axially spaced, generally parallel edge surfaces (22 and 24), said inner surface (18) defining a fluid flow path (26) which extends along said axis (16), said edge surfaces (22 and 24) being located in respective generally parallel transverse planes (28 and 30) which are essentially perpendicular relative to said axis (16); and a plurality of mixer components (32) located in said flow path (26), said components (32) having a first end (34) which is closer to the transverse plane (28) of said first edge (22) than to the transverse plane (30) of the second edge (24) and a second end (36) which is closer to the transverse plane (30) of said second edge (24) than to the transverse plane (28) of the first

edge (22), said mixer components (32) being arranged in at least two separate intersecting oblique planes (38, 40, 42 or 44), each of which intersecting oblique planes (38, 40, 42 and 44) is disposed at an angle relative to said axis (16), said mixer components (32) comprising crossbars (32a-d), with at least two of said crossbars (32a-d) arranged in each of said intersecting oblique planes in laterally spaced relationship, at least said mixer components (32) are formed by casting as a single monolithic unit and characterised in that said saddle element (10) comprises at the edge surfaces (22 and 24) notches and tabs aligning and bringing the element in mated, contacting relationship with an adjacent element in a stack of elements being separately mounted on the central axis (16) to permit individual removal of said saddle elements from each other."

IX. Opponent/appellant I objected to claim 1 of the main request on the grounds of lack of novelty in the light of document O1/O2 and claim 1 of the auxiliary request on the grounds of lack of inventive step over the combined teachings of documents O1/O2 and O5. It also was of the opinion that claim 1 of the auxiliary request did not meet the requirements of Articles 84 and 123(2) EPC.

X. Patentee's/appellant's II arguments, as far as they are relevant for the present decision, can be summarised as follows:

(a) The subject-matter of claim 1 of the main request is novel over the disclosure of document O1/O2 because the registration means are provided at the

edge surfaces whereby in O1/O2, the axial notches are located in the outer edges of the mixing plates. In O1/O2, the saddle elements are furthermore brazed together, which renders the individual removal of a saddle element impossible.

(b) The starting point for evaluating the inventive merits of the present invention is O1/O2. The skilled person would not consider O5 as relevant because problems of cleaning or of assembly/ disassembly are not addressed in this document.

(c) If nevertheless the skilled person were to take O5 into consideration, it would note that the side walls of the individual mixing elements are too thin to withstand the high pressures susceptible to be encountered with polymer melts. A combination of O5 with O1 would also not lead to the subject-matter of present claim 1 because there are no notches at the edge surfaces of the individual elements of O5. Furthermore, by bringing together two individual elements of O5, they would not be in mated, contacting relationship as the interlocked side walls of contiguous elements create an internal spacing 40 between them.

XI. Opponent/appellant I requested that the decision under appeal be set aside and that the patent be revoked.

Patentee/appellant II requested that the decision under appeal be set aside and that the patent be maintained on the basis of claims 1 to 17 according to the main request filed with letter of 2 May 2008 or,

alternatively, on the basis of claims 1 to 16 according to the auxiliary request filed during the oral proceedings before the board.

Reasons for the Decision

1. *Main request - Novelty*

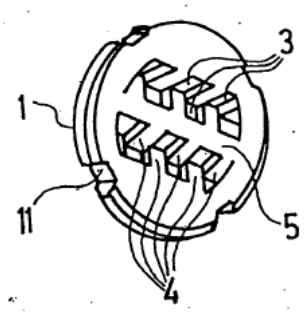
1.1 As a preliminary remark, it is observed that claim 1 of the present request which relates to a saddle element for a static mixer, does not concern a device comprising one or more such saddle elements, but an individual entity suitable for being used in a static mixer.

Such an entity being independent and physically separated from any other physical entity, the feature "*separately mounted on the central axis to permit individual removal of said saddle elements from each other*" - which further defines said entity in present claim 1 - does not have any limiting effect on the subject-matter of said claim.

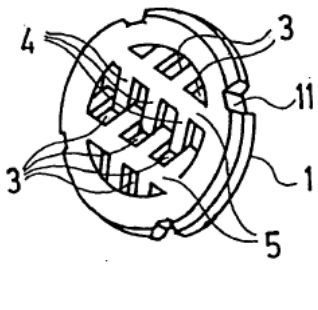
1.2 According to present claim 1, the claimed saddle element comprises a generally ring-shaped support structure (12) and a mixing structure which occupies the flow path (26) of the ring-shaped structure, whereby the mixing structure comprises *"a plurality of mixer components (32) located in said flow path (26), said components (32) having a first end (34) which is closer to the transverse plane (28) of said first edge (22) than to the transverse plane (30) of the second edge (24) and a second end (36) which is closer to the*

transverse plane (30) of said second edge (24) than to the transverse plane (28) of the first edge (22), said mixer components (32) being arranged in at least two separate intersecting oblique planes (38, 40, 42 or 44), each of which intersecting oblique planes (38, 40, 42 and 44) is disposed at an angle relative to said axis (16), said mixer components (32) comprising crossbars (32a-d), with at least two of said crossbars (32a-d) arranged in each of said intersecting oblique planes in laterally spaced relationship".

1.3 The patentee/appellant II, although contesting that the subject-matter of claim 1 would lack novelty over the mixing plates illustrated as OBR. 1 and OBR. 2 in document O1,



OBR. 1



OBR. 2

recognized that the mixing structure composed of the bars 4 and transverse ribs 5 and having the above illustrated design would fall under the wording of the mixing structure indicated hereinabove in italics.

The above mixing plates are advantageously produced by a precision casting method (O2, page 3, last paragraph) and are advantageously provided in their outer edges with axial notches 11, which enable sets of mixing

plates to be welded together using longitudinal continuous welds along the groove formed by the axial notches 11 (O2, page 4, lines 8 to 13).

1.4 The arguments put forward by the patentee/appellant II as regards the novelty of present claim 1 (see point X.(a)) cannot be accepted by the board, because as can be seen from OBR.1 and OBR.2, the axial notches 11 provided in the outer edge of the mixing plates are in the form of an axial groove which connects the upper and lower edge surfaces of the mixing plate. The axial notches 11 are thus not only provided in the outer edge of the mixing plate - as argued by the patentee/ appellant II - but also at both edge surfaces of said mixing plates.

The board has furthermore no doubt that the axial notches 11 would allow several such mixing plates to be aligned in a stack, for instance by applying a guiding bar along the groove formed by contiguous axial notches, and therefore the axial notches 11 are clearly and unambiguously "registration means" in the sense of present claim 1.

The patentee's/appellant's II argument that the feature "*separately mounted … to permit individual removal of said saddle elements from each other*" would provide novelty to the subject-matter of present claim 1 is void because as indicated in item 1.1, this feature has no real limiting effect on the individual saddle element defined in present claim 1.

Hence, claim 1 reads on the mixing plates illustrated by OBR. 1 and OBR. 2.

1.5 In view of the above findings that O1/O2 discloses a mixing plate - i.e. a "saddle element" - with all the features of claim 1 according to the main request, its subject-matter lacks novelty and claim 1 is therefore not allowable under Article 54(1)(2) EPC.

2. *Auxiliary request - inventive step of claim 1*

2.1 The subject-matter of claim 1 of this request no longer relates to an individual saddle element, but to a static mixer comprising two saddle elements. It further differs from that of claim 1 according to the main request in that the saddle element (10) comprises at the edge surfaces (22 and 24) *"notches and tabs aligning and bringing the element in mated, contacting relationship with an adjacent element".*

2.2 In accordance with the "problem-solution approach" applied by the boards of appeal, it is necessary to establish the closest state of the art, to determine in the light thereof the technical problem addressed by the alleged invention and whether the latter is successfully solved, and finally to examine the obviousness of the claimed solution to this problem in the light of the state of the art.

2.3 In agreement with the parties, document O1/O2 is taken as the starting point for assessing inventive step as it concerns (see item 1. *supra*) a static mixer comprising mixing plates having a mixing structure and a reinforced ring-shaped support structure according to the preamble of present claim 1.

In O1, in particular Figures 1 and 2 (OBR. 1 and OBR. 2), the mixing plates are provided in their outer edges with axial notches 11, which enable sets of mixing plates to be welded together using longitudinal continuous welds along the groove formed by said axial notches (O2, page 4, lines 8 to 13; Figure 4).

2.4 Starting from O1/O2, the patentee/appellant II defined the problem to be solved by the subject-matter of present claim 1 as the provision of a static mixing structure which is not only easier to assemble and to disassemble, but also easier to maintain and to clean (see in this respect paragraph [0009] of the patent in suit).

Concerning this problem, the board notes that the static mixer of O1 may as well be disassembled, for instance by removing the welds. It cannot be denied that removing such welds is far more complicated than disassembling the saddle elements provided with the tabs and notches presently claimed, however once the permanent attachments between the mixing plates of O1 have been removed, an individual mixing plate appears to be cleaned or maintained as easily as an individual saddle element of the mixing structure presently claimed.

Accordingly, the board shares the opinion of the opponent/appellant I that the contribution of the notches and tabs defined in present claim 1 directly relates to the ease of assembly and disassembly of the mixer structure, but that the maintenance or cleaning facility is the same for both the saddle elements presently claimed and those according to O1/O2.

2.5 Therefore, the problem to be solved in the light of O1/O2 can only be seen in the provision of an improved assembly and disassembly of the static mixer structure.

For the board, it is credible that the above problem has been effectively solved. The question which remains to be answered is whether the solution as proposed according to present claim 1 involves an inventive step or not.

2.6 The subject-matter of claim 1 of the present request distinguishes from O1/O2 in that the individual saddle element comprises at the edge surfaces (22 and 24) notches and tabs aligning and bringing the element in mated, contacting relationship with an adjacent element in a stack of elements being separately mounted on the central axis to permit individual removal of saddle elements from each other.

2.7 The skilled person is aware of document O5, which discloses a stationary material mixing apparatus (i.e. a static mixer) having the shape of a conduit comprising individual biscuit sections aligned along a common longitudinal axis, each biscuit section comprising - as the mixing structure - a plurality of openings in which are located mixing elements inducing a rotational angular velocity to the fluid stream (column 2, lines 9 to 19). The individual biscuits possess side walls which are notched so that adjacent biscuits are in a nesting or interlocking relationship (claim 5; column 3, lines 35 to 39).

2.8 O5 does not explicitly mention that the above static mixer can be easily assembled or disassembled, however

under the heading "Background of the invention", O5 explains that "*prior art approaches to static mixers have generally involved … fabrication of component mixer elements coupled with some type of permanent attachment between elements and a conduit and/or between elements within a conduit*" (column 1, lines 23 to 28). Under the same heading, O5 describes the prior art mixing apparatus depicted in US-A-3923288 - which comprises a plurality of self-nesting, abutting and axially overlapping elements fitted into a conduit - as being a "*marked improvement in static mixer technology*" (column 1, lines 36 to 43).

Accordingly, the above excerpts clearly and unambiguously show that at the filing date of O5 permanent attachments between mixing elements were one of the drawbacks in the present technical field, and that one of the concerns was, implicitly, the ease of assembly or disassembly of such devices.

The Figures 3 and 4 of O5 (hereinafter reproduced), which are representative of the static mixer depicted in O5, disclose - in the board's view - a device overcoming the above mentioned prior art drawbacks, i.e. a static mixer which unequivocally can be easily assembled and disassembled.

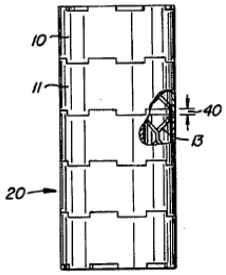


FIG._3.

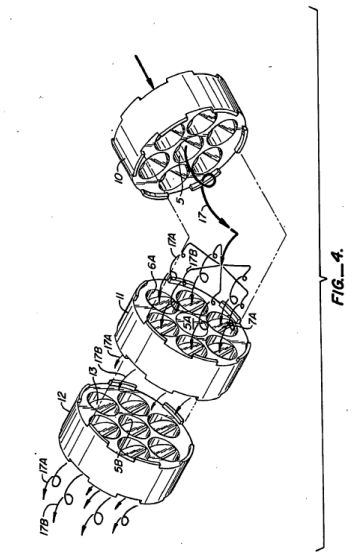


FIG._4.

2.9 In this context, the skilled person starting from the static mixer disclosed in O1/O2 and faced with the problem of an improved assembly and disassembly thereof would inevitably consider the side walls design of the above static mixer (Figures 3 and 4) as a promising way of solving his problem.

2.10 The arguments of the patentee/appellant II (see item X. (c)) in this respect cannot be accepted for the following reasons:

(a) There is no limitation in present claim 1 as to the pressure magnitude that the ring-shaped support structure of an individual saddle element is supposed to withstand; the skilled person has thus no reason to believe that the notched side walls of the individual biscuit sections of O5 would not be suitable as a "ring-shaped support structure" in the sense of present claim 1 and he would therefore not disregard O5, as argued by the patentee/appellant II.

(b) It is true that the static mixer illustrated in Figure 3 of O5 includes a spacing 40. However, as can be seen from the claims of O5, a "spacing created between individual biscuit elements" is only recited in dependent claim 2, which means that this feature is manifestly optional in O5. And even if the spacing 40 was compulsory in O5, it must be noted that the subject-matter of present claim 1 does not exclude the presence of such a spacing between two adjacent saddle elements, so that the wording of present claim 1 indisputably allows a combination of O5 with O1/O2.

(c) As can be seen above from Figure 4, the notched side walls of the individual biscuit sections 10, 11, 12 comprise a certain number of notches (recesses), and between each couple of consecutive notches a protrusion upraises which directly and unambiguously is a "tab" in the sense of present claim 1. It can further be seen that in the individual biscuit sections, said protrusions and notches are clearly located at the parallel edge surfaces of each individual biscuit section.

(d) Figures 3 and 4 further attest that the protrusions and notches in the side walls align two adjacent biscuits in a "stack of elements mounted on a central axis". As indicated in claim 5 and at column 3, lines 35 to 39 of O5 and also attested by Figure 3 of O5, the individual biscuits are further in a "nested" or "interlocking relationship", which indisputably provides evidence that the internal spacing 40 seen on Figure 3 does not prevent an individual

biscuit from being in "mated, contacting relationship" with an adjacent biscuit.

2.11 In view of these findings, and as documents O1/O2 and O5 contain no information which might deter the skilled person from combining their teachings, the board concludes that the subject-matter of present claim 1 is obvious to a person skilled in the art faced with the problem indicated in item 2.5 in view of the cited state of the art. Therefore claim 1 does not meet the requirements of Article 56 EPC.

3. In conclusion, since none of the sets of claims on file meets the requirements of the EPC, none of the patentee's/appellant's II requests can be granted.

Under these circumstances, the other questions - for instance whether the documents O6 to O8 are admitted into the proceedings or whether the subject-matter of claim 1 according to the auxiliary request meets the requirements of Articles 84 or 123(2) EPC - may remain open.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

C. Vodz G. Raths