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# Datasheet for the decision of 24 February 2026

**Case Number:** T 0548/24 - 3.3.08

**Application Number:** 18205490.8

**Publication Number:** 3483280

**IPC:** C12P19/04

**Language of the proceedings:** EN

**Title of invention:**
A fermentation method for producing gellan gum

**Patent Proprietor:**
Zhejiang Dsm Zhongken Biotechnology Co., Ltd
DSM IP Assets B.V.

**Opponent:**
Jungbunzlauer Austria AG

**Headword:**
Production of gellan gum/ZHEJIANG DSM ZHONGKEN BIOTECHNOLOGY CO. and DSM IP ASSETS

**Relevant legal provisions:**
EPC Art. 56

**Keyword:**
Claims as granted - Inventive step - (no)

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**

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**Case Number: T 0548/24 - 3.3.08**

# D E C I S I O N
# of Technical Board of Appeal 3.3.08
# of 24 February 2026

| | |
|---|---|
| **Appellant:** (Opponent) | Jungbunzlauer Austria AG<br>Opernring 1<br>1010 Wien (AT) |
| **Representative:** | Ellmeyer, Wolfgang and Rupp, Wolfgang.<br>P.O. Box 50<br>Mariahilfer Strasse 50<br>1070 Wien (AT) |
| **Respondent:** (Patent Proprietor 1) | Zhejiang Dsm Zhongken Biotechnology Co., Ltd<br>Economic Zone<br>Gaoqiao Town<br>Tongxiang<br>Zhejiang 314515 (CN) |
| **Respondent:** (Patent Proprietor 2) | DSM IP Assets B.V.<br>Wilhelminasingel 39<br>6221 BE Maastricht (NL) |
| **Representative:** | Longland, Emma and Hansen Marianne<br>Venner Shipley LLP<br>406 Science Park<br>Milton Road<br>Cambridge CB4 0WW (GB) |
| **Decision under appeal:** | **Decision of the Opposition Division of the European Patent Office posted on 12 February 2024 rejecting the opposition filed against European patent No. 3483280 pursuant to Article 101(2) EPC** |

**Composition of the Board:**

| | |
|---|---|
| **Chair** | T. Sommerfeld |
| **Members:** | M. Montrone |
| | A. Bacchin |

## Summary of Facts and Submissions

I. An opposition was filed against European patent No. 3 483 280 B1 ("the patent"), which was granted for European patent application No. 18 205 490.8. The patent was opposed on the ground for opposition under Article 100(a) EPC in conjunction with Article 56 EPC.

II. The present appeal has been filed by the opponent ("appellant") against the decision of an opposition division to reject the opposition.

III. In reply, the patent proprietors ("respondents") submitted counter arguments and requested that the appeal be dismissed and the patent be maintained as granted.

IV. Claim 1 as granted (sole request) reads:

"*1. A fermentation method of producing gellan gum comprising using an amount of 3%-50% of the total volume of fermentation broth of a gellan gum fermentation in a fermentor as a seed for a next batch gellan gum fermentation, wherein the fermentation broth comprises the gellan gum and strains that are capable of producing the gellan gum, and wherein the amount of fermentation broth is used as the seed without separation of the cells of the strains from the fermentation broth*".

V. Oral proceedings were held in the presence of both parties.

VI. The following documents are mentioned in this decision:

D2: English translation of an excerpt from the monograph "Industrielle Mikrobiologie", H.J. Rehm (ed.), Springer Verlag, 1967, 44-46 (D1)

D10: US 2006/0019354 A1

VII. The arguments of the parties relevant for the decision are dealt with in detail in the Reasons for the Decision.

VIII. The parties' requests relevant to the decision were the following:

The appellant (opponent) requested:
- that the decision under appeal be set aside and amended such that the patent be revoked.

The respondents (patent proprietors) requested:
- that the appeal be dismissed and the patent be maintained as granted.

## Reasons for the Decision

Claims as granted (sole request)

*Claim construction - claim 1*

1. Claim 1 relates to a method of gellan gum fermentation, i.e. of a polysaccharide produced by biotechnological means (for the full wording of claim 1, see section IV above).

1.1 Since the producer cell is not specified in claim 1, the method encompasses the use of any cell or

microorganism suitable for that purpose. The patent mentions in this respect that such strains "*include but are not limited*" to bacteria of the genus Sphingomonas (e.g. paragraph [0009]).

1.2 The claimed method is further specified in that a certain amount of broth of a first fermenter ("*3%-50% of the total volume of fermentation broth*") is used as "*seed*" (i.e. as inoculum) for "*a next batch gellan gum fermentation*". This seed contains the broth without separating therefrom the cells and the gellan gum produced. Although not indicated in claim 1, it is implicit that this seed also contains the "old" medium of the first fermentation, i.e. the claimed seed consists of the complete non-purified broth.

1.3 The claimed method comprises thus at least two separate fermentations in which a specified amount of non-purified broth (minimum: 3% of the total volume, maximum: 50% of the total volume) from a first fermentation culture is used as seed/inoculum for a second batch fermentation. The use of further fermentation processes is not excluded from claim 1 due to the use of the comprising language.

1.4 The first fermentation from which the seed is taken is not further specified in claim 1. Accordingly, claim 1 encompasses any type of fermentation suitable for gellan gum production, for example, batch or fed-batch fermentations. The second fermentation is specified as "*batch*".

1.5 In addition, claim 1 does not specify the time point during the first fermentation for taking a certain percentage of the broth as inoculum. Thus an inoculum can be taken at any time point during the first

fermentation, for example, during the exponential growth phase or later when the culture has entered the production phase.

1.6 It is uncontested that fermentations using as seed/ inoculum the broth of a first batch fermentation for starting a second batch fermentation are commonly referred to in the art as "*repeated batch*" or "*semi-batch*" fermentations (decision under appeal, Reasons 1.2 including documents referred to therein).

*Inventive step*

*Closest prior art and distinguishing features*

2. It is common ground that document D10 represents the closest prior art for the method of claim 1.

3. The board agrees with the conclusions of the opposition division that there is no direct and unambiguous disclosure in document D10 for the feature "*that 3-50% of a volume of fermentation broth, comprising cells, broth and gellan gum, is used to seed a further fermentation broth*" in claim 1 (decision under appeal, Reasons 1.2.8).

4. The appellant disagreed and submitted that document D10 implicitly discloses a semi-batch method for producing gellan-gum without separating cells from the broth and the gellan gum. In support of their case a passage in paragraph [0061] of document D10 was referred to, which reads as follows: "*In another aspect of the present invention, fermentation may be carried out in a semi-batch process where bacteria from one fermentation are used as an inoculum for a subsequent fermentation. In this aspect, for example, Sphingomonas that have been*

*separated from the exopolysaccharide which they produced may be added to a fresh fermentation broth, or a fresh fermentation broth may be added to the remaining Sphingomonas. Hence, this aspect of the invention precludes the need to provide a separate seed culture*" (emphasis added by the board).

4.1 As indicated above (point 1.6), it belongs to the common general knowledge that a "*semi-batch process*" indicated in the first sentence of paragraph [0061] of D10 relates to a fermentation process wherein a broth sample of a first batch fermenter is used for inoculating a subsequent batch fermenter. However D10 mentions in the first sentence of the passage indicated above the term "*bacteria*" and not broth, which implies a separation of the bacteria from the broth before their use as inoculum. The use of bacteria in D10 instead of the complete broth for inoculating the second fermenter is supported by the second sentence of the passage of paragraph [0061] too which mentions that Sphingomonas is separated from the exopolysaccharide which they produce.

4.2 The appellant submitted that the term "*for example*" at the beginning of the second sentence in the passage of paragraph [0061] of D10 (point 4 above) indicated that the separation of Sphingomonas was not a "*compelling feature of the semi-batch process*". The board agrees with the appellant that the term "*for example*" indicates to the skilled person that other options exist. While the sole explicit option reported in the second sentence of this passage in paragraph [0061] is, however, the use of Sphingomonas that has been separated from the exopolysaccharide and Sphingomonas to be used for fermentations is stated to be the preferred bacterium in document D10, other bacterial

host cells are likewise reported (paragraph [0054]). It might thus be that the other fermentation options refer to these other bacteria.

4.3 The appellant submitted further that the skilled person would have ignored the separation step mentioned in the passage of paragraph [0061] of D10 indicated above because it was known that those cells died by being separated from the medium and were thus no longer suitable as a seed for the subsequent fermentation process. Evidence of this assertion has not been provided by the appellant and remains thus an unproven speculation.

4.4 Irrespective thereof, the separation of Sphingomonas from its exopolysaccharide is also in line with the term "*bacteria*" used in the first sentence of paragraph [0061] of D10 (point 4 above). Also the mentioning of separated Sphingomonas implies - when taking the whole disclosure of document D10 into account (paragraphs [0024] and [0062]) - that such a separation has been carried out by a centrifugation step which leaves the exopolysaccharides in the supernatant while the bacteria are pelleted. The board agrees in this context with the opposition division's finding (decision under appeal, Reasons 1.2.5).

4.5 Sphingomonas produces various exopolysaccharides including *inter alia* gellan gum in slime form (D10, e.g. paragraphs [0005], [0014], [0028] and claims 20 and 22). These exopolysaccharides in slime form can be "*substantially separated from bacterial cells by, for example, centrifugation of the fermentation broth*" or by "*aqueous dilution of the broth*" (D10, paragraph [0024]). This seems to involve an additional alcoholic

precipitation step prior to centrifugation (D10, paragraph [0062]).

4.6 In view of these considerations, the board is not convinced that document D10 implicitly discloses the use of an untreated Sphingomonas cell broth as inoculum for the second fermentation.

5. In agreement with the opposition division (decision under appeal, Reasons 1.2.6 and 1.2.8), the method of claim 1 differs thus from that of document D10 in that 3-50% of a total volume of broth comprising cells, old medium and gellan gum of a first fermentation is used as seed/inoculum for a second batch fermentation instead of using Sphingomonas cells alone.

*Technical effects and objective technical problem*

6. The technical effects ascribable to this difference are contentious between the parties. While the appellant in agreement with the opposition division (decision under appeal, Reasons 1.3) merely acknowledges a reduction of process steps leading to a simplified method, the respondents advanced more advantageous effects, such as a reduced risk of contamination, a shortening of the production cycle time and a production yield that is comparable to that of a batch fermentation if not increased (particular reference was made to paragraph [0021] of the patent).

7. The method of document D10 as disclosed in paragraph [0061] uses at least one process step more than the claimed method, i.e. an additional centrifugation step (point 4.4 above). Claim 1 is thus directed to a process that requires at least one process step less.

7.1 The board is however not persuaded by the respondents' submission that more beneficial effects can be ascribed to this difference. It is noted that comparative experimental data between the claimed fermentation method and that of document D10 are not on file.

7.2 The respondents submitted that those comparative examples were difficult to provide, in particular due to the lack of strains, and culture conditions and guidance provided for example in paragraphs [0060] and [0061] of D10 which seemed agreeable between both parties.

The board does not agree. It is an established principle in *inter partes* proceedings that each of the parties to the proceedings carries the burden of proof for the facts they allege. In the specific case of establishing that the claimed invention is associated with a technical effect, it is incumbent upon the patent proprietor (here respondents) to prove that the claimed subject-matter leads to the advantageous effects mentioned in the patent. Comparative examples represent one way to demonstrate such an effect, especially in cases where the patent specification is silent on the alleged effect(s). In the absence of facts, however, a pure statement as in paragraph [0021] of the patent is not convincing, since the statement as such is not sufficient evidence that various additional effects of the claimed method exist when compared to the method of D10, at least not over the whole scope claimed.

7.3 Moreover as regards the asserted shortening of the production cycle, the claimed method as well as that of D10 save the extra time needed for providing a separate seed culture since the inoculum is taken from the

previous fermentation (point 1.3 above and third sentence of the passage of paragraph [0061] of D10, point 4 above).

7.4 Further as regards the asserted "reduced" contamination risk, paragraph [0012] of the patent reports that a certain amount of seed can be taken from the first fermenter and transferred to a second fermenter. Although such a transfer might occur within the fermenter system, as argued by the respondents, thereby minimising a contamination risk, claim 1 is not limited thereto. Accordingly the claimed process comprises a transfer of inoculum from a first to a second fermenter for which necessarily a certain contamination risk exists.

8. The respondents argued further that the patent disclosed in paragraph [0032] that the production yield of cells grown in semi-batch fermentation was comparable if not higher to that of cells grown in batch fermentation. In view thereof they submitted that the problem to be solved resided rather in the provision of an improved process for the production of gellan gum.

9. The board does not agree. Example 1 of the patent discloses the cultivation of a particular strain of Sphingomonas under particular conditions. The method of claim 1 is not limited thereto. Moreover, as submitted by the respondents themselves, the results shown in paragraph [0032] of the patent may be interpreted as a comparable yield to batch fermentations only which does not amount to a technical effect that can be taken into account for the formulation of the technical problem.

10. In view of these considerations, the board in agreement with the opposition division (decision under appeal, Reasons 1.3) concludes that the technical problem to be solved resides in the provision of a simplified fermentation method of producing gellan gum.

11. In view of the working examples disclosed in the patent, the board is satisfied that the claimed method solves this technical problem.

*Obviousness*

12. The remaining question to be assessed is thus whether the skilled person starting from the method of document D10 and facing the technical problem defined above would have modified the method to arrive at the claimed method in an obvious manner.

13. As set out in point 4 above, paragraph [0061] of D10 already suggests the use of a semi-batch fermentation for the production of exopolysaccharides, which includes gellan gum (e.g. paragraph [0005]). It is uncontested that a standard semi-batch fermentation uses the complete non-purified broth of the first fermentation as inoculum (point 1.6 above) and it is common general knowledge that a semi-batch fermentation may use about 25% of the broth as inoculum for the subsequent fermentation (document D2, page 1 last paragraph to page 2, first paragraph). Accordingly, the skilled person by following the teaching of document D10 in light of its common general knowledge would have arrived at the method of claim 1 without applying any inventive skill.

14. The respondents submitted that gellan gum was not the preferred exopolysaccharide disclosed in D10 but only

one of a long list. The board does not agree: paragraph [0005] of D10 discloses that gellan gum is one of three "*sphingans*" that is commercially produced by Sphingomonas in large-scale submerged fermentations and paragraph [0054] of D10 discloses that "*Sphingomonas*" is the most preferred host strain to be used for this purpose. Accordingly, Sphingomonas is indicated in D10 as being preferred for the purpose of producing *inter alia* gellan gum commercially in large scales.

15. Furthermore, the second sentence of paragraph [0061] of D10 indicated in point 4 above starts with *"In this aspect*" which indicates that this sentence refers to the first sentence starting with "*In another aspect*" and hence to the use of a semi-batch fermentation for the production of an exopolysaccharide including gellan gum. This second sentence of paragraph [0061] of D10 further uses the term "*for example*" in the context of Sphingomonas which has "*been separated from the exopolysaccharide which they produced*". As set out above (point 4.2), the expression "*for example*" indicates to the skilled person that several options exist. This includes, in the absence of a teaching to the contrary, the use of Sphingomonas without a prior separation from its exopolysaccharide.

16. The respondents argued that the skilled person did not consider a semi-batch fermentation suitable for Sphingomonas producing gellan gum, for several reasons. Firstly, a semi-batch process was mentioned in D10 solely once in paragraph [0061], while D10's main teaching dealt with batch fermentations and the generation of mutated strains to increase the yield of exopolysaccharides. Secondly, the working examples (in particular Example 3) of D10 only disclosed the fermentation of Sphingomonas producing gellan gum in

capsule form which prevented the access of oxygen and nutrients to the bacteria if used as inoculum for a second batch fermentation. Thirdly, the strains used in Example 3 were derived from a parent strain that was indicated as being "*hard to cultivate*" (paragraph [0072]). These difficulties in culturing the strains deterred the skilled person from using them as inoculum for a further fermentation. Fourthly, cells taken as inoculum at the end of fermentation were generally stressed and it was unknown if they were able to propagate again if used as inoculum for a second fermentation. Fifthly, since gellan gum was a food product and bacteria producing this product mutated during the fermentation, the skilled person always used a fresh strain as seed culture for initiating a new fermentation. Sixthly, paragraph [0061] of D10 explicitly taught to separate the cells from their exopolysaccharide, a teaching the skilled person would not ignore.

17. The board does not agree.

17.1 While it is true that a semi-batch fermentation is mentioned only once in paragraph [0061] of D10 without providing technical details for putting this type of fermentation into practise, it is uncontested that a semi-batch fermentation is commonly known and applied by the skilled person parallel to batch and fed-batch fermentations (e.g. document D2, pages 1 and 2). Therefore, the disclosure in paragraph [0061] can not be regarded as an isolated teaching that is unrelated to the batch fermentations mentioned in D10.

17.2 Further and contrary to the submissions made by the respondents, the working examples in D10 do not teach the use of Sphingomonas strains producing gellan gum

capsules only. Example 3 of D10 mentions explicitly strain "*α016*", which according to paragraph [0079] and the table mentioned therein, produces gellan gum as "*white slime*", i.e. not in capsules that envelop the bacteria. The sole capsule producing strain used in Example 3 of D10 is "*strain ATCC31464, parent of X287*" which was used as "*a capsule forming gellan wild type strain*". The respondents have not argued that the slime producing forms of Sphingomonas faced problems with an appropriate access to oxygen and nutrient if cultivated under fermentation conditions. Irrespective thereof, this would also not be credible since at the inoculation phase of a fermenter in a semi-batch fermentation the bacteria are four-fold diluted (point 13 above) by the addition of fresh medium so that no viscosity issues arise that may restrict the cells' access to oxygen and nutrients.

17.3 Further while paragraph [0072] of D10 indeed indicates that strain X996 is hard to cultivate, Example 3 disclosing the gellan gum slime producing strain "*α016*" (being a descendent of X996) is silent on any cultivation problems. Accordingly the skilled person would not be deterred from using this strain as inoculant in a further fermentation.

17.4 As regards the asserted use of a bacterial inoculum taken at the end of a previous fermentation, i.e. at a stage where the cells were stressed, the following is relevant. Document D2 (supra), representing the skilled person's common general knowledge, mentions, that "*A series of such vessels for continuous multi-stage fermentation can also be carried out semi-continuously. For this purpose, for example, a discontinuous fermentation is allowed to start in the first vessel and, in the exponential growth phase, about 1/4 of the*

*substrate is added as inoculant solution to a new vessel that had already been filled to 3/4 with fresh nutrient solution*" (emphasis added). Thus actively propagating cells are used as inoculum in a semi-batch fermentation and not cells at the end of the fermentation when they are in the production phase. Irrespective thereof, in view of the explicit teaching in paragraph [0061] of D10 to cultivate cells in a semi-batch fermentation as an alternative to the previously mentioned batch fermentations (paragraph [0060] of D10), the board is convinced that the skilled person in the absence of an explicit teaching not to use a semi-batch fermentation would have taken paragraph [0061]'s teaching at face value. Nor is for the reasons set out above (point 1.5), the time point defined in claim 1 for taking the inoculum. It can thus be taken at any time point during fermentation, including the phase when the cells grow exponentially.

17.5 As regards the issue that cells develop mutations during the first fermentation, D10 is silent on any high mutation rate of the Sphingomonas strains used. In the absence of such a teaching, or of any other evidence in this regard, the respondents' submission remains speculative only.

17.6 As regards a mandatory separation step, although paragraph [0061] of D10 mentions explicitly the use of Sphingomonas being separated from the exopolysaccharide produced, this disclosure is indicated as "*for example*" only. Thus such a separation is exemplary and due to the considerations set out above, technical reasons are not on file making such a separation mandatory. Moreover, since the use of a complete broth as inoculum of a semi-batch fermentation is commonly used - i.e. the standard applied (point 1.6 above), the skilled

person taking common general knowledge into account would have used as alternative inoculum, the complete broth as well.

18. The opposition division held (decision under appeal, point 1.4.2) that based on paragraph [0003] of the patent and paragraph [0006] of D10 the skilled person had a prejudice in using a semi-batch fermentation for producing gellan gum.

18.1 The board does not agree. There is no documentary evidence on file for this finding of the opposition division. On the contrary, document D10 explicitly suggests the use of a semi-batch fermentation for Sphingomonas for producing exopolysaccharides, which includes gellan gum (point 10 above). Furthermore document D10 suggests that a transfer of a highly viscous inoculum into a new fermenter is not mandatory since a "*fresh fermentation broth may be added to the remaining Sphingomonas*" (point 4 above). Although this statement in paragraph [0061] of document D10 refers to separated Sphingomonas, the same holds true for cells that have not been separated from an exopolysaccharide.

18.2 Paragraph [0006] of D10 is silent on prejudices too. This paragraph reports only that "*conditions that allow for higher fermentation yields of exopolysaccharides also result in increased broth viscosity, which thickening ultimately requires higher energy input to effectively disperse oxygen and nutrients to allow sufficient bacterial growth in the fermentation broth*" (emphasis added). In other words, a higher viscosity caused by increased amounts of exopolysaccharides (e.g. gellan gum) in a fermenter requires more energy for supplying cells with oxygen and nutrients. This higher need for energy represents,

however, no prejudice for the skilled person in using a semi-batch fermentation since (1) a higher energy input solves the problem of viscosity and (2) the viscosity issue affects all types of fermentations equally including batch fermentations.

18.3 In addition the board agrees with the appellant that while the production of gellan gum may cause a high viscosity at the end of fermentation, potential viscosity issues play no or a minor role only at the inoculation phase, i.e. at the beginning of a fermentation. This is so because the inoculum gets highly diluted with fresh medium at this stage (point 13 above). As regards semi-batch fermentations, document D2 (page 2, first paragraph), representing the skilled person's common general knowledge, discloses a use of 25% ("*1/4*") of the broth as inoculum, i.e. a four-fold dilution.

18.4 Further, paragraph [0003] of the patent simply states that "*Gellan gum is mainly produced through batch fermentation*" (emphasis added). The term "*mainly*" implies that gellan gum is not exclusively produced by batch fermentations but that other types of fermentations are used as well.

18.5 In particular, semi-batch fermentations differ from batch fermentations in essence only by the type of sample used as inoculum, i.e. the use of separate seed cultures (batch) versus cells obtained from the previous fermentation (semi-batch) (D10, paragraphs [0060] and [0061], and point 4 above).

19. Since the method of claim 1 lacks an inventive step over the teaching of document D10 taking common general knowledge into account, Article 100(a) EPC in

conjunction with Article 56 EPC prejudices the maintenance of the claims as granted (sole request).

## Order

## For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chair:

C. Rodríguez Rodríguez T. Sommerfeld

Decision electronically authenticated