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Amended claims in accordance with Rule 137(2)
EPC.

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(54) **A METHOD AND COMPOSITION FOR ABSORBING IONIZING RADIATION**

(57) A method and composition for absorbing ionizing radiation in air flow systems.

A neutron poison is used in combination with a binder and is applied to a filter of an air flow system with the result that ionizing radiation is absorbed from the filter and air.

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Description

FIELD OF INVENTION

[0001] The invention generally relates to a method and composition for absorbing ionizing radiation. More particularly but not exclusively the invention relates to a method and composition for absorbing ionizing radiation from the air and from any accumulated radiation in the filter of an air flow system.

BACKGROUND

[0002] Some buildings have air flow problems and/or problems with temperature control and so have air flow systems which typically use air from outside the building. It is a well known problem that ionizing radiation, bacteria and other microorganisms contaminate the air we breathe and the environments we live in. It is further known in the field of air flow systems that they tend to have poor air filtration systems and as such, the air inside the building is frequently contaminated.

[0003] It is an object of a preferred form of the present invention to go at least some way towards addressing this problem. While this is an object of a preferred embodiment, it should not be seen as a limitation on the scope of the invention as claimed. The object of the invention per se is simply to provide the public with a useful choice.

[0004] All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein; this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in Europe or in any other country.

[0005] The term "comprising" and derivatives thereof, eg "comprises", if and when used herein in relation to a combination of features should not be taken as excluding the possibility that the combination may have further unspecified features. For example, a statement that an arrangement "comprises" certain parts does not mean that it cannot also, optionally, have additional parts.

SUMMARY OF THE INVENTION

[0006] According to one aspect of the invention there is provided a method for absorbing ionizing radiation, comprising;

- applying to a filter of an air flow system at least one binder; and
- applying to the filter at least one neutron poison so

that the neutron poison is bound to the filter by the binder, and the neutron poison absorbs accumulated ionizing radiation in the filter and ionizing radiation from air which passes through the filter.

[0007] Preferably the neutron poison is substantially boric acid.

[0008] Preferably the neutron poison is substantially B-10 enriched boric acid.

[0009] Preferably the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.

[0010] Preferably the binder and neutron poison are applied simultaneously.

[0011] Preferably the binder and neutron poison are applied separately.

[0012] Preferably the binder and neutron poison are sprayed onto the filter from an aerosol can.

[0013] Preferably the binder and neutron poison are brushed onto the filter.

[0014] Preferably the air flow system is an air conditioning system.

[0015] Preferably the air flow system is a heat pump system.

[0016] Preferably the air flow system is a ventilation system.

[0017] In another aspect of the invention there is provided an ionizing radiation absorbing filter when used for absorbing ionizing radiation in an airflow system, having:

- a filter;
- at least one neutron poison; and
- at least one binder which binds at the least one neutron poison to the filter;

the filter being formed such that when in use in an airflow system the neutron poison absorbs accumulated ionizing radiation in the filter and ionizing radiation from air which passes through the filter.

[0018] Preferably the neutron poison is substantially boric acid.

[0019] Preferably the neutron poison is substantially B-10 enriched boric acid.

[0020] Preferably the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.

[0021] In another aspect of the invention there is provided a composition when used for absorbing ionizing radiation in an airflow system comprising:

- at least one neutron poison; and
- at least one binder;

the composition adapted such so that when in use the composition is applied to a filter of an air flow system and the neutron poison is bound by the binder to the filter with the result that neutron poison absorbs accumulated ionizing radiation in the filter and ionizing radiation in an airflow system.

[0022] Preferably the neutron poison is substantially

boric acid.

[0023] Preferably the neutron poison is substantially B-10 enriched boric acid.

[0024] Preferably the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.

[0025] Preferably the composition is in an aerosol formulation.

DETAILED DESCRIPTION

[0026] Preferred forms of the invention will now be described by way of example although it should be appreciated that the inventive concept is not limited to these.

[0027] In a preferred embodiment the invention provides a method of absorbing ionizing radiation by applying a composition to a filter of an air flow system.

[0028] Radiation is a process in which electromagnetic waves of the whole electromagnetic spectrum as well as energetic particles including atomic and subatomic particles travel through a medium. Radiation is largely classified into ionizing radiation and non-ionizing radiation. There are different types of ionizing radiation such as neutron radiation which is a type of ionizing radiation which consists of free neutrons and can cause biological harm to the human body.

[0029] The inventive composition comprises a neutron poison and a binder. A neutron poison (also called a neutron absorber) is a substance with a large neutron absorption cross-section which can absorb ionizing radiation. In a preferred embodiment of the invention the neutron poison comprises boric acid. Boric acid (molecular formula: H_3BO_3) is an inorganic acid and is a white powder or transparent crystallized substance that is soluble in water. Natural boron contains two stable isotopes, namely B-10 and B-11. B-10's cross section for thermal neutron absorption is larger than B-11 and so enriched boric acid with higher B-10 is preferred. Another advantage of using boric acid as the neutron poison is that it also has antibacterial, antifungal, antiviral properties. It also has dust, haze, pollution and small particle retention properties.

[0030] In a particularly preferred embodiment of the invention the boric acid is prepared from either triethanolamine borate $C_6H_{12}BNO_3$, Triethanolamine borate $C_6H_{12}NO_3B$, or trimethyl borate $B(OCH_3)_3$, all of which render the same result, being that they all decompose in the atmosphere in the presence of moisture, leaving behind boron in the form of boric acid as a white powder covering the surface to which they are applied to. Preparation of the above is to heat ethanol or methanol to approximately 50 degrees C and add 7% boric acid (but not limited to 7%) to the solution while stirring. In some embodiments crystal forming inhibitors can be added to the solution.

[0031] It will be appreciated by those skilled in the art that other neutron poisons can be used such as boral, borated aluminium, borax, boron carbide, boron containing alloys, boron nitride, boron oxide, iron boride, burnable poi-

sons for reactor fuel, sodium pentaborate etc.

[0032] The binder is preferably a substance which is capable of binding the neutron poison to a filter. In a preferred embodiment of the invention the binder consists of distillates (petroleum), hydrotreated heavy paraffinic oil. The binder may also contain a marker such as C.I. Solvent red 164 (DIY) and/or prussian blue cane.

[0033] The neutron poison and binder is applied to a filter of an air flow system such as an air conditioner, a heat pump or a ventilation system. It will be appreciated by those skilled in the art that the term filter used throughout the specification also encompasses a screen or any other device which has a similar function to a filter or screen through which air passes. In a particularly preferred embodiment of the invention the poison and binder is applied to the filter at the same time. However it will be appreciated by those skilled in the art that the neutron poison and binder can be applied separately to achieve the same result. The composition can be applied in a number of different ways such as being sprayed on, painted on, or can be added at the time the filter is being manufactured etc. In the most preferred embodiment the neutron poison and binder are formulated such that they are contained in the same aerosol can and sprayed onto the filter.

[0034] Once the composition has been applied to the filter any ionizing radiation already accumulated in the filter will be absorbed by the neutron poison and any ionizing radiation in the air which passes through the filter will be absorbed by the neutron poison.

[0035] It will be appreciated that those skilled in the art (e.g. a chemist or physicist) could easily run a number of tests to ascertain whether ionizing radiation has been absorbed by the neutron poison bound to the filter. One such way could be taking a Geiger counter reading of the filter or air prior to applying the neutron poison and binder and one reading afterwards. Another way would be using a simple laboratory test for example some neutron poison are detected as they absorb ionizing radiation. Further in some neutron poisons the isotope composition can also be tested for example Boron which is enriched in B-10, when it absorbs ionizing radiation the B-10 is depleted. It will also be appreciated that the level of absorption can vary depending on what neutron poison is used, the concentration of the neutron poison and the amount added to the filter.

[0036] It is to be understood that even though numerous characteristics and advantages of the various embodiments of the present invention have been set forth in the foregoing description, together with details of the structure and functioning of various embodiments of the invention, this disclosure is illustrative only, and changes may be made in detail so long as the functioning of the invention is not adversely affected. For example the particular elements of the neutron poison and binder may vary dependent on the particular application for which it is used without variation in the spirit and scope of the present invention.

[0037] In addition, although the preferred embodiments described herein are directed to methods and a composition for absorbing ionizing radiation it will be appreciated by those skilled in the art that variations and modifications are possible within the scope of the appended claims.

Claims

1. A method for absorbing ionizing radiation, comprising;
 - applying to a filter of an air flow system at least one binder; and
 - applying to the filter at least one neutron poison so that the neutron poison is bound to the filter by the binder, and the neutron poison absorbs accumulated ionizing radiation in the filter and any ionizing radiation from air which passes through the filter.
2. A method according to claim 1, wherein the neutron poison is substantially boric acid.
3. A method according to claim 1 or 2, wherein the neutron poison is substantially B-10 enriched boric acid.
4. A method according to claim 1, 2, or 3, wherein the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.
5. A method according to any one of the preceding claims, wherein the binder and neutron poison are applied simultaneously.
6. A method according to any one of claims 1-4 wherein the binder and neutron poison are applied separately.
7. A method according to any one of the preceding claims wherein the binder and neutron poison are sprayed onto the filter from an aerosol can.
8. A method according to any one of claims 1-6 wherein the binder and poison are brushed onto the filter.
9. A method according to any one of the preceding claims, wherein the air flow system is an air conditioning system.
10. A method according to any one of claims 1-8, wherein the air flow system is a heat pump system.
11. A method according to any one of claims 1-8, wherein the air flow system is a ventilation system.
12. A composition when used for absorbing ionizing ra-

diation in an airflow system comprising:

- at least one neutron poison; and
- at least one binder;

the composition adapted such so that when in use it is applied to a filter of an air flow system and the neutron poison is bound by the binder to the filter with the result that neutron poison absorbs accumulated ionizing radiation in the filter and ionizing radiation in an airflow system.

13. A composition according to claim 12, wherein the neutron poison is substantially boric acid.
14. A composition according to claim 12 or 13, wherein the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.
15. A composition according to any one of claims 12, 13 or 14 wherein the composition is in an aerosol formulation.

Amended claims in accordance with Rule 137(2) EPC.

1. A method for absorbing ionizing radiation, comprising;
 - applying to a filter of an air flow system at least one binder; and
 - applying to the filter at least one neutron poison so that the neutron poison is bound to the filter by the binder, and the neutron poison absorbs accumulated ionizing radiation in the filter and any ionizing radiation from air which passes through the filter.
2. A method according to claim 1, wherein the neutron poison is substantially boric acid.
3. A method according to claim 1 or 2, wherein the neutron poison is substantially B-10 enriched boric acid.
4. A method according to claim 1, 2, or 3, wherein the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil.
5. A method according to any one of the preceding claims, wherein the binder and neutron poison are applied simultaneously.
6. A method according to any one of claims 1-4 wherein the binder and neutron poison are applied separately.
7. A method according to any one of the preceding

claims wherein the binder and neutron poison are sprayed onto the filter from an aerosol can.

8. A method according to any one of claims 1-6 wherein the binder and poison are brushed onto the filter. 5
9. A method according to any one of the preceding claims, wherein the air flow system is an air conditioning system. 10
10. A method according to any one of claims 1-8, wherein the air flow system is a heat pump system.
11. A method according to any one of claims 1-8, wherein the air flow system is a ventilation system. 15
12. Use of a composition for absorbing ionizing radiation in an airflow system comprising:
 - at least one neutron poison; and 20
 - at least one binder;

the composition adapted such so that when in use it is applied to a filter of an air flow system and the neutron poison is bound by the binder to the filter with the result that neutron poison absorbs accumulated ionizing radiation in the filter and ionizing radiation in an airflow system. 25
13. Use of a composition according to claim 12, wherein the neutron poison is substantially boric acid. 30
14. Use of a composition according to claim 12 or 13, wherein the binder is substantially distillates (petroleum) hydrotreated heavy paraffinic oil. 35
15. Use of a composition according to any one of claims 12, 13 or 14 wherein the composition is in an aerosol formulation. 40

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 9040

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 104 402 918 A (ZHENGZHOU SIGMA CHEMICAL CO LTD) 11 March 2015 (2015-03-11)	12-14	INV. G21F9/02
Y	* the whole document *	15	
X	GB 538 408 A (COLGATE PALMOLIVE PEET CO) 1 August 1941 (1941-08-01)	12-14	
Y	* page 5, lines 1-11 *	15	
A	WO 2013/065829 A1 (DAIWABO HOLDINGS CO LTD [JP]; DAIWABO NEU CO LTD [JP]; DAIWABO PROGRES) 10 May 2013 (2013-05-10)	1-15	
A	EP 1 868 209 A1 (TOYO BOSEKI [JP]; WAKAIDA ENGINEERING INC [JP]; UNIV TOKYO [JP]) 19 December 2007 (2007-12-19)	1-15	
A	DE 25 08 544 A1 (AMERICAN AIR FILTER CO) 29 January 1976 (1976-01-29)	1-15	TECHNICAL FIELDS SEARCHED (IPC)
			G21F C07F B01D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 December 2015	Examiner Lohberger, Severin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 17 9040

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 104402918 A	11-03-2015	NONE	
GB 538408 A	01-08-1941	NONE	
WO 2013065829 A1	10-05-2013	JP 5237510 B1 JP WO2013065829 A1 WO 2013065829 A1	17-07-2013 02-04-2015 10-05-2013
EP 1868209 A1	19-12-2007	EP 1868209 A1 JP 4549388 B2 WO 2006109595 A1	19-12-2007 22-09-2010 19-10-2006
DE 2508544 A1	29-01-1976	AU 7990075 A BE 827534 A1 BR 7502935 A CH 604876 A5 DE 2508544 A1 ES 436400 A1 ES 448177 A1 FR 2284958 A1 GB 1513964 A IT 1033350 B JP S5114600 A NL 7504015 A ZA 7501303 A	14-10-1976 31-07-1975 06-07-1976 15-09-1978 29-01-1976 01-01-1977 01-07-1977 09-04-1976 14-06-1978 10-07-1979 05-02-1976 20-01-1976 28-01-1976