

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To: see form PCT/ISA/220

Date of mailing (day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference see form PCT/ISA/220	FOR FURTHER ACTION See paragraph 2 below
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International application No. PCT/US2019/062106	International filing date (day/month/year) 19.11.2019	Priority date (day/month/year) 27.11.2018
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International Patent Classification (IPC) or both national classification and IPC INV. B01J47/022 B01J49/60 B01J49/06 B01J49/05
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Applicant SPECIALTY ELECTRONIC MATERIALS NETHERLANDS BV
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1. This opinion contains indications relating to the following items:


- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016	Date of completion of this opinion see form PCT/ISA/210	Authorized Officer Kaluza, Nicoleta Telephone No. +31 70 340-0
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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	<u>1-7</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-7</u>
Industrial applicability (IA)	Yes: Claims	<u>1-7</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1 Reference is made to the following documents:
- D1 EP 0 497 632 A1 (PERMUTIT CO LTD [GB]) 5 August 1992 (1992-08-05)
- D2 EP 0 551 002 A1 (ROHM & HAAS [US]) 14 July 1993 (1993-07-14)
- D3 Anonymous: "Product Data Sheet AMBERLITE(TM) 14i Inert Resin Polypropylene, Inert Resin for Industrial Demineralization Applications", 1 May 2018 (2018-05-01), pages 1-3, XP055670919, Retrieved from the Internet: URL:https://www.lenntech.com/Data-sheets/DOW-177-03819-14i-L.pdf [retrieved on 2020-02-21]
- D4 RO 121 020 B1 (DOW DEUTSCHLAND INC [DE]; OBSESTVO S OGRANICENNOJ OTVETS [RU]) 30 November 2006 (2006-11-30)
- D5 Anonymous: "Product Data Sheet AMBERLITE(TM) 62i Inert Resin Polyethylene, Inert Resin for Industrial Demineralization Applications", 1 May 2018 (2018-05-01), pages 1-3, XP055670920, Retrieved from the Internet:URL:https://www.lenntech.com/Data-sheets/DOW-177-03820-62i-L.pdf [retrieved on 2020-02-21]
- D6 US 4 269 715 A (BARRAQUE CHRISTIAN ET AL) 26 May 1981 (1981-05-26)
- 2 Furthermore, the mentioned lack of clarity notwithstanding (see **Item VIII** below), the subject-matter of claims 1-7 is either not new in the sense of Article 33(2) PCT or it does not involve an inventive step in the sense of Article 33(3) PCT, and the criteria of Article 33(1) PCT are therefore not met.
- 2.1 Document D1 an apparatus for ion exchange comprising vessels arranged in series, each vessel containing an ion exchange material (D1, page 3, lines 37-43), In order to prevent blockage of the inlet and outlet valves at the top of the vessels, large beads of resin, typically of diameter 1 to 1.5 mm and with a density be low $1 \times 10^3 \text{ kg/m}^3$, generally around 0.85 kg/m^3 are placed at the top of the vessels, above the ion exchange resin bed or the bottom of each vessel. These larger beads may be either the same ion exchange resin or inert resin

beads. The inert resin beads help to distribute the flow before the water meets active resin in the vessel, thereby making the best use of the active resin (D1, page 3, lines 44-51).

The diameter of inert resin particles is considered as an average diameter equivalent to the harmonic mean diameter of claim 1.

The configuration of the apparatus disclosed in D1 is shown in Fig. 1 and the layer of inert resin is denoted 10 and it can be seen that it is positioned at the end portions of the vessel and it will occupy between 25% to 95% of the total volume of the end portion of the respective vessels (D1, Fig. 1, page 4, line 29 - page 5, line 37).

Although a distributor plate separating the bed from an end portion of the tank is not explicitly disclosed, this feature is considered a slight constructional change in an ion exchange apparatus and it belongs within the scope of the customary practice followed by persons skilled in the art without involving any inventive skills. Consequently, this feature cannot confer inventiveness to the subject-matter of claim 1. In the view of D1, the subject-matter of claim 1 is considered not inventive (Article 33(3) PCT).

It is also considered that D1 also discloses the features of dependent claims 6 and 7 which cannot be considered inventive (Article 33(3) PCT).

2.2 Document D2 discloses an ion exchange resin column which comprises an inlet for fluid to be treated in the loading cycle of the ion exchange process, an outlet for fluid treated in loading cycle of the ion exchange process, a section for ion exchange resin, and a section for inert, particulate filter material, said section for inert, particulate filter material being located between said section for ion exchange resin and said inlet such that said section for inert, particulate filter material is closer to said inlet than any section for ion exchange resin (D2, claim 1). Retaining means being in the form of a plate having a plurality of orifices or nozzles therein may be located at different positions inside the column (D2, claims 2,3).

D2 discloses that the volume of the inert particulate filter material is less than the volume of the section within which it is located, which will mean that it will occupy less than 100 % of the volume (D2, claim 6). The inert, particulate filter material is a high density polyethylene, polypropylene, polystyrene or polyamide (D2, claim 7) with a particle size of from about 0.5 mm to 1.7 mm (D2, claim 10) preferably, but it may be between 0.1 mm to 5 mm (D2, page 5, lines 21-33). the bed of the inert material has a depth (height) of from about 10 cm to about

50 cm (D2, claim 11). Since similar values of the inert filling height are recited in the present application, on page 4, lines 12-15, it is interpreted that these depth or height values will correspond to a volume of 25 to 95 % of the portion containing the inert medium in rapport with the total volume of the end portion.

D2 explicitly discloses that by particle size is meant the diameter of the particles in the case of spherical particles and the minimum and maximum diameters in case of non-spherical particles (D2, page 5, lines 28-29). For spherical particles the average sphericity and the average roundness is considered 1.

D2 explicitly discloses the use of different inert materials in Table 1 with a density of 0.94-0.96 g/ml for PE, 0.91-0.96 g/ml for PP and 0.95-0.08 g/ml for Amberlite RF-14. (D2, Table 1).

In the view of D2, the subject-matter of claims 1-7 is not new (Article 33(2) PCT).

- 2.3 The inert resin Amberlite 14i is based on polypropylene and it is a floating, non-functionalized, transparent, cylindrical-shaped specifically designed for use as an upper layer in a down-flow regenerated ion-exchange systems, such as floating beds. This inert resin has a specific gravity lower than water, which ensures it will stay above the ion exchange resin bed, The inert forms a protective layer to prevent plugging of the distribution nozzles during the compaction/bed-lift step in case fines are present in the resin bed. The particle size is in diameter 1.2-1.5 mm and length 1.3-1.7 mm which fall under the diameter of claim 1. The particle density is 0.95 g/ml (D3, page 1)

If other dimensions of the inert resin particles will be required, the person skilled in the art will know how to adapt the dimensions within the limits of the scope of the customary practice followed by persons skilled in the art without involving any inventive skills. Consequently, this feature cannot confer inventiveness to the subject-matter of claim 1.

In the view of D3, the subject-matter of claims 1-7 is not inventive (Article 33(3) PCT).

- 2.4 Document D4 discloses a regeneration method of a ion exchange bed positioned in a vessel in a pulsed mode (D3, claims 1-3). The ion exchange resin may be a cation exchange resin type DOWEX UPCORE MONO C-600 and the inert resin is type DOWEX IF-62. The capacity of vessel is 0.5 m³, the volume occupied by the ion exchange resin is 0,45 m³ and that occupied by the inert resin is 0.02 m³. Starting from these volumes, it may be considered that the volume occupied by the inert resin is between 25% and 95% of the total

volume of the end portion (D4, page 4, lines 45-48). The inert resin is positioned above the ion exchange resin and the vessel contains upper and lower distribution devices denoted as 1 and 5 in Figures 1-4 (D4, page 4, lines 1-24).

- 2.5 It is well known from D5 that the inert resin Dowex IF-62 is a floating, non-functionalized, transparent, amorphous shaped resin made of polyethylene. It is specifically designed for use as an upper layer in up-flow regenerated ion exchange systems, such as UPCORE Packed Bed Systems. This inert resin has a specific gravity lower than water, which ensures it will stay above the ion exchange resin bed. The particle diameter is between 2.5 and 4 mm. The particle density is 0.95 g/ml (D5, page 1). The bed depth may be given by the producer in the technical sheets (D5, page 2).

Since, in the present application the same inert resin is employed, namely DOWEX UPCORE IF-62 also named AMBERLITE 62i, it is considered that the inert resin from D3 and D4 will present the same values concerning average sphericity, average roundness harmonic mean diameter.

In the view of D4 and D5, the subject-matter of claims 1-7 is not new (Article 33(2) PCT).

- 2.6 Document D6 discloses an apparatus for treating fluids having solid particles suspended therein, said apparatus comprising: a treatment column having an interior including a treatment zone completely filled with a bed of granular treatment material (D6, claim 10). The treatment column comprises a cylindrical container having closed upper and lower ends, a support member within said container adjacent said lower end thereof for supporting said bed of treatment material, an upper member within said container adjacent said upper end thereof, and openings extending through said support member and said upper member (D6, claim 11). A layer of granular inert material within said interior of said cylindrical container is at a position directly above said upper portion of said bed of treatment material and directly below said upper member, said inert material having a specific gravity less than 1, said layer of inert material comprising means for preventing particles of said bed of treatment material from clogging said openings in said upper member (D6, claim 12).

The inert material preferably has a specific gravity of less than one and may be formed of a plastic material, for example polypropylene, with a granule size of approximately 2 mm. This inert granular material floats and prevents any direct contact between the fine particles of the granular treatment material and the distributing openings or holes in the upper member. Thus, the layer of granular

inert material prevents clogging or plugging of such holes. Generally, the layer of granular inert material may be approximately 10 to 15 cm thick to obtain the desired effect (D6, column 6, lines 20-35, Fig. 1).

Although the dimension of inert material in D6 falls outside of the range claimed in present claim 1, but it is inside of the dimension range described in the present application, it is considered that the person skilled in the art will know to adapt the dimensions of the inert material according with the configuration of the treatment column, i.e. the dimensions of the columns, the particle size of the ion exchange resin used as treatment material. This will not require any inventive skills, but it is considered within the common practice in the field of ion exchange systems.

- 2.7 In the view of D6, the subject-matter of claims 1-7 is not inventive (Article 33(3) PCT).

Re Item VIII

Certain observations on the international application

- 3 Claims 1-7 do not comply with clarity according to Art. 6 PCT.
- 3.1 While independent claim 1 is directed to a fluid treatment apparatus, the dependent claims 2-7 are all directed back to "*The method of claim 1*". Since no method is claimed in claim 1 or even method steps, it is not clear in which category the embodiments recited in the dependent claims 2-7 belong.
- 3.2 According to the requirements of Rule 10.2 PCT, the terminology and the signs shall be consistent throughout the application. This requirement is not met in view of the use of the expressions "end portion of the tank", "total volume of the end portion", "volume of the end portion", "volume of the lower end portion" for the same feature, i.e. where it is positioned the inert medium in the tank and how much volume occupies (see claims 1,3,7 and description, page 2, lines 22-29).
- 3.3 The subject-matter described on page 3, lines 9-11 concerning the harmonic mean diameter of the amorphous particles does not fall entirely within the scope of the claims. In this passage, it is stated that "*the amorphous particles have a harmonic mean diameter no greater than 150 mm, preferably no greater than 100 mm, preferably no greater than 50 mm, preferably no greater than 25 mm, preferably no greater than 10 mm, preferably no greater than 6 mm*", while in claim 1 is stated that "*at least one inert medium comprising amorphous particles*

having a harmonic mean diameter from 2.5 to 250 mm". This inconsistency between the claims and the description leads to doubt concerning the matter for which protection is sought, thereby rendering the claims unclear (Article 6 PCT).

- 3.4 Since the dimensions and the shape of the inert particles are not clearly defined, it is also not possible to accurately assess the meaning of "average sphericity" and "average roundness" (Article 6 PCT).
- 3.5 The vague and imprecise statement in the description on page 5, line 1 implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them.