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- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

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(54) Title: COMPACT REACTOR WITH FINNED PANELS

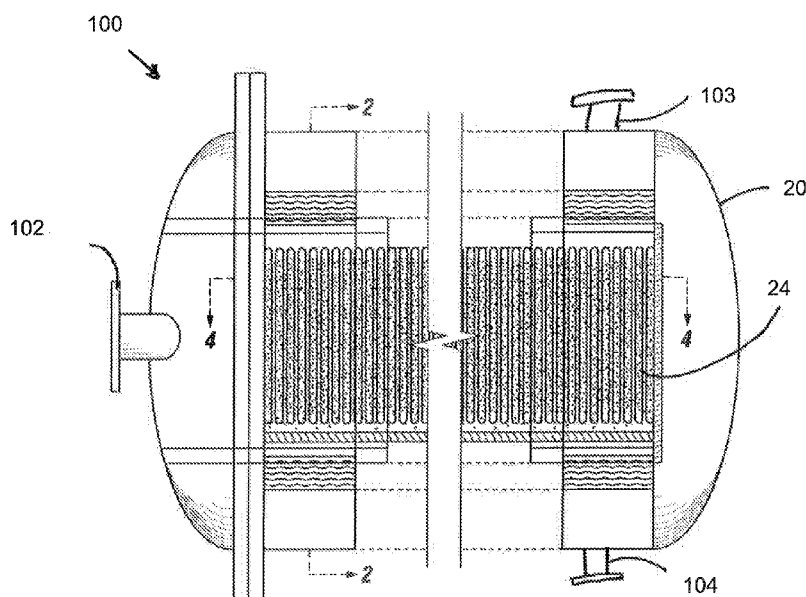


FIG. 1

(57) Abstract: Herein disclosed is a reactor comprising: a multiplicity of elements wherein each element comprises at least two folded fins and at least two spacers, wherein the at least two folded fins and spacers are attached to each other and form a flow passage for a heat transfer medium; a containment structure configured to contain the multiplicity of elements, wherein space formed between the elements and the containment structure is configured to contain a granular catalyst placed in proximity to the elements and configured to allow passage of a process fluid; and a structure placed at the bottom of the multiplicity of elements configured to support the granular catalyst. Also disclosed herein is a method of carrying out a reaction.



INTERNATIONAL SEARCH REPORT

0147023000 25-10-2014
International application No.

PCT/US 14/29886

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01J 38/10; C07C 27/00 (2014.01)

CPC - B01J 12/007, 2219/00081

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B01J 38/10; C07C 27/00 (2014.01)

CPC: B01J 12/007, 2219/00081

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 518/700, 715

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST (USPT,PGPB,JPAB,EPAB); Google

Search Terms: Fischer-tropsch reactor catalyst exothermic heat fins spacer copper aluminum brass element catalyst support porous heat transfer fluid medium water hydrocarbon shell container vessel pressure granular powder channel plenum process fluid synga

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	WO 2013/008029 A1 (Banister) 17 Jan 2013 (17.01.2013), entire document especially abstract, page 12, ln 10-25, page 11, line 25 to page 12, ln 10 and page 12, ln 15-30, page 13, ln 15-30; fig. 1a and 2a	16-20, 22-26 and 36-42 ----- 1-15, 21 and 27-35
Y	US 2010/0126727 A1 (Vinegar et al.) 27 May 2010 (27.05.2010), entire document especially abstract, para [2764]; fig. 497	1-15 and 27-35
Y	US 2010/0160463 A1 (Wang et al.) 24 June 2010 (24.06.2010), entire document especially abstract, para [0078]	6 and 21

 Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

24 September 2014 (24.09.2014)

Date of mailing of the international search report

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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
----- See Extra Sheet -----

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Box III: Observations where unity of invention is lacking:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-15 and 27-35: directed to a reactor and method of carrying out a reaction

Group II: claims 16-26 and 36-42: directed to a reactor and method of carrying out a reaction

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I includes the special technical features of at least two folded fins and spacers, wherein the at least two folded fins and spacers are attached to each other; and a containment structure configured to contain the multiplicity of elements, wherein space formed between the elements and the containment structure is configured to contain a catalyst.

Group II includes the special technical features of wherein each element comprises a lower inlet channel, an upper outlet channel, and a channel made from folded fin comprising folds, wherein the lower inlet channel, upper outlet channel and one side of the folds are connected to form a flow passage for a heat transfer medium and the other side of the folds are configured to contain a catalyst and to allow passage of a process fluid.

Groups I-II share the technical features of a reactor comprising a multiplicity of elements wherein each element comprises a folded fin, a flow passage for a heat transfer medium, a catalyst, passage of a process fluid and a structure placed at the bottom of the multiplicity of elements configured to support the catalyst.

However, these shared technical features do not represent a contribution over the prior art of WO 2013/008029 A1 (Banister) (17 Jan 2013), which discloses a reactor comprising a multiplicity of elements wherein each element comprises a folded fin (page 12, ln 10-25; fig. 1a and 2a, elements 90 with heat transfer tube 105 having finned structure that is folded), a flow passage for a heat transfer medium (page 11, line 25 to page 12, ln 10; fig. 1a, heat transfer tubes 78 which are fed water), a catalyst (page 12, ln 5-10), passage of a process fluid (page 12, ln 20-30) and a structure placed at the bottom of the multiplicity of elements configured to support the catalyst (page 11, ln 10-20 and page 12, ln 7-10, porous catalyst support).

As the above reactor was known, as evidenced by the teaching of Banister, this cannot be considered a special technical feature that would otherwise unify the groups.

Groups I-II therefore lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.