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(54) Title: METHOD AND FILTERING ARRANGEMENT IN A GAS PROCESS

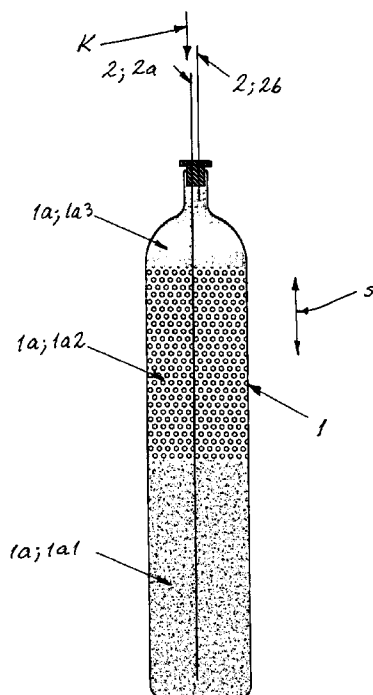


FIG. 2

(57) Abstract: The invention relates to the method in a gas process, in which a filtering arrangement is being used in order to purify a process gas (K), whereby the filtering arrangement comprises one or several hermetically closed and replaceable gas filters provided with filtering means. A gas bottle (1) filled with one or several filtering materials (1a) is being used as the gas filter. The invention relates also to a filtering arrangement for purifying a process gas carried out according to the method.



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Method and filtering arrangement in a gas process

5 The invention relates to a method and a filtering arrangement in a gas process according to the preambles of the independent claims related thereto.

10 An efficient filtering of gas is important particularly in use of ultra clean gases, such as e.g. in production of cooling gases for military missiles, in maintenance and service of gas networks in industry, in gas factories, in laboratories etc. In figure 1 is shown as an example a customary gas process, in which the gas is being produced by a compressor, filtered, check
15 filtered and after that pressurized to suit the gas process. In the gas filtering there has been used two parallel filters, which are being used one at a time in a way that during a replacement situation, circulation of the gas is being directed through the clean filter and the used filter is being replaced.

20 The size of replaceable filtering cartridges, being generally used in the type of implementation described above, is typically about five litres and the cartridges are specially made, and also due to that
25 expensive. The operating periods of the filtering cartridges in question are rather short, which is why the maintenance and service costs of the filters in question are thus disproportionately high.

30 The type of filtering arrangements described above are being used in connection with operating processes of most heterogeneous gases, such as e.g. nitrogen, argon, oxygen or zero air, in which case the aim is to eliminate impurities in the process gas so that impure
35 gas may not enter the actual operating process in order to avoid production interruption and/or even device damages. By use of an impure process gas in a critical operating process there has been caused significant

technical, economical and operational damages in practice.

5 It is the aim of the method and the filtering arrangement according to the present invention to achieve a decisive improvement in the problems described above and thus to raise essentially the level of prior art. In order to carry out this aim, the method and filtering arrangement according to the
10 invention are mainly characterized by what has been presented in the characterizing parts of the independent claims related thereto.

15 As the most important advantages of the method and the filtering arrangement according to the invention may be mentioned the simplicity and efficiency of use thereof, wherein the filtering of a process gas can be carried out at reasonable costs instead of special made and expensive filtering cartridges by using usual gas
20 bottles filled with suitable filtering materials. In this way the cost efficiency of a gas process can be significantly improved, without, however, risking the purity of the process gas. By using gas bottles, the sizes of which are significantly bigger than the
25 present filtering cartridges, a gas process can be maintained uninterruptedly over a very long time without a need for maintenance and service measures that must be performed at very short time intervals within the filtering cartridges being used nowadays.

30 The invention enables thus optimizing of operational costs and technical functioning in operating processes of most heterogeneous gases without a risk of an impure gas entering an operating process, in which case a risk
35 for the operating process is not caused due to that that there is for some reason no time/willingness to perform a scheduled filtering cartridge replacement.

Other advantageous embodiments of the method and filtering arrangement according to the invention are presented in the dependent claims related thereto.

5 In the following description, the invention is illustrated in detail with reference to the appended drawings, in which

in figure 1

10 is shown a usual coupling principle of a gas process provided with usual filtering cartridges, and

in figure 2

15 is shown an exemplary cross sectional view of an advantageous gas filter in a filtering arrangement carried out according to the invention.

20 The invention relates first of all to a method in a gas process, in which a filtering arrangement is being used in order to purify a process gas K, whereby the filtering arrangement comprises one or several hermetically closed and replaceable gas filters
25 provided with filtering means. A gas bottle 1 filled with one or several filtering materials 1a is being used as the gas filter.

30 As an advantageous embodiment of the method, the gas bottle 1 is being filled with two or more particle-like filtering materials 1a, being arranged therein as filtering zones following one another in a longitudinal direction s.

35 Furthermore as an advantageous embodiment particularly according to the advantageous embodiment shown in figure 2, at least three filtering materials 1a are being used in the filtering, such as alum 1a1 operating

as a coarse filtering zone, zeolite 1a2 operating as a molecular filtering zone and activated carbon 1a3 operating as a fine filtering zone, and/or the like.

5 As a further advantageous embodiment of the method, the process gas K to be filtered is being led into a coarse filtering zone 1a1 existing at one end of the gas bottle 1 and the filtered process gas is being exhausted from a fine filtering zone 1a3 existing at an
10 opposite end of the gas bottle.

Furthermore as an advantageous embodiment of the method, in order to improve functioning of the filtering arrangement, retention time of the process
15 gas K to be filtered in the filtering is being increased by using a gas bottle 1 with a volume of ≥ 50 litres.

The invention relates on the other hand to a filtering arrangement for purifying a process gas, which
20 comprises one or several hermetically closed and replaceable gas filters provided with filtering means. A gas filter being used in the filtering arrangement comprises a gas bottle 1 filled with one or several
25 filtering materials 1a.

As an advantageous embodiment of the filtering arrangement, the gas bottle 1 is filled with two or more particle-like filtering materials 1a, being
30 arranged therein as filtering zones following one another in a longitudinal direction s.

Particularly with reference to the advantageous embodiment shown in figure 2, the filtering means
35 comprise two or more filtering materials 1a, such as alum 1a1 operating as a coarse filtering zone, zeolite 1a2 operating as a molecular filtering zone and activated carbon 1a3 operating as a fine filtering

zone, and/or the like. In this case the filtering arrangement comprises a flow arrangement 2 in order to lead the process gas K to be filtered by a first flow way 2a into a coarse filtering zone 1a1 existing at one end of the gas bottle 1, and on the other hand to exhaust the filtered process gas by a second flow way 2b from a fine filtering zone 1a3 existing at an opposite end of the gas bottle 1.

As a further advantageous embodiment particularly to improve functioning of the filtering arrangement by increasing the retention time of the process gas K to be filtered in the filtering, the volume of the gas bottle 1 is ≥ 50 litres. The filtering efficiency of the gas bottles having a many times larger volume compared to traditional filtering cartridges is naturally of a very high level, in addition to which the manufacturing and production costs of so called standard gas bottles are fractional when compared to the manufacturing and production costs of special manufactured filtering cartridges.

The type of a gas bottle 1 as shown in figure 2 can be exploited when needed on the replacement principle with two gas bottles as shown e.g. in figure 1.

It is clear, that the invention is not limited to the embodiments presented or described above, but instead it can be varied within the basic idea of the invention in very many ways. It is thus first of all clear that in the embodiments of the method and filtering arrangement according to the invention, also other type of gas bottles can be exploited than illustrated in figure 2. Furthermore the cross section shown in figure 2 is of exemplary nature only, so that the flow arrangements of the gas to be filtered can also be carried out vice versa or a differing amount of

filtering materials in separate zones can be used therein etc.

Claims:

1. Method in a gas process, in which a filtering arrangement is being used in order to purify a process gas (K), whereby the filtering arrangement comprises one or several hermetically closed and replaceable gas filters provided with filtering means, **characterized** in that a gas bottle (1) filled with one or several filtering materials (1a) is being used as the gas filter.
2. Method according to claim 1, **characterized** in that the gas bottle (1) is being filled with two or more particle-like filtering materials (1a), being arranged therein as filtering zones following one another in a longitudinal direction (s).
3. Method according to claim 1 or 2, **characterized** in that at least three filtering materials (1a) are being used in the filtering, such as alum (1a1) operating as a coarse filtering zone, zeolite (1a2) operating as a molecular filtering zone and activated carbon (1a3) operating as a fine filtering zone, and/or the like.
4. Method according to any of the preceding claims 1-3, **characterized** in that the process gas (K) to be filtered is being led into a coarse filtering zone (1a1) existing at one end of the gas bottle (1) and the filtered process gas is being exhausted from a fine filtering zone (1a3) existing at an opposite end of the gas bottle.
5. Method according to any of the preceding claims 1-4, **characterized** in that in order to improve functioning of the filtering arrangement, retention time of the process gas (K) to be filtered in the

filtering is being increased by using a gas bottle (1) with a volume of ≥ 50 litres.

5 6. Filtering arrangement for purifying a process gas, which comprises one or several hermetically closed and replaceable gas filters provided with filtering means, **characterized** in that a gas filter being used therewith comprises a gas bottle (1) filled with one or several filtering materials (1a).

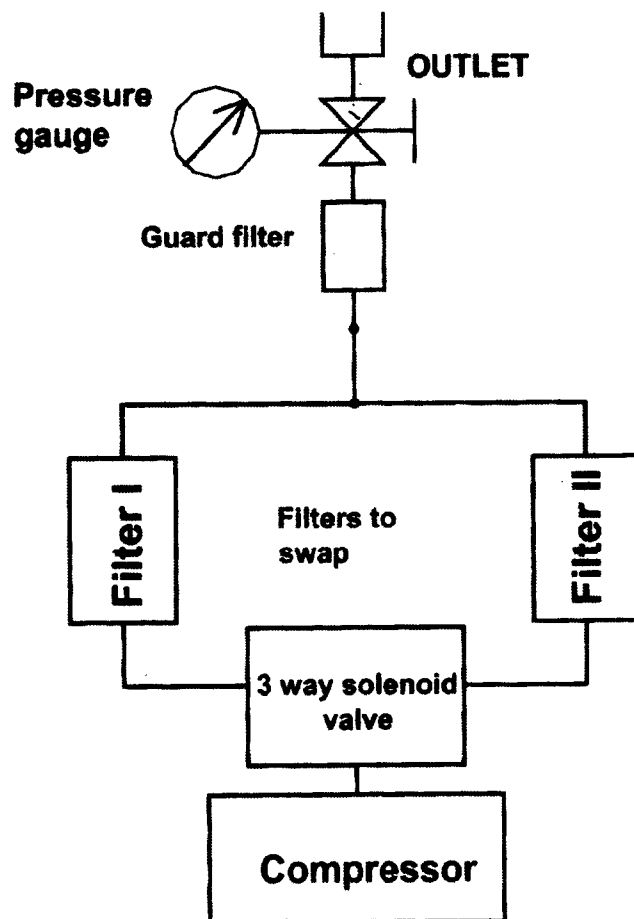
10 7. Apparatus according to claim 6, **characterized** in that the gas bottle (1) is filled with two or more particle-like filtering materials (1a), being arranged therein as filtering zones following one another in a longitudinal direction (s).

15 8. Apparatus according to claim 6 or 7, **characterized** in that the filtering means comprise two or more filtering materials (1a), such as alum (1a1) operating as a coarse filtering zone, zeolite (1a2) operating as a molecular filtering zone and activated carbon (1a3) operating as a fine filtering zone, and/or the like.

25 9. Apparatus according to any of the preceding claims 6-8, **characterized** in that it comprises a flow arrangement (2) in order to lead the process gas (K) to be filtered by a first flow way (2a) into a coarse filtering zone (1a1) existing at one end of the gas bottle (1), and on the other hand to exhaust the filtered process gas by a second flow way (2b) from a fine filtering zone (1a3) existing at an opposite end of the gas bottle (1).

35 10. Apparatus according to any of the preceding claims 6-9, **characterized** in that particularly to improve functioning of the filtering arrangement by increasing the retention time of the process gas (K) to

be filtered in the filtering, the volume of the gas bottle (1) is ≥ 50 litres.

**FIG. 1**

PRIOR ART

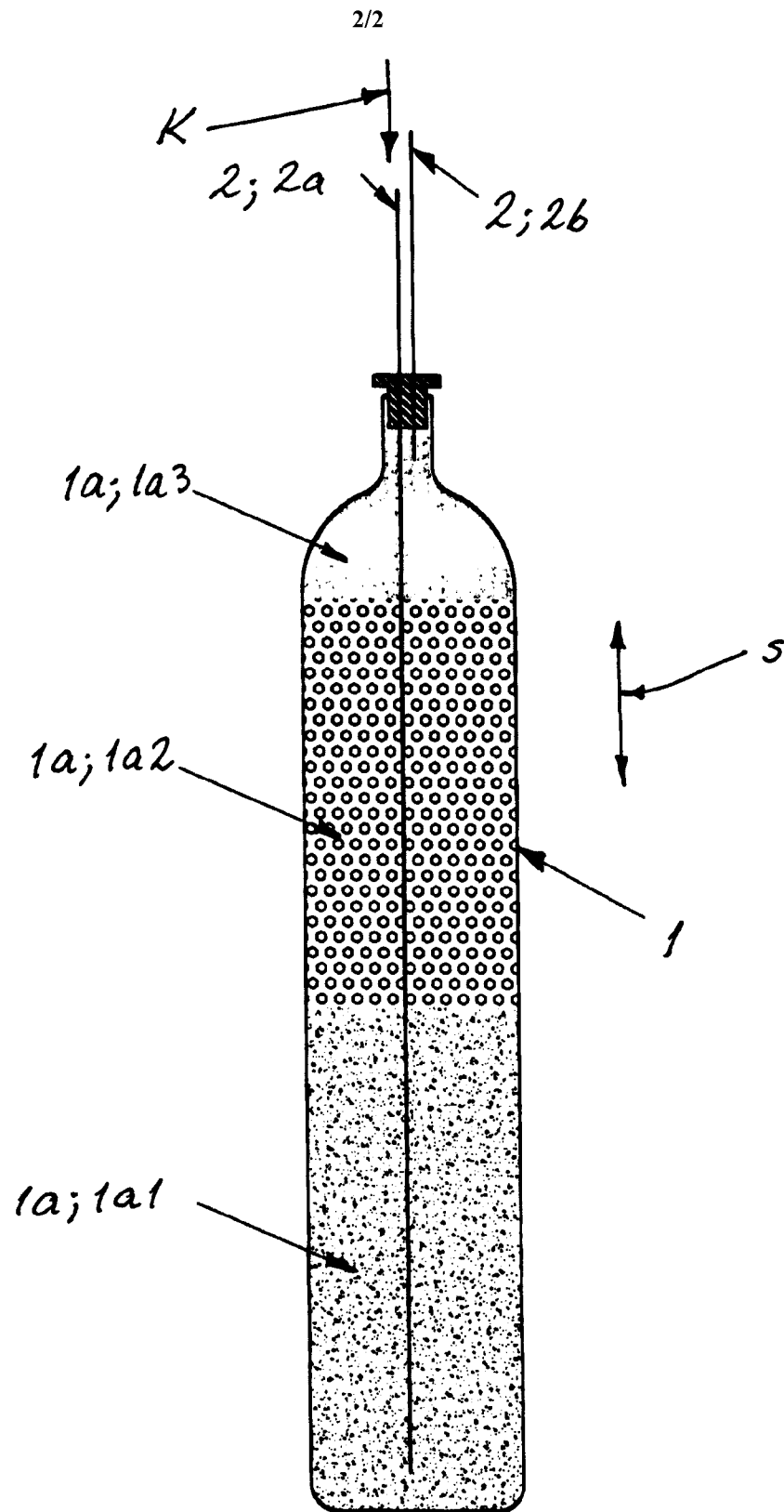


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2012/050242

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: B01D, F17C

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, PAJ, 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	US 5133787 X (DIOT CHRISTIAN ET AL), 28 July 1992 (1992-07-28); column 1, line 7 - line 12; column 1, line 30 - line 36; column 3, line 5 - line 61; column 1, line 49 - line 59; figure 1 --	1-10
A	US 4162289 A (ELLER HORST ET AL), 24 July 1979 (1979-07-24); column 3, line 1 - line 33; figure 1; claim 1 --	1-10
A	US 5151395 A (TOM GLENN M), 29 September 1992 (1992-09-29); column 32, line 60 - line 68; figure 10; claim 1 -- -----	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

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Continuation of: second sheet

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Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/FI2012/050242

US	5133787 X	28/07/1992	CA	2037370 A1	03/09/1991
			EP	0444995 A1	04/09/1991
			FR	2659030 B1	08/01/1993
			JP	5068838 A	23/03/1993
US	4162289 A	24/07/1979	NONE		
US	5151395 A	29/09/1992	WO	9113679 A1	19/09/1991