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Case Number: T 1939/12 - 3.3.05

Application Number: 09713403.5

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IPC: B01F13/02, B01F7/00, B01F15/02

Language of the proceedings: EN

Title of invention:
A GAS ACTUATED MIXING SYSTEM AND METHOD

Applicant:
Farm Renewable Environmental Energy Ltd

Headword:
Anaerobic Digester/FARM RENEWABLE ENVIRONMENTAL ENERGY LTD

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step (main request and auxiliary request) : no - obvious modification

Decisions cited:
T 0254/86

Catchword:

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Case Number: T 1939/12 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 5 December 2014

Appellant: (Applicant)	Farm Renewable Environmental Energy Ltd Lodge Farm Commonwood Holt Wrexham LL13 9TE (GB)
Representative:	Walker, Ross Thomson Forresters Skygarden Erika-Mann-Strasse 11 80636 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 17 April 2012 refusing European patent application No. 09713403.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Raths
Members:	H. Engl
	M. Blasi

Summary of Facts and Submissions

I. European patent application EP 09 713 403.5 was refused by a decision of the examining division taken in oral proceedings on 15 March 2012 and posted on 14 April 2012.

II. The examining division relied *inter alia* on the following prior art documents:

D1: WO-A-89/00151
D2: US-A-4 179 220
D3: US-A1-2002/0 139 748
D4: FR-A-888 432
D5: EP-A-1-0 938 456
D7: GB-A-0 292 714
D12: EP-B1-1 023 244 (cited in the application)

III. The examining division decided that the subject-matter of claims 1 and 11 of the main request lacked novelty having regard to documents D1 to D5 and that claims 1 and 11 of the auxiliary request did not involve an inventive step having regard to document D1 in combination with document D7.

IV. The applicant (henceforth: the appellant) filed an appeal against this decision including amended claims as a main request. In the alternative, the appellant requested that the set of claims filed on 8 March 2012 as an auxiliary request be taken into consideration.

V. The board issued a communication pursuant to Article 15(1) RPBA in which it raised an objection under Article 56 EPC against claim 1 (of both requests). The board argued that, starting from D2 as the closest prior art and aiming at improving mixing,

the skilled person would consider implementing the sequential unconfined gas mixing ("SUGM") system which was known *per se* from document D12.

VI. The appellant's reply was received with letter of 3 November 2014.

VII. Oral proceedings took place on 5 December 2014 during which the appellant filed new sets of claims as a main request and an auxiliary request. They differ from the claims previously on file only by a minor correction in claim 11 (the word "via" was inserted between "digester" and "the gas bubbles" under item b)).

VIII. The independent claims 1 and 11 of these requests are worded as follows:

Main request:

"1. An anaerobic digester (1, 10, 20, 30) having a gas bubble agitated mixing system, said digester comprising:

a container in which a viscous fluid that is to be digested may be held;

a plurality of gas pipes (6), each pipe having an outlet (8) arranged to introduce gas bubbles into the base region of the container (1), said gas bubbles being of a size suitable to agitate the viscous fluid;

a moveable carrier arm (4) having said gas pipe outlets (8) mounted thereon; and wherein the movement of the carrier arm (4) causes the position at which each outlet introduces gas bubbles into the container (1) to vary over time; and

characterised by gas control means (7) for expelling gas bubbles from the gas pipe outlets sequentially rather than concurrently."

"11. A method of mixing viscous fluids within an anaerobic digester (1, 10, 20, 30) having a plurality of gas pipe outlets (8) on a moveable carrier arm (4) within the base region of the digester, comprising:

a) providing a viscous reaction mixture of organic materials and bacteria within the anaerobic digester; and

b) mixing the reaction mixture by introducing gas bubbles into the base region of the digester via the gas bubbles outlets (8), said gas bubbles being of a size suitable to agitate the reaction mixture, whilst moving the gas pipe outlets within the container and thereby varying the point at which gas bubbles are introduced into the container over time; and

characterised in that the gas bubbles are introduced via each of the gas pipe outlets (8) sequentially rather than concurrently."

Auxiliary request:

"1. An anaerobic digester (1, 10, 20, 30) having a gas bubble agitated mixing system, said digester comprising:

a container in which a viscous fluid that is to be digested may be held;

a plurality of gas pipes (6), each pipe having an outlet (8) arranged to introduce gas bubbles into the base region of the container (1), said gas bubbles being of a size suitable to agitate the viscous fluid;

a moveable carrier arm (4) having said gas pipe outlets (8) mounted thereon; and wherein the movement of the carrier arm (4) causes the position at which each outlet introduces gas bubbles into the container (1) to vary over time; and

characterised by gas control means (7) for

expelling gas bubbles into the container through each gas pipe in turn."

"11. A method of mixing viscous fluids within an anaerobic digester (1, 10, 20, 30) having a plurality of gas pipe outlets (8) on a moveable carrier arm (4) within the base region of the digester, comprising:

a) providing a viscous reaction mixture of organic materials and bacteria within the anaerobic digester; and

b) mixing the reaction mixture by introducing gas bubbles into the base region of the digester via the gas bubbles outlets (8), said gas bubbles being of a size suitable to agitate the reaction mixture, whilst moving the gas pipe outlets within the container and thereby varying the point at which gas bubbles are introduced into the container (1) over time; and

characterised in that the gas bubbles are introduced via each of the gas pipe outlets (8) in turn."

IX. The appellant essentially argued as follows:

In its statement of grounds of appeal, the appellant emphasised the functional distinction between a "carrier" arm and a "mechanical mixing" arm. It also explained the mode of expelling the gas bubbles "sequentially rather than concurrently". The difference between these two modes implied that the gas control means expelled the gas bubbles from each of the outlets in turn rather than expelling gas bubbles from each of the outlets at the same time.

The appellant then noted that novelty was not disputed.

The appellant argued in the letter dated

3 November 2014 that D12 should be considered the closest prior art because it also disclosed a digester with sequential unconfined gas mixing ("SUGM").

Starting from D12, the problem consisted in providing an anaerobic digester with a SUGM system with a simplified construction and lower maintenance costs.

This problem was solved by providing a plurality of gas pipes with outlets on a moveable carrier arm.

As to the question of obviousness, the appellant argued that the skilled person would not combine D12 with D2 because of a clash in teaching between the two documents. The lightweight gas distribution arm in D12 was not suitable for use with a SUGM system without considerable re-designing. The skilled person would refrain from bolting multiple pipes onto this lightweight arm because doing so would increase the energy requirement of the system.

The subject-matter of claims 1 and 11 thus involved an inventive step having regard to D12 and D2.

Taking document D2 as the starting point, in the appellant's view the same conclusion of non-obviousness would be reached. The digester disclosed in D2 suffered from uneven mixing caused by the random way in which the bubbles were expelled from the multiple gas outlets of the rotating gas distribution arm, causing regions of "dead space". The problem therefore consisted in providing an improved anaerobic digester. This problem was solved by designing the digester with gas control means that ensured that gas was expelled from each gas outlet in turn, thus addressing the "dead space" issue.

D2 itself was silent on the "dead space" problem. D12 would not be taken into consideration because mounting multiple gas pipes onto the lightweight gas distribution arm of D2 inevitably increased the load, necessitated more powerful drive means to move the arm and brought unwanted increases in energy requirement.

X. Requests

The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the claims of the main request, or in the alternative, the claims of the auxiliary request, both filed during the oral proceedings.

Reasons for the Decision

1. Novelty

The board is satisfied that the claimed subject-matter according to the main and auxiliary requests is novel having regard to the available prior art. A detailed reasoning is not necessary because the appeal fails for other reasons.

Main request

2. Inventive step

2.1 The invention

The application is concerned with an aerobic digester having a gas bubble agitated mixing system and a method

of mixing viscous fluids.

2.2 Closest prior art

2.2.1 An aerobic digester was known from document D2 (abstract; Figure 1) and D12 (paragraph [0003]; Figure 1). Both documents appeared to qualify as the closest prior art document.

The appellant argued in the statement of grounds of appeal that D2 represented the closest prior art.

In a later submission (of 3 November 2014) and during oral proceedings, however, the appellant argued that D12 constituted the closest prior art because, in addition to being directed to the same purpose as the claimed invention, D12 and the claimed invention both utilised sequential unconfined gas mixing (SUGM).

2.2.2 The board is not convinced of D12 being the correct choice of the closest prior art. In accordance with the case law, the closest prior art is a document conceived for the same purpose or aiming at the same objective and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications (see Case Law of the Boards of Appeals of the EPO, 7th Edition 2013, page 170, sections I.D. 3.4.2 and 3.4.3, and the decisions cited therein). The closest prior art has also been termed as the "most promising springboard" towards the invention (T 254/86, OJ EPO 1989, 115, Reasons point 15).

Both D2 and D12 are concerned with problems of mixing in apparatuses for the anaerobic digestion of biodegradable wastes and sludges (D2, column 1, lines 6 and 7; column 5, line 65 to column 6, line 17; D12,

paragraphs [0003], [0004] and [0061]). In both documents, problems of uniformity of mixing and of energy or power requirements are addressed.

However, because the mixing assembly in D12 is a **fixed** installation (see Figures 1, 2, 21 and 24), whereas the D2 proposes an assembly which is **rotatable** about the central axis of the digester and has moveable gas outlets (see Figure 1), the board considers that the mixer/digester of D2 would require less structural modifications than the static design of D12.

In fact, in order to arrive at the claimed invention, the only necessary modifications to D2 are the upstream fitting of a SUGM rotary valve and of at least two independent gas pipes each having at least one gas outlet.

Therefore, the board starts from D2 as the closest prior art document for assessing inventive step.

2.2.3 D2 discloses an apparatus for anaerobic digestion having a moving, non-mixing carrier arm (gas distribution arm (9)) for the gas outlets and pipes. Gas bubbles are expelled from multiple gas outlets (10) in the gas distribution arm as they rotate within the digester. Because the gas bubbles may be expelled in a random way (i.e. not in a uniform manner from all the gas outlets), regions of "dead space" may be created which are not agitated by bubbles. The present application aims to overcome this problem (see page 4, second paragraph).

Furthermore, the application aims at providing the aforementioned advantages at reduced energy

requirements of the system (see page 3, lines 3 and 4).

2.3 Problem

According to the application in suit, the problem was to avoid "dead spaces" within a container using the gas actuated mixing method. Starting from D2, the appellant defined the problem underlying the application as the provision of an improved anaerobic digester.

2.4 Solution

As a solution to this problem, the application under appeal proposes an anaerobic digester according to claim 1 of the main request, characterised in that:
- a plurality of gas pipes (6) are mounted on a moveable carrier arm (4);
- each gas pipe has a single gas outlet (8); and
- gas control means (7) are provided for expelling gas bubbles from the gas pipe outlets sequentially (in turn).

2.5 Success of the solution

The board accepts that the above defined problem is successfully solved. The improvement lies in the fact that the system of the claimed invention avoids the creation of "dead spaces" due to the provision of gas control means for expelling gas bubbles into the digester through each gas pipe in turn (sequential unconfined gas mixing, SUGM) (see page 4, second paragraph). The board also accepts that such SUGM mixing is advantageous in energy consumption since lower power pumps may be used in the operation of the system whilst minimising the creation of "dead

spaces" (application in suit, page 4, lines 10 to 11).

2.6 Obviousness

It remains to be decided whether the claimed solution is obvious having regard to the prior art.

2.6.1 The board considers that the present application combines, in an obvious manner, essential apparatus details known *per se* from D2 and D12.

Document D12 is a relevant piece of prior art which is mentioned in the description (page 1). It discloses an anaerobic digester containing a viscous liquid (sludge) which is agitated by sequential unconfined gas mixing (SUGM) (see paragraphs [0004], [0008], [0009] and [0061]). Accordingly, the mixing apparatus of D12 comprises means (e.g. a multiple port rotary valve 4) for distributing the primary gas feed sequentially into a number of individual gas pipes 7, each of which has an injection port 10 at its free end from which the gas is injected into the digester. For uniform mixing, the injection ports are evenly distributed across the tank floor (see paragraphs [0054] to [0057], Figures 1 and 2). However, in accordance with D12 and in contrast with the instant application the gas pipes (and gas outlets) are all stationary (not moveable).

According to D12, the advantages of the SUGM agitation system are greater mixing power and reduced danger of blockage (see paragraph [0037]).

2.6.2 In the board's judgment, the skilled person aiming at improving mixing in the digester of D2 having a moving, non-mixing carrier arm for the gas pipe outlets would realise without exercise of inventive skill that an

improved agitation system could be devised by implementing the SUGM agitation system known from D12, a system known for its powerful mixing and easy maintenance. SUGM is also adaptable to any size or shape of digester (D12, paragraphs [0009], [0037] and [0039]). In this manner the "dead space" problem can be solved while the advantages of a moveable carrier arm (which makes it possible to expel bubbles at more locations in the container than could otherwise be reached if the gas pipes were static) are maintained. Evidently, the gas control means (7) of the present application, designed for sequentially expelling gas bubbles from the gas pipe outlets, correspond in function to the multiple port rotary valve for distributing the primary gas feed sequentially into a number of individual gas pipes, as disclosed in D12 (see in this context the description, page 9, last full paragraph). Different lengths of pipes allow to reach different locations in the digester vessel.

2.6.3 The appellant argued that D12 would not be taken into consideration because mounting multiple gas pipes onto the lightweight gas distribution arm of D2 inevitably increased the load, necessitated more powerful drive means to move the arm and brought unwanted increases in energy requirement.

This argument is not convincing, for the following reasons. D2 neither explicitly nor implicitly refers to the gas distribution arm (9) as being necessarily of a "lightweight" construction. On the contrary, in the embodiment shown in Figure 1 of D2, the entire mixing assembly (4) rests on a plurality of vertical supporting wheels (7) which bear the weight of the construction. This does not imply a particular lightweight construction.

It is correct that D2 states that the mixing device having a gas emitting mixer/scraper arm (9) requires "much less power" than conventional mixers/scrapers (column 5, lines 57 to 65). The board notes, however, that this advantage is only attributed to the embodiments of Figure 1 and 3. Therefore, the appellant's reference to the allegedly "lightweight" construction of the embodiment depicted in Figure 2 (the "gas lift drive means") is besides the point.

Further, there is evidence that the above-mentioned energy advantage is not due to an allegedly "lightweight" construction of the carrier arm. The gas emitted from the arm (9) clears the sludge away from the immediate vicinity of the scraper arm (9) with the result that only a small torque is required for its movement (D2, column 6, lines 1 to 13).

2.6.4 The appellant's main argument that D12 and D2 would not be combinable for clash in teachings is thus not borne out by the factual content of the respective documents.

2.6.5 The appellant also relied on an alternative argumentation which started from D12 assumed to be the closest and therefore most relevant prior art to assess the inventive step. However, the appellant's showing of non-obviousness vis-à-vis such art is irrelevant and inconclusive to validity in the absence of an assessment of inventive step in respect of the objectively closest state of the art. For the reasons given under point 2.3.2 above, D12 is not the most promising springboard, so that the appellant's arguments in this respect must be refuted.

2.6.6 Therefore, the subject-matter of claim 1 of the main request does not involve an inventive step (Article 56 EPC)

Auxiliary request

3. Inventive step

The independent claims of the main request differ from those of the auxiliary request in wording (by the characterising clause), but not in substance.

The board considers the phrase

"*gas control means (7) for expelling gas bubbles into the container through each gas pipe outlet in turn*"

as essentially describing the same technical feature as the corresponding phrase in claims 1 and 11 of the main request (reading

"*gas control means (7) for expelling gas bubbles from the gas pipe outlets sequentially rather than concurrently*").

The appellant declared during the oral proceedings that in essence the same arguments applied for the subject-matter claimed in both requests.

The board is of the opinion that the reasons presented for claim 1 of the main request (see point 2. above) apply *mutatis mutandis* to claim 1 of the auxiliary request.

Therefore, the subject-matter of claim 1 of the auxiliary request does not involve an inventive step

(Article 56 EPC).

3.1 In the absence of an allowable request, the appeal is dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz G. Raths

Decision electronically authenticated