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[Continued on next page]

(54) Title: REMOVAL DEVICE FOR DIRT PARTICLES AND/OR GAS BUBBLES

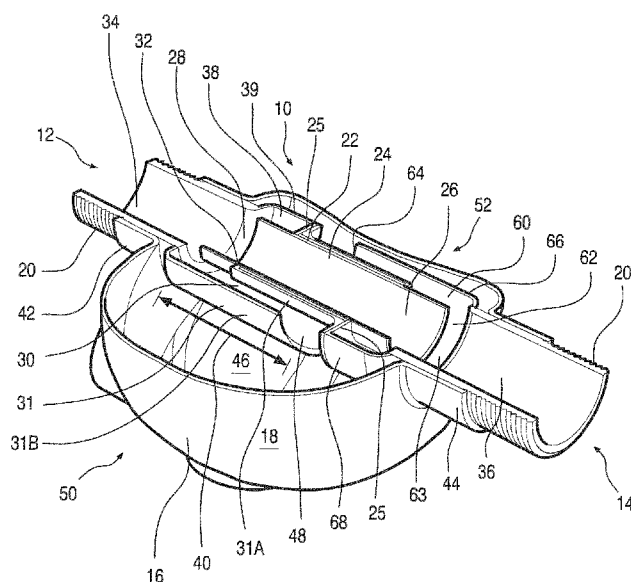


FIG.2

(57) Abstract: The present invention relates to a removal device for removing dirt particles and/or gas bubbles from a liquid in a liquid conduit system, the removal device comprising: -a housing having an entry and an exit, the housing defining an inner space within the housing, -a main inner channel constructed to guide a main flow through the inner space from the entry to the exit, -at least one branch flow channel, which branches off from the main inner channel at a branch location, the branch flow channel being configured to - in use - branch off a relatively small portion from a main flow, -at least one quiet zone in the inner space, wherein in use the at least one branch flow channel discharges into the at least one quiet zone, wherein the dimensions of the quiet zone is chosen in such a way that in use, a velocity of the liquid in the at least one quiet zone is lower than in the main inner channel and low enough to allow: - dirt particles to settle and/or -gas bubbles to form and rise in the at least one quiet zone, -at least one return flow channel for a return flow from the at least one quiet zone back to the main inner channel, wherein the return flow channel merges with the main inner channel at a merge point.

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- *with international search report (Art. 21(3))*
- *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))*

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/NL2012/050388

## A. CLASSIFICATION OF SUBJECT MATTER

INV. B01D21/00 B01D21/02 B01D45/00 E03F5/14 B01D19/00  
ADD.

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)

B01D E03F

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

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

EP0-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                            | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | WO 2011/037465 A1 (FLAMCO BV [NL]; ZAAZEN ABRAHAM [NL]; CNOSSEN JAN HENK [NL])<br>31 March 2011 (2011-03-31)<br>cited in the application<br>abstract<br>----- | 1-15                  |
| X         | EP 2 266 676 A1 (UNIVERSITEIT ANTWERPEN [BE]; KAREL DE GROTE HOGESCHOOL KATHOLIEKE HOGE) 29 December 2010 (2010-12-29)<br>figure 3<br>-----                   | 1-15                  |
| X         | WO 2010/107304 A1 (FLAMCO BV [NL]; CNOSSEN JAN HENK [NL])<br>23 September 2010 (2010-09-23)<br>figures<br>-----                                               | 1-15                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* 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

27 August 2012

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NL2012/050388

### 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 additional 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 an 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.:

1-15

#### 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

Information on patent family members

International application No

PCT/NL2012/050388

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                            | Publication<br>date                                  |
|-------------------------------------------|---------------------|-----------------------------------------------------------------------|------------------------------------------------------|
| WO 2011037465 A1                          | 31-03-2011          | EP 2480307 A1<br>NL 2003551 C<br>US 2012175318 A1<br>WO 2011037465 A1 | 01-08-2012<br>28-03-2011<br>12-07-2012<br>31-03-2011 |
| EP 2266676 A1                             | 29-12-2010          | NONE                                                                  |                                                      |
| WO 2010107304 A1                          | 23-09-2010          | EP 2408533 A1<br>US 2010236409 A1<br>WO 2010107304 A1                 | 25-01-2012<br>23-09-2010<br>23-09-2010               |

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

A dirt/gas removal device, comprising a housing which encompasses a main inner channel, a branch flow channel discharging into a quite zone to separate dirt/gas from a liquid flow and a return channel for the cleaned flow discharging into the main inner channel.

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2. claims: 16-23

A member comprising a tube, a branch flow channel and a return flow channel.

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3. claims: 24, 25

A dirt/gas removal device comprising a housing which encompasses a main inner channel and two mounting zones for gas discharge and dirt discharge.

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