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D E C I S I O N
of 7 March 1995

Case Number: T 0005/93 - 3.2.3

Application Number: 83306309.2

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Language of the proceedings: EN

Title of invention:
A decanter centrifuge

Patentee:
ALFA - LAVAL SEPARATION A/S

Opponent:
KHD Humboldt Wedag AG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"General technical knowledge applicable in specific technical field"
"Inventive step denied"

Decisions cited:
T 0176/84, T 0104/83, T 0056/87, T 0204/83, T 0127/85

Catchword:
-



Case Number: T 0005/93 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 7 March 1995

Appellant: ALFA - LAVAL SEPARATION A/S
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 29 September 1992,
posted on 6 November 1992, revoking European
patent No. 0 107 470 pursuant to Article 102(1)
EPC.

Composition of the Board:

Chairman: C. T. Wilson
Members: F. Brösamle
L. C. Mancini

Summary of Facts and Submissions

- I. European patent No. 0 107 470 was granted with seven claims; Claim 1 thereof reads as follows:

"1. A decanter centrifuge comprising an elongate bowl (1), a bearing (6) at each end of the bowl supporting the bowl for rotation about its longitudinal axis with the longitudinal axis having a substantially horizontal component, a stationary support means (8) for supporting each bearing, a conveyor screw (3) located within the bowl and journalled for rotation about the axis of the bowl, drive means for rotating the bowl, and differential drive means for causing the conveyor screw to rotate relative to the bowl, characterized in that a load transferring spring system (7) is interposed between each bearing (6) and its associated support means (8), each of said spring systems (7) being dimensioned with such a low spring rate that the lowest natural vibration frequency of the resiliently supported centrifuge is substantially below the operational running speed range of the centrifuge."

- II. Following an opposition by KHD Humboldt Wedag AG - Respondent in the following - the Opposition Division revoked the above European patent in the oral proceedings held on 29 September 1992, whereby the written decision was issued on 6 November 1992.

In the light of

(D2) "Hütte", Taschenbuch des Ingenieurs, 28 Edition 1954, pages 334/335, and

(D3) "Bedienungsanleitung der Dekantierzentrifuge OV-34" which inter alia is substantiating a public prior use

the Opposition Division in its decision came to the conclusion that the subject-matter of granted Claim 1 does not involve an inventive step as required by Article 56 EPC.

III. The Proprietor - Appellant in the following - by letter of 16 December 1992, received on 19 December 1992, lodged an appeal against the decision of the Opposition Division and paid the fee on the same day. The Statement of Grounds of Appeal was received on 4 March 1993. It was argued that (D3) is accepted as public prior use and that the known decanter centrifuge "OV-34" does not go beyond conventional prior art, since the rubber rings thereof did not serve to produce "a load transferring spring system" as claimed. (D3) in the Appellant's opinion did not disclose the dimensions and the stiffness of the used rubber rings so that no supercritical operation mode could be considered to have been envisaged in the centrifuge "OV-34". Moreover a technical prejudice was claimed against the operation of a decanter centrifuge in a supercritical mode which prejudice was demonstrated in Annexes B to Q filed during pre-grant examination. The Appellant came moreover to the result that the rubber rings of "OV-34" have simply to be seen as sealing rings, and that the prior used centrifuge should be made available to the Appellant for inspection. The Appellant furthermore contested the statement in the impugned decision that the problem to be solved by the invention had to be seen in avoiding "frequency tuning" and that (D2) was a useful document to lead a skilled person to the claimed invention i.e. by already teaching a supercritical mode of operation of turbomachines in general and of a vertical centrifuge in particular, since in (D2) only a bearing at ~~one~~ end of the rotor is envisaged.

The Appellant requests therefore as a **main request** to set aside the impugned decision and to maintain the patent in its granted form.

IV. The Respondent contended that (D3) is a novelty destroying document in view of the decanter centrifuge according to granted Claim 1, since "Anlage K12" which is a report dealing with the dynamic behaviour of the decanter centrifuge according to (D3) makes it absolutely clear that the known centrifuge is operated beyond the lowest natural vibration frequency. In his findings the known rubber rings are equivalent to the claimed spring systems "7" and constitute such a soft bearing that a supercritical operation of the centrifuge is possible. Should the Board come to the conclusion that the subject-matter of granted Claim 1 is novel the Appellant also raised an objection for lack of inventive step thereof and requests to dismiss the appeal.

V. Following a communication of the Board pursuant to Article 11(2) RPBA oral proceedings were held on 7 March 1995 in which the Appellant maintained his request to uphold the patent as granted (main request), however, submitted new Claims 1 as first and second auxiliary request:

(a) Claim 1 of the first auxiliary request differs from granted Claim 1 in that the words "lowest natural" of it are replaced by "first critical".

(b) Claim 1 of the second auxiliary request reads as follows:

"1. A decanter centrifuge comprising an elongate bowl (1), a bearing (6) at each end of the bowl supporting the bowl for rotation about its longitudinal axis with the longitudinal axis having

a substantially horizontal component, a stationary support means (8) for supporting each bearing, a conveyor screw (3) located within the bowl and journalled for rotation about the axis of the bowl, drive means for rotating the bowl, and differential drive means for causing the conveyor screw to rotate relative to the bowl, characterized in that a load transferring spring system (7) is interposed between each bearing (6) and its associated support means (8), each of said spring systems (7) comprising at least two distinct spring structures mounted with adjusted pre-compression, such that with the bowl at rest the resultant of all forces acting on each bearing maintains the axis of that bearing in a central position relative to the associated support means, and each spring system being dimensioned with such a low spring rate that the first critical vibration frequency of the resiliently supported centrifuge is substantially below the operational running speed range of the centrifuge."

VI. The Appellant in addition to his arguments filed in written form brought forward the following arguments:

- the request for inspection of the decanter centrifuge "OV-34" was upheld and it was stressed that the burden of proof is on the side of the Respondent to demonstrate that the rubber rings of "OV-34" can be seen as soft bearings allowing a supercritical operation of the known decanter centrifuge;
- calculations carried out by the Appellant on the basis of dimensions taken from the "OV-34" - manual demonstrate that the known centrifuge is likely to

be operated below the critical frequency so that their rubber rings obviously serve a different purpose from the claimed springs, namely sealing or mounting;

- it is accepted that (D2) per se teaches a supercritical operation of turbomachines and vertical centrifuges but it is contended that a prejudice excluded that a skilled person could envisage such an operation mode in combination with a horizontal centrifuge being based on two end bearings; the Appellant is of the opinion that earlier filed "Annex B to Q" substantiate the existence of a technical prejudice against a supercritical operation mode of a centrifuge type as claimed i.e. with a horizontal rotor and two bearings;
- though in the attacked patent only one frequency is used for expressing the claimed subject-matter, this frequency is **not** to be seen as a first or lowest "rigid body mode" but as a "first flexible critical speed", see "Exhibit A1" page 8 filed with letter of 30 January 1995;
- from the patent, see column 1, lines 19 to 34 it would be clear that "flexible critical speed" is meant when discussing US-A-2 867 378 (D4 in the following) so that the "sheet 64" of the pre-grant file extensively discussed in the oral proceedings before the Board has to be seen as lowering the frequencies i.e. in a supercritical mode;
- with respect to the first auxiliary request it was set out that the amendment was carried out for clarifying Claim 1 as granted;

- in combination with the second auxiliary request it was highlighted that counteracting springs as claimed enable a "soft" bearing; the adjustment of these springs is carried out in a way that the rotor of the centrifuge is duly supported in a vertical direction; in a formal respect the combination of granted Claim 1 with only a part of granted Claim 3 is seen as admissible since otherwise an unjustified restriction of the claim would result;
- summarising all arguments the Appellant contended that one of the three existent requests is allowable in the meaning of Articles 54 and 56 EPC so that the impugned decision cannot be upheld.

VII. The Respondent essentially argued as follows:

- if necessary the known centrifuge "OV-34" could be made available for inspection by the Appellant;
- the objection under Article 54 EPC (novelty) was upheld since (D3) was seen as a novelty destroying document;
- soft bearings in the meaning of granted Claim 1 are known from (D3) when duly interpreted by a skilled person, see also "Anlage K12", and since granted Claim 1 only defines "the lowest natural vibration frequency";
- without any differentiation in the complete European patent No. 0 107 470 between rigid body modes and flexible critical speeds it is allowable to interpret any lowest natural vibration frequency of a known centrifuge as novelty destroying;

- it is irrelevant that the rubber rings of "OV-34" are split (upper and lower bearing element) since this constructional element does not exclude a supercritical operation of the centrifuge; the rubber rings realised in "OV-34" do not have a centring effect since this function is part of spherical bearings which allow an angular displacement of the rotor ends;
- though the Respondent has measured the frequency beyond which a self-centring effect of the rotor (supercritical mode of operation) exists and though the Appellant has carried out calculations of this frequency both ways lead to a critical frequency in the range of 4 000 to 5 000 rpm;
- since the Appellant has not correctly defined the existing frequencies as rigid body modes and as flexible critical speeds it is not admissible to differentiate the actually existing frequencies in a late stage as important and unimportant frequencies; see also page 64 of the pre-grant file and "Anlage K12" which are identical in this respect;
- in addition the Respondent pointed to (D2) and argued that a combination of (D3) and (D2) deprives the subject-matter of Claim 1 according to the main, first and second auxiliary request of an inventive step;
- with respect to the second auxiliary request the Respondent pointed out that a rubber ring has to be seen as an indefinite number of springs so that the claimed feature of providing "at least two distinct spring structures" has to be seen as known;

- summarising the above arguments the appeal (of the Proprietor) has consequently to be dismissed.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. In the opposition proceedings (D3) was accepted as public prior use of a decanter centrifuge "OV-34" with a horizontal axis and bearings at each side of the rotor whereby rubber rings are foreseen as soft bearing elements. The manual of this known centrifuge is silent about the dimensions, the stiffness and further characteristics of these rubber rings and also about the operational speeds of the rotor be it sub- or supercritical.
3. The Board after hearing both parties in the oral proceedings before the Board could not obtain such a clear opinion that it could decide on the question whether the known centrifuge "OV-34" itself is a "supercritical" centrifuge or not:
 - 3.1 The Respondent who had the centrifuge "OV-34" available for tests came to the result that this centrifuge is destined for a supercritical operation i.e. well above the rigid body modes with peaks "I" and "II" in the meaning of page 64 of the pre-grant file. Since the Respondent did not make available this machine to the Appellant (though in the oral proceedings before the Board such an offer was made) and to the Board the crucial point to be decided is the disclosure of the manual of "OV-34" i.e. (D3).

3.2 As already set out in above remark 2 this document does not unambiguously disclose a supercritical operation mode in the sense of handbook knowledge as exemplified for instance by (D2). Due to this fact and to the fact that the patent in suit is relatively vague in respect of the definition of vibration frequencies of a system consisting of a centrifuge and its support it is not possible for the Board to decide whether or not (D3) is a novelty destroying document. Under these circumstances the crucial question to be decided is inventive step.

4. A delimitation of granted Claim 1 over (D3) leads to the result that all features thereof are known apart from the softness of the spring bearings such that the centrifuge is operated at supercritical speeds.

It is clear that a system embracing a centrifuge and a support underlies a multitude of vibration frequencies, some of them being flexible critical speeds of the rotor system. In some a rotor-translation takes place while in others the rotor is deflected and its axis is no longer parallel to its original position at rest.

The Appellant's differentiation into important and non-important critical speeds is arbitrary and not supported by the patent in suit, from which document no such differentiation can be seen. The attacked patent is moreover completely silent in respect of any influence of the support system (foundation) on the dynamic behaviour of the centrifuge. Even if the skilled person knows the above exemplified background of mechanics it appears not allowable to exclude - for reasons of defending the claimed centrifuge against prior art - some frequencies as irrelevant and to redefine the mode of operation.

5. The nearest prior decanter centrifuge is reflected by (D3). It is normal practice to study such a known machine as to its properties such as for example its output i.e. its capacity to separate a suspension into solids and into liquids. Due to its operation speed which in the Board's assessment is **not necessarily and unambiguously** supercritical in the sense of handbook knowledge such as (D2), the output of the known decanter centrifuge may be seen as insufficient and not economical.

It is normal practice to look for possibilities to overcome the restrictions of a known machine and to pose a technical problem such as the endeavour to improve the output of a known decanter centrifuge. Such considerations do not yet demand inventive skill, since it is sufficient to study the behaviour of a known machine and to study possibilities for overcoming potential deficiencies thereof.

6. As can be seen from the written and oral statements of the parties it was never disputed that there exists a direct interrelationship between the operational speeds of a centrifuge and its output so that a skilled person would and could envisage the possibility to vary the parameter "operational speed" of the centrifuge as the means to improve the output.

7. From (D2) covering a more general technical field such as the elastic behaviour of turbomachines it is known that turbomachines and in particular a vertical centrifuge, see Figure 19 and corresponding text of (D2), can be equipped with bearings in the form of springs, that are so soft that the rotor of the machine under certain conditions - namely supercritical speeds - is subjected to a self-centring effect which leads to a stabilisation of the rotor on a high level of rotation.

A skilled person was therefore aware of the possibility of overcoming speed restrictions by providing soft bearings which enable a self-centring effect and allow a supercritical operation of a turbomachine such as a centrifuge.

Since in (D2) not only turbomachines but also turbines and a vertical centrifuge are dealt with in combination with a supercritical operation there cannot be claimed that a **prejudice** against the supercritical operation of a decanter centrifuge existed, even if in (D2) a **vertical** centrifuge is shown and granted Claim 1 is based on a **horizontal** centrifuge with bearings at its **both ends**, since a skilled person, (see T 176/84, OJ EPO 1986, 50), would and could consult a more general technical field for getting useful information concerning the possibilities to increase the operational speeds of machines. The above decision takes therefore precedence over the decisions cited by the Appellant, namely T 104/83 (unpublished) and T 56/87, OJ EPO 1990, 188 as well as T 204/83, OJ EPO 1985, 310 which deal respectively with the issues of which features can be derived from a diagrammatic representation in a prior art document and of what can be derived from a drawing.

8. In the absence of a technical prejudice against operating a centrifuge in a supercritical mode a skilled person without knowing the claimed invention would and could combine the teachings of (D3) and (D2) i.e. to envisage the provision of soft bearings to allow a self-centring effect of the rotor when run in a supercritical operation. It is obvious that the possibility of increasing the rotational speed of the centrifuge-rotor solves the objective problem of the invention, namely to increase the output of a known decanter centrifuge.

Since the teaching of (D2) is **not restricted** to vertical rotors or to rotors with only one fixed bearing a skilled person would not have to overcome serious difficulties when applying soft bearings in combination with the known centrifuge "OV-34" according to (D3).

Claim 1 of the main request is therefore not based on an inventive step in the meaning of Article 56 EPC and is not therefore allowable.

First auxiliary request

9. Claim 1 of this request differs only slightly from granted Claim 1 in that the "lowest natural" vibration frequency has been modified into "first critical" vibration frequency.

As set out above in combination with Claim 1 of the main request the patent in suit does not clearly define the frequencies so that the above modification has to be seen merely as "tidying up" in the meaning of T 127/85, OJ EPO 1989, 271.

For the above reasons Claim 1 of the first auxiliary request is also not allowable.

Second auxiliary request

10. In this request Claim 1 is a combination of features of granted Claim 1 and part of granted Claim 3 (resultant of all forces ... maintains the axis ... in a central position).

The extra information given by Claim 1 of the second auxiliary request which is not part of granted Claim 1 is that on each bearing at least two distinct spring structures are arranged which by adjusting their pre-

compression ensure that with the bowl at rest the resultant of all forces acting on each bearing maintains the axis of that bearing in a central position relative to the associated support means.

The rubber rings according to (D3) can be seen as direct equivalents to "at least two distinct spring systems" as claimed since a rubber ring comprises an indefinite resilient support and fulfils the requirement of holding a rotor in a central position. Claim 1 of the second auxiliary request does therefore not contain technical information which makes the centrifuge of Claim 1 of the main request inventive since a simple exchange of structural elements, namely rubber rings and distinct spring systems, and maintaining a known central position of the rotor under all existing forces appear to lie in the design freedom of a skilled engineer. A surprising not foreseeable effect in the extra feature of Claim 1 of the second auxiliary request cannot be seen and was not brought forward by the Appellant so that this Claim 1 is also not allowable for reasons of Article 56 EPC.

Final remarks

11. Even consideration of Appellant's arguments not dealt with above, do not give rise to favourable findings in respect of the Appellant:

- it is a fact that the Respondent up to the oral proceedings before the Board did not make available a decanter centrifuge "OV-34" to the Appellant; since (D3) was, however, accepted as public prior use, there cannot be seen a legal consequence which negatively affects Appellant's rights, since the Board's assessment is **not based** on lacking novelty, but on lack of inventive step in the light of (D3)

and (D2); in spite of Respondent's refusal to make the "OV-34" centrifuge available to the Appellant he carried out calculations and came to the result that this centrifuge is not novelty destroying to the existent versions of Claim 1; who in this situation had the burden of proof has therefore not to be decided;

- since (D2) gives enough information to the skilled person that supercritical operations of turbomachines are possible, Appellant's "Annexes B to Q" filed for proving a technical prejudice against trying such an operation mode of a centrifuge are without a basis;
- the disclosure at column 1, lines 19 to 34 of the patent in suit cannot serve as a reliable basis for distinguishing a rigid body mode from a flexible critical speed of the rotor system;
- the Board has no objection to raise as far as the formal admissibility of Claim 1 of the second auxiliary request is concerned;
- it is irrelevant that (D3) is silent about the properties and the size of the known rubber rings of "OV-34" since the Board did not decide that (D3) is novelty destroying; the further assumptions of the Appellant such as the intention of split rubber rings has no legal consequence for the crucial question of this case, namely to decide on the inventive contribution of the invention as claimed to the prior art;

- whether or not Respondent's calculations and abstract models used for these calculations are correct has no influence on the Board's findings since they were not relevant for the assessment of Article 56 EPC;
- the reference to the not pre-published document DE-A-4 315 694 is not suited to prove a technical prejudice since (D2) clearly contradicts the existence of such a technical prejudice;
- considering the whole of the technical information given by the complete patent specification in suit it cannot be concluded that "supercritical operation" means beyond lowest flexible critical speed;
- (D4) being less relevant than (D3) this document needs no specific consideration.

Conclusion

12. Under these circumstances the Board comes to the result that there is no valid request on file so that the impugned decision cannot be set aside.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:



N. Maslin

The Chairman:



C. T. Wilson

