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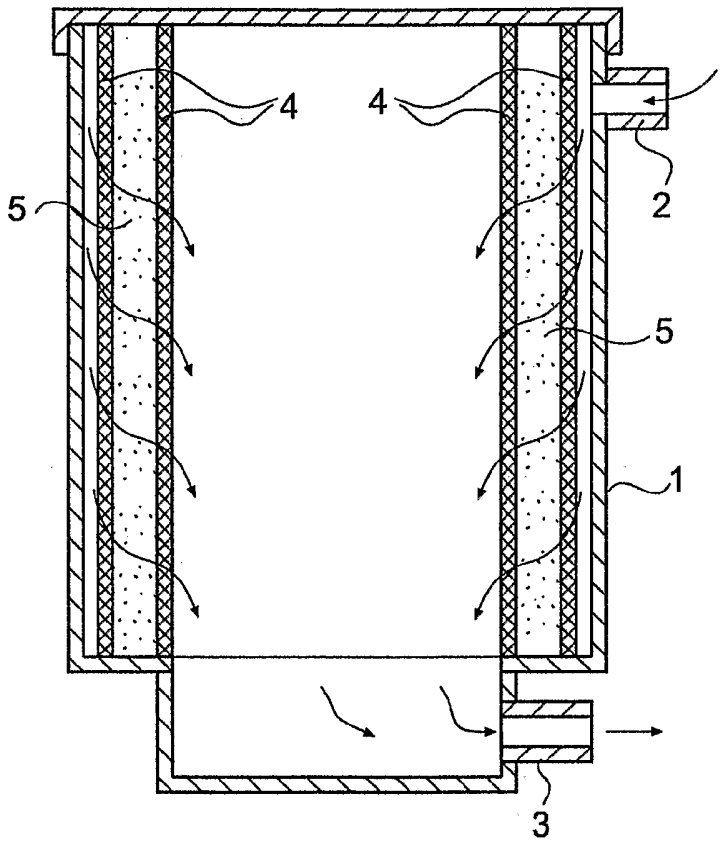
(54) Title: FILTER DEVICE



(57) Abstract: The invention relates to a filter device consisting of a receptacle (1) comprising an inlet duct (2) and an outlet duct (3) and of a filter mesh (4) within the receptacle. The filter mesh (4) has a double wall with an intermediate space filled with a filter material layer (5) absorbing crude oil distillate.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Filter device

This invention relates to a filter device consisting of a receptacle comprising an inlet duct and an outlet duct and of a filter mesh within the receptacle.

Prior art filter devices of this kind are used for removing particles from liquids. Such filter devices known *per se* are not usable for oil removal from water, for instance. This invention has the purpose of providing a filter device allowing separation also of various chemicals from water. The filter device of the invention is characterised by the filter mesh having a double wall, with an intermediate space filled with a filter material layer absorbing crude oil distillate.

One embodiment of the invention is characterised by a cylindrical receptacle and a tubular filter mesh, with the filter mesh including an annular space accommodating the filter material layer. The filter material layer thus forms a circular tubular mat within the receptacle, through which the liquid to be filtered flows or is pressed evenly.

The filter mesh may contain activated carbon and a HEPA filter substance, which have a joint anti-bacterial effect.

One embodiment of the invention is further characterised by the filter material layer being amino resin and organic polymer, preferably at an approximate ratio of 53/47. All the tests have proved that the combination of the type described above purifies water, removing aircraft petrol, kerosene, mineral oil, such as "diesel/fuel oil" and lubricating oil, and also a liquid chemical tested in an experiment. Thus, for instance, a test using "diesel/fuel oil" C_{10}-C_{21} and lubricating oil C_{22}-C_{40} (hydrogen fractions) mixed at a percentage of 0.1 in water, i.e. at a ratio of 50 ml/50 l of water, yielded only 0.013 mg/l and 0.014 mg/l, respectively, after filtering and purification. These test results give evidence of the excellent operation of the filter device in accordance with the invention.

The invention is explained below by means of an example and with reference to the accompanying drawing, whose figure shows the principle view of the filter device in cross-section.

The filter device consists of a receptacle 1, comprising an inlet duct 2 and an outlet duct 3, and of a filter mesh 4 within the receptacle. The filter mesh 4 has a double

wall with an intermediate space filled with a filter material layer 5 absorbing crude oil distillate. The receptacle 1 is cylindrical and the filter mesh 4 is tubular, forming an annular space within the filter mesh, in which the filter material layer 5 is placed. The filter mesh may contain activated carbon and a HEPA filter substance, which together remove any bacteria from the liquid to be filtered. The filter material layer 5 consisting of amino resin and organic polymer removes crude oil distillates, such as fuels and oils, from the water well enough for the purified water to be returned to sea or ground water, for instance.

Claims

1. A filter device consisting of a receptacle (1) comprising an inlet duct (2) and an outlet duct (3) and of a filter mesh (4) within the receptacle, **characterised** in that the filter mesh (4) has a double wall with an intermediate space filled with a filter material layer (5) absorbing crude oil distillate.

2. A filter device as defined in claim 1, **characterised** in that the receptacle (1) is cylindrical and the filter mesh (4) is tubular, the filter mesh including an annular space, in which the filter material layer (5) is placed.

3. A filter device as defined in claim 1 or 2, **characterised** in that the filter mesh (4) contains activated carbon.

4. A filter device as defined in any of the preceding claims, **characterised** in that the filter mesh (4) contains a High Efficient Particulate Air (HEPA) substance.

5. A filter device as defined in any of the preceding claims, **characterised** in that the filter material layer (5) consists of amino resin and organic polymer, preferably at an approximate ratio of 53/47.

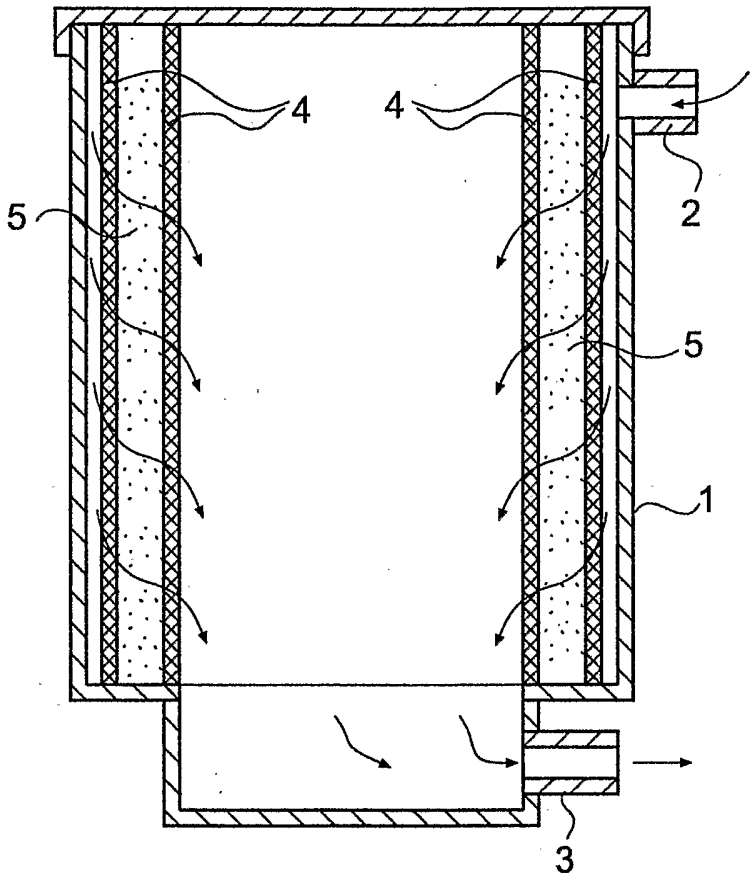

Fig.1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 2005/000404

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
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: C02F, B01D, B01J

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1180498 A1 (EPCON NORGE AS), 20 February 2002 (20.02.2002), See paragraphs (0001)-(0002), (0020)-(0021) & claims 2,12	1-4
Y	--	5
X	US 4839040 A (LARS E. ALM), 13 June 1989 (13.06.1989), column 3, line 17 - line 24, figure 2, abstract	1-4
Y	--	5
Y	EP 0988889 A1 (AUERGESELLSCHAFT GMBH), 29 March 2000 (29.03.2000), See paragraphs (0015), (0018), (0019) & claims 1-2,5-8	5
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"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	Date of mailing of the international search report
17 January 2006	18 -01- 2006
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jens Waltin/Els Telephone No. +46 8 782 25 00

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EP	1180498	A1	20/02/2002	AT	285383	T	15/01/2005
				AU	7659901	A	18/02/2002
				BG	107571	A	30/01/2004
				BR	0113045	A	01/07/2003
				CA	2417965	A	14/02/2002
				CN	1460089	A,T	03/12/2003
				DE	60107960	D	00/00/0000
				DK	200300168	A	13/03/2003
				EA	4111	B	00/00/0000
				EG	22748	A	30/07/2003
				EP	1307404	A,B	07/05/2003
				ES	2234862	T	01/07/2005
				MX	PA03001190	A	02/08/2004
				NO	20030611	A	31/03/2003
				SK	2382003	A	01/07/2003
				WO	0212128	A	14/02/2002
US	4839040	A	13/06/1989	AU	5774086	A	05/11/1986
				CA	1278530	A,C	02/01/1991
				DK	162635	B,C	25/11/1991
				DK	588586	A	08/12/1986
				EP	0256013	A	24/02/1988
				ES	553832	A	01/03/1987
				ES	8703815	A	16/05/1987
				JP	62502731	T	22/10/1987
				NO	160506	B,C	16/01/1989
				NO	864892	A	05/12/1986
				SE	8501721	A	10/10/1986
				WO	8606059	A	23/10/1986
EP	0988889	A1	29/03/2000	AT	287292	T	15/02/2005
				DE	19714350	A,B	01/10/1998
				ZA	9808616	A	31/03/1999