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- with international search report (Art. 21(3))
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(54) Title: FEED DIFFUSER

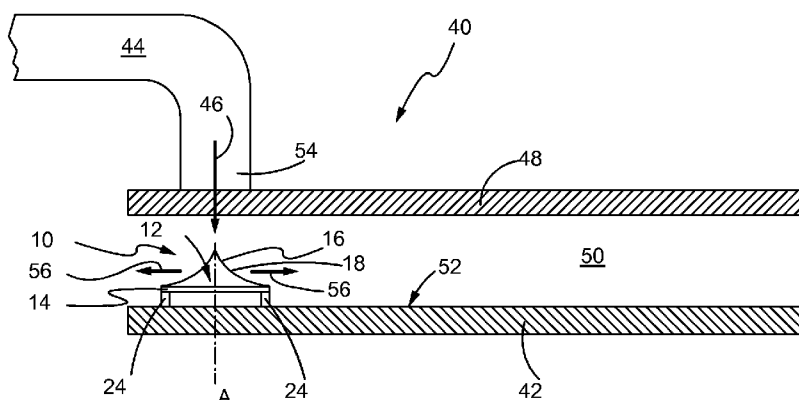


FIG. 3

(57) Abstract: A feed diffuser is disclosed. The diffuser may comprise a base disposed orthogonal to a flow, a body extending from the base toward the flow, and an apex provided at a termination of the body in a direction toward the flow. The body may decrease in cross-sectional area from the base to the apex.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 13/68731

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:
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 1-10, directed to a feed diffuser.

Group II: Claims 11-15 directed to a system for providing flow to a liner.

Group III: Claims 16-20 directed to a combustor.

---Continued on Supplemental Page---

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.:
1-10

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 13/68731

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F03B 1/04 (2014.01)

CPC - F04D 29/441

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)

CPC: F04D 29/441

USPC: 415/207

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC: 415/211.2; 60/800, 804, 751, 752

IPC(8): F03B 3/16; F03D 1/04, 3/04; F02C7/20, 1/00; F02G 3/00 (keyword limited; terms below)

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

PatBase; Google Patents; Google

Search Terms Used: conical, cone, diffuser, diffusor, splitter, gas, turbine%, aperture%, hole%, opening%, port%, channel%, effusion, liner

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0257869 A1 (CORNELIUS et al) 14 October 2010 (14.10.2010) fig 2, para [0033]-[0034]	1-3
Y		4-10
Y	US 6,334,297 B1 (DAILEY et al) 01 January 2002 (01.01.2002) fig 2, col 5, ln 18-21	4-6
Y	US 2004/0011043 A1 (PIDCOCK et al) 22 January 2004 (22.01.2004) fig 2	7
Y	US 2007/0227150 A1 (ALKABIE et al) 04 October 2007 (04.10.2007) fig 22	8-10

☐ 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

25 August 2014 (25.08.2014)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 13/68731

Continuation of Box III: Observations where unity of invention is lacking

The inventions listed as Groups I-III 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 contains the special technical features of a base disposed orthogonal to a flow; a body extending from the base toward the flow; and an apex provided at a termination of the body in a direction toward the flow, not required by Groups II and III.

Group II contains the special technical feature of a coolant supply source configured to provide a flow in an orthogonal direction onto the liner, not required by Groups I and III.

Group III contains the special technical feature of a shell having impingement holes.

Groups I-III share the common technical feature of a diffuser, which is known in the prior art, as shown by US 2010/0257869 A1 to Cornelius, et al. (hereinafter Cornelius), which teaches a diffuser (32, fig 2, para [0032]).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

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