BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [x] To Chairmen

D E C I S I O N
of 16 March 1994

Case Number: T 0585/91 - 3.2.3

Application Number: 88900419.8

Publication Number: 0373159

IPC: F28D 11/02, F26B 11/12

Language of the proceedings: EN

Title of invention:
Device for heating and/or drying

Applicant:
Ullum, Henrik

Opponent:
-

Headword:
-

Relevant legal norms:
EPC Art. 56, 83

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0585/91 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 16 March 1994

Appellant: Ullum, Henrik
Lykkesholm 1
DK-2690 Karlslunde (DK)

Representative: Lund, Preben
Larsen & Birkeholm A/S
Skagensgade 64
P.O. Box 200
DK-2630 Taastrup (DK)

Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 25 March 1991 refusing European patent application No. 88 900 419.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C.T. Wilson
Members: J. du Pouget de Nadaillac
L.C. Mancini

Summary of Facts and Submissions

I. The appeal is directed against the decision of the Examining Division of the EPO dated 12 March 1991 with the written grounds being sent on 25 March 1991. The Examining Division refused European patent application No. 88 900 419.8, filed as PCT/DK87/00163 and published under the publication number WO 89/06337, on the grounds that the subject-matter of the claims filed on 12 March 1991 does not involve an inventive step, as required by Articles 52 and 56 EPC.

During the examination procedure, the following documents were, *inter alia*, cited:

- US-A-3 923 097
- US-A-3 777 810
- DE-C-3 038 317
- GB-A-1 383 690
- "Elemente des Apparatebaus", von H. Titze, 1963, Springer Verlag, page 218 (Absatz 11.28: "Doppelmantelgefäße für Wärmetauscher").
- "Heat Exchanger Design Handbook", 1987, VDI-Verlag Gmbh, pages 4.4.4-2 to 4.4.4-5.

II. The Appellant (Applicant) lodged his appeal on 10 May 1991, paying the appeal fee on the same date. The Statement of Grounds of Appeal was received on 17 July 1991, including two sets of claims with the corresponding descriptions and drawings.

III. In response to a communication dated 22 June 1993 of the Board of Appeal, which expressed a provisional negative opinion, the Appellant submitted new requests.

Following an invitation to oral proceedings, he filed with his letter dated 16 February 1994 two new sets of claims, as main and auxiliary requests, together with new descriptions and drawings.

IV. Oral proceedings took place on 16 March 1994. During these proceedings, an amendment was made to Claim 1 of both requests.

V. Claim 1 of the main request reads as follows:

"Apparatus for the heating and/or drying of wet, comminuted material, e.g. organic material, said apparatus comprising a stationary housing (2) with a rotatable, hollow rotor (3) with inlet (4) and discharge (5) of a heat medium and possible condensate (6) hereof, and said rotor having annular disc-like drying elements (9,9',9'') disposed at intervals and made of plate parts deformed and welded together, and each with at least one hollow channel (10', 10'') to which the heating medium is fed, characterised in that each drying element (9,9',9'') comprises only two annular, disc-like plates (17, 18) coupled together to form the drying element, and that both plates are deformed in such a way that annular channels (10, 10') are formed to which the heating medium is fed in parallel, and that the two plates are joined directly together by welding."

Claim 1 of the auxiliary request only differs from this above wording by the introduction of the following additional feature:

"(...that annular channels are formed) **together with supply channels (12,13) for the annular channels** (to which ...)".

VI. The Appellant argued as follows:

Before the present invention, two different main methods were known for the production of the disc-like drying elements, which are provided on the outer surface of the drum of apparatuses for the drying of wet, comminuted material. According to a first method, the disc-like elements are made of thin plates and are fixed to the drum either directly - see US-A-3 777 810 - or by means of intermediate walls - see DE-C-3 038 317. However, the use of thin plates allows the heating medium to be introduced into the disc-like elements at a very low pressure only and, thus, problems occur for feeding the heating medium. The other method is based upon the use of thick plates of about 6 to 12 mm for manufacturing the disc-like elements, so that the heating medium can be fed at a higher pressure and, thus, brings more heat. The use of thick plates further allows a reduction of the thickness of the disc-like elements and, therefore, gives a more compact construction with, further, an increased effective space between the disc-like elements for the reception of the comminuted material to be dried. US-A-3 923 097 shows such an example. However, with this method, the welding of the thick plates causes deformation of the drying elements and, then, it is very difficult to straighten out the finished drying element so that it becomes plane. The present invention starts from this prior art and has the object to avoid this deformation problem without losing the advantages of this last method.

The solution is based on the idea of making the channels of the drying elements as symmetric as possible in a radial plane. It was first tried to weld channels on both sides of a central plate (see

Figures 1 and 2 of the original application), but deformations appear due to the welding process. Then, the use of a single plate deformed to form annular channels and welded on another plane plate was unsuccessful, since the deformed plate remained curved and could not be pressed against the other plate for the welding step. One final and successful solution uses two plane plates, which are first pressed and fixed together by means of circular and straight weldings made on these plates for the formation of annular and supply channels. The obtained element is indeed uneven and deformed because of the welding process, but, surprisingly, as soon as an hydraulic fluid at a very high pressure is introduced between the plates for the production of the channels, the drying element straightens itself and a plane shape is obtained.

This symmetrical construction brings many advantages: The strength of the drying elements is very high, can resist heavy mechanical impacts and the production process, which requires only a few steps, can moreover be automatized to a great extent, since the welding seams are mostly circular. A D.C. welding process can be used with the advantage that no welding seams remain on the surfaces, so that no finishing step, such as grinding of the weld seams, is needed. The smooth outer surface of the drying elements, which is obtained, avoids any sticking of the product mass. When steam is used, the condensate of this heat medium can be driven out of the channels without problem. Furthermore, even if one of the weld seams is not tight, the drying elements still function, provided that the outermost weld seam is tight. Tests have shown that the thermal capacity and, thus, the efficiency of the device are significantly increased, since the heat medium can be

fed at higher pressures than was possible with the prior art devices. Pressures of about 12,5 bar are applicable. Moreover, the heat distribution is more uniform, because of the unbroken outer surfaces of the drying elements. The high resistance of the moving parts of the dryer, namely the drying elements, doubles the life time of the whole device. All these advantages have led to a great commercial success of the claimed apparatus, which is progressively replacing all prior art devices.

Claim 1, by indicating that only two plates are used and, further, that they are joined directly together by welding, discloses a combination of features which cannot be found in the prior art. Claim 1 indicates that the claimed subject-matter mainly concerns elements of a rotor, which rotate, requiring, therefore, high strength properties. It follows that the apparatus of this claim necessarily concerns drying devices made of thick material, like stainless steel having a thickness of 6 to 12 mm, in order to have sufficient strength to deliver the necessary heat for the material to be dried and additionally to carry mechanical stirring means. Prior art techniques applied on drying apparatuses, which are made of relatively weak materials, cannot, consequently, be transferred to the present invention, in particular when they concern stationary, passive heat exchangers, like those disclosed in the article "Elemente des Apparatebaues", by H.Titze or in the "Heat Exchanger Design Handbook". Documents DE-C-3 038 317 and US-A-3 777 810 also concern drying elements made of thin plates and these plates are welded on intermediate walls. Moreover, supply tubes for the heat medium or other tubes are disposed inside the drying elements between the plates.

This prior art, therefore, does not give any hint in the direction of the present invention.

VII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or of the auxiliary request filed with his letter dated 16 February 1994, in which both Claims 1 are restricted to parallel feed of the heating medium, as shown in the above given wording.

Reasons for the Decision

1. The appeal is admissible.

2. The new Claim 1 complies with the requirements of Article 123(2) EPC. The feature that each drying element comprises only two annular, disc-like plates, which are both deformed to form channels, is supported by the figures. The coupling of the plates by welding is disclosed in page 7, line 6, of the original application.

The embodiments relative to the use of arched metal strips (original Figures 2 and 3) or of a single plate deformed for the formation of the channels have been deleted from the original description and drawings, so that the new description and drawings are in conformity with the new claims (Article 84 EPC).

3. *Interpretation of Claim 1 of the main request*

Contrary to the Appellant's assertion, the subject-matter of Claim 1 in suit is not limited to disc-like drying elements made of thick plates. This aspect of the invention put forward by the Appellant is

completely absent from the wording of Claim 1 as well as from the description and drawings. Even the kind of apparatus disclosed in the preamble of Claim 1, namely an apparatus comprising a rotatable, hollow rotor, does not necessarily imply that thick plates have to be used. Several prior art documents relating to said kind of devices describe drying elements made of thin plates, even when additionally provided with mechanical stirring means, see for example US-A-3 777 810. The prior art citation mentioned in the introductory part of the description of the application in suit, namely US-A-3 923 097, does not give any clear indication in this direction. Claim 1 of the present application, indeed, emphasises the use of only two plates for the production of the drying elements, but it remains quite doubtful whether the person skilled in the art can deduce from this sole information that necessarily thick plates have to be employed. The solution of the present invention does not seem to be clearly given (Article 84 EPC).

However, as will be seen from the following, the final decision in this Appeal does not hinge on whether it is possible to interpret Claim 1 in such a way that thick plates have to be used.

4. The subject-matter of Claim 1 is new. The use of only two annular, disc-like plates for the production of the drying elements is not disclosed by any of the cited prior art documents.

5. The preamble of Claim 1 is based upon the apparatus known from Document US-A-3 923 097. This document discloses a heat exchanger for drying moist comminuted material and describes, more particularly, the disc heating elements of the revolving rotor of this

apparatus. In one embodiment, these disc heating elements are each made of one plane annular plate, which is embossed or calendered so as to form a helical channel and this channel is covered and, thus, closed by a helically cut and embossed metal strip welded on the plate. The hollow space of the channel is longitudinally divided by a partition in two helical passages, one for the flow of the heat medium from the rotor towards the outer edge of the disc element and the other for the return of said medium or its condensate to the rotor, in which conduits for the supply and removal of the heating medium are provided. With this solution, the production of the disc heating elements can be largely mechanized and automatically carried out, since a continuous welded seam is needed.

This known disc heating element is therefore only made of two parts, namely the annular plate and the helical strip, no reinforcing means being provided. Rustproof material is given as material, but, as already mentioned, no clear indication on the thickness of the metal plate and strip is given. In the introductory part of this document, column 1, lines 50 to 60, the reader indeed is advised that, in the prior art, since steam is generally used as a heating medium, either the disc heating elements are made from heavy sheet or reinforcing stays have to be welded between the two plates forming the heating elements, but, for the solution itself, the necessity of thick material is not disclosed. According to the Appellant, however, for the same reason as for the present invention, thick material is implicitly disclosed.

6. The two-part form of the contested Claim 1 is misleading, since features of the characterising part are known from the above mentioned closest prior art,

namely that a plate is deformed to form channels and that only two components are used for forming each disc element. Hence, the present invention according to Claim 1 differs from the apparatus known from said prior art in that:

(a) another deformed annular plate replaces the helical trip;
(b) the deformations of both plates are such that annular and supply channels are formed;
(c) the heat medium is fed in parallel.

7. According to the description of the application in suit, the spiral shaped channels, which cover the channels of the deformed annular plate, give rise to difficult welding processes and, thus, to drawbacks from the point of view of production. The Appellant has explained that during the welding step of this known solution the plane plate deforms in such a way that it is a laborious job to straighten the obtained disc-like element to bring it to its plane state. The object of the present invention is, therefore, to provide an apparatus of the kind in question, but of such a configuration that the production is to a great extent easier.

8. However, the teaching of Claim 1 of the application in suit defines the desired apparatus rather than giving a complete teaching of how this result can be achieved in practice and there is no disclosure in the patent application of the necessary steps which can solve the problem underlying the present invention. In view of the Appellant's arguments and more particularly of his disclosure of the method, which is appropriate to reach the claimed apparatus, it is clear that the features of Claim 1 do not solve the above mentioned technical

problem. They only constitute a part of the real solution:

The Appellant has recognised that, in fact, it was only after the filing date of the present application that the real solution was found, namely the particular method described in Point VI above. According to this method, two annular, disc-like plates, which are plane and, thus, not yet deformed, are welded by means of circular weldings, which are made between the subsequent channels to be formed and a welded pipe section is also provided. **The obtained element is rended uneven because of this welding process**. Then, hydraulic fluid under a very high pressure is introduced by the pipe section and forms the channels and ,surprisingly, the whole element becomes absolutely plane.

9. According to Claim 1, two annular plates, which are deformed so as to form annular channels, are welded together. With these structural features only, the person skilled in the art is not in a position to determine when and how the plates are welded and deformed and he can only rely on his common general knowledge, which is to be seen in the light of the prior art, in which the plates were first deformed and then welded. Thus, on the sole basis of the claimed solution, the person skilled in the art cannot deduce, even implicitly, the measures, which are necessary to solve the above-mentioned problem.

The description of the patent application also does not give him the necessary information. Even by applying, as argued by the Appellant, the idea - not claimed, but disclosed as an embodiment - of a symmetrical arrangement in the radial plan of the channels, the

plates will still be deformed by the heat of the welding step, thus rendering straightening up necessary.

Therefore, the Board is of the opinion that the patent specification does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a skilled person in the art, since it does not disclose sufficient specific measures as to how the desired claimed apparatus according to Claim 1 can be achieved in practice without meeting the known deformation problem of the plates (Article 83 EPC). This opinion was clearly set out during the oral proceedings before the Board.

10. Since Claim 1, however, does not define a method, but an apparatus, which is new, it has to be seen in the light of its structural features, particularly in the light of those features distinguishing the claimed apparatus from that according to the above-mentioned closest prior art.

11. Several prior art documents, however, show that, in the concerned technical field, it was well-known to produce elements of heat exchangers by joining together by welding two plates deformed in such a way that channels are formed, reinforcing elements being eventually interposed between the plates. Thin plates seem to be mostly used.

Considering, first, heat exchangers comprising only passive, stationary elements, the two documents "Elemente des Apparatebaus" and "Head Exchanger Design Handbook" describe immersion panels or double-layer walls of tanks or vessels of heat exchangers, for example of the jacket-type clamped onto the vessel or

integral therewith. They are constructed "by combining two embossed panels so that the embossed patterns form the channels through which the heating or cooling medium flows" (page 4.4.4-2 of the handbook). Embossed panels or embossed strips are shown as equivalent. Figure 7 of the handbook also shows as equivalent spiral-shaped channels, like those described in the above closest prior art, or parallel-flow channels, so that the heating medium is fed in parallel, as is the case with the present invention.

In the more accurate technical field of the present invention, namely heat exchangers having rotors, documents US-A-3 777 810 and DE-C-3 038 397 disclose disc drying elements of the rotor, which are made of two plates deformed so as to form **annular** channels. These plates are welded partly directly together or partly onto reinforcing rings or stays mounted between them. Thin material are used for the plates.

12. For the relevant person skilled in the art, it is, therefore, common general knowledge for the production of drying elements to use two plates deformed to form annular channels and to weld them together. As seen above, this method was also used in the case of heat exchangers comprising rotors with drying elements, but, until the present invention in most cases, thin material was used for the plates and reinforcing elements were at least partly placed between the plates. However, US-A-3 923 097, the closest prior art, teaches that reinforcing elements can be avoided by using heavy sheet material for the drying elements, see in particular column 1, lines 50 to 60, and applies this idea by welding a helicoidal strip to a deformed plate. It belonged, therefore, to the routine approach of the skilled person to try this possibility also in

combination with two plates formed with annular channels, which, as seen above, are equivalent means. Once having annular channels, the feeding in parallel of these channels follows, it being well known in the concerned technical field as shown by the cited technical handbook. The provision of passages for the heat medium realised in the intermediate welding seams between the channels, as suggested by the holes in the reinforcing rings or plates shown in US-A-3 777 810 or DE-C-3 038 397, or the provision of a common supply channel, as shown by the above mentioned handbook, are normal design possibilities for the same specialist, who had, therefore, before the date of the present invention all the information to reach the subject-matter of Claim 1 of either the main or the auxiliary request.

13. DE-C-3 038 397 could, also, be chosen as closest prior art since the subject-matter of Claim 1 differs from the apparatus known from that citation by the following features:

(a) only the two deformed plates are used to produce the drying elements (which, as seen above, implies the use of thick material)
(b) and the heat medium is fed in parallel.

From US-A-3 923 097, the person skilled in the art receives the idea that, for improving the production of the disc-like elements, the reinforcing elements can be avoided by using thick material. Following this suggestion, he has to provide means for supplying the heat medium to all channels and knows from his common general knowledge, see the above-mentioned handbook, that a possibility consists in the provision of a supply channel.

14. The arguments of the Appellant and, more particularly, his disclosure of the method used to produce the disc-like drying elements, shows that, even if the idea of only using two plates made of thick material and deformed to form annular channels is obvious, as seen above, the person skilled in the art was in fact impeded from applying such an idea because of problems arising during the welding process of the deformed plates: Due to the high temperatures needed during this process, the plates lose their original plane shapes, so that deformed disc-like drying elements are obtained. The present application does not solve this problem. On the other hand, the specific and perhaps inventive method of manufacturing the new claimed apparatus cannot contribute to the inventiveness of said apparatus, all the more as this method cannot be deduced from the application as filed.

15. Summarising, the Board comes to the conclusion that Claim 1 of the main request is not based on an inventive step so that this claim is not allowable. The appendant claims fall with the non-allowable independent claim.

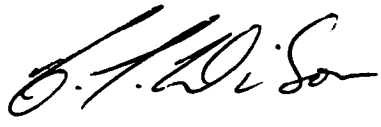
Since the additional feature of Claim 1 of the auxiliary request, namely the provision of supply channels, represents an obvious possibility for a mandatory step (see Point 12) of the feature of Claim 1 of the main request, according to which the heating medium is fed in parallel, this claim, for the same reasons, cannot serve as the basis for the grant of a patent.

Order

For the above reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:



N.Maslin C.T. Wilson