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B01D 47/06

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B1R RAJM R203

(56) Documents Cited:
GB 2220587 A **JP 010277142 A**
SU 000997756 A **US 6312504 B**
US 6214097 B **US 3841063 A**
US 3651620 A

(58) Field of Search:
UK CL (Edition X) **B1R**
INT CL⁷ **B01D**
Other: **ONLINE: EPODOC, WPI**

(54) Abstract Title: **Water jet filter for removing particles from air**

(57) The filter comprises a cylindrical housing 10. An inlet tube 12 for the inflow of particle laden air extends through the top of the housing 10 and terminates at a point spaced from the base 11 of, and below the midpoint of the housing. The flow is maintained by suction applied at port 13. Reservoir 14 is mounted on the base 11 and is filled with water W. Water is injected into particle laden air in tube 12 as a jet or spray J. The injected droplets of water attach to the particles in the air, and wet particles fall and settle in vessel 14. Clear water flows over the lip of vessel 14 into a sump S in which pump 16 is located, the clean water being recirculated to form water jet J.

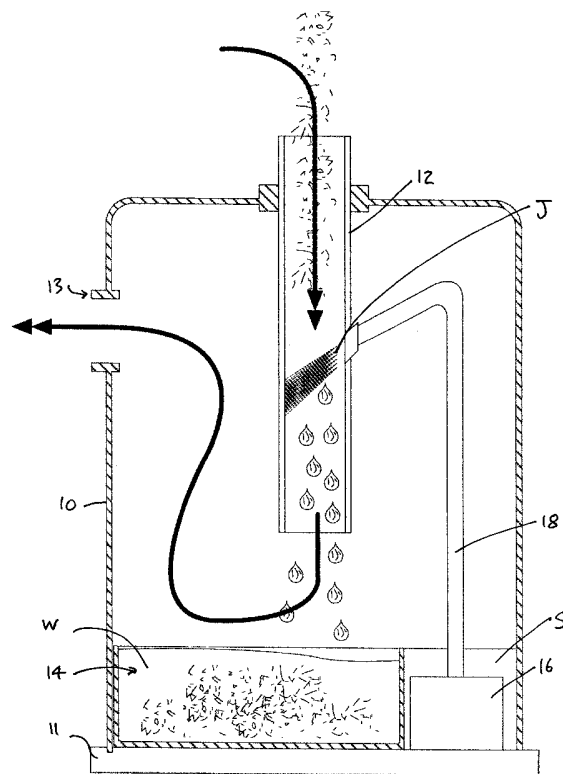


Figure 3

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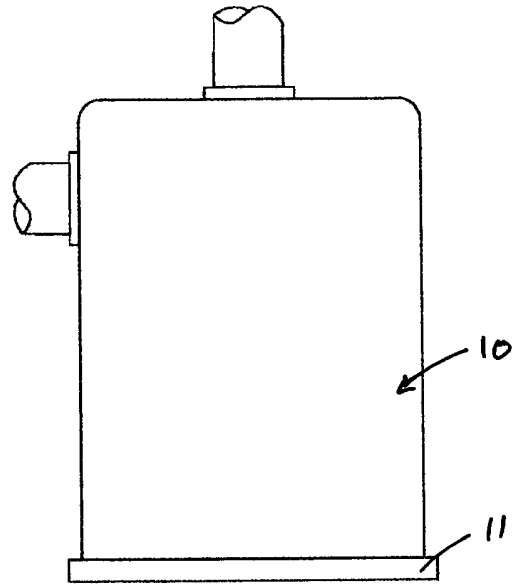


Figure 1

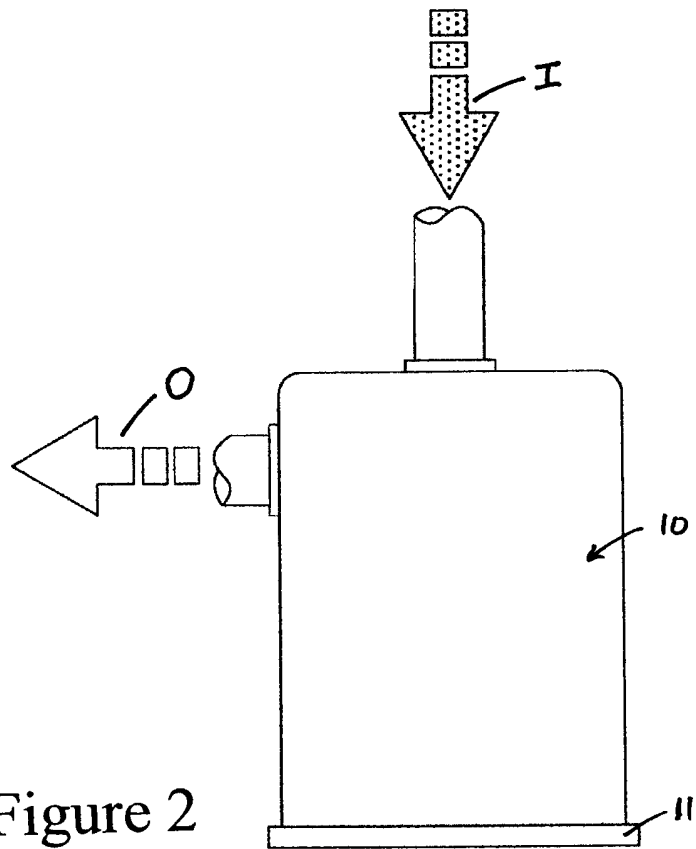


Figure 2

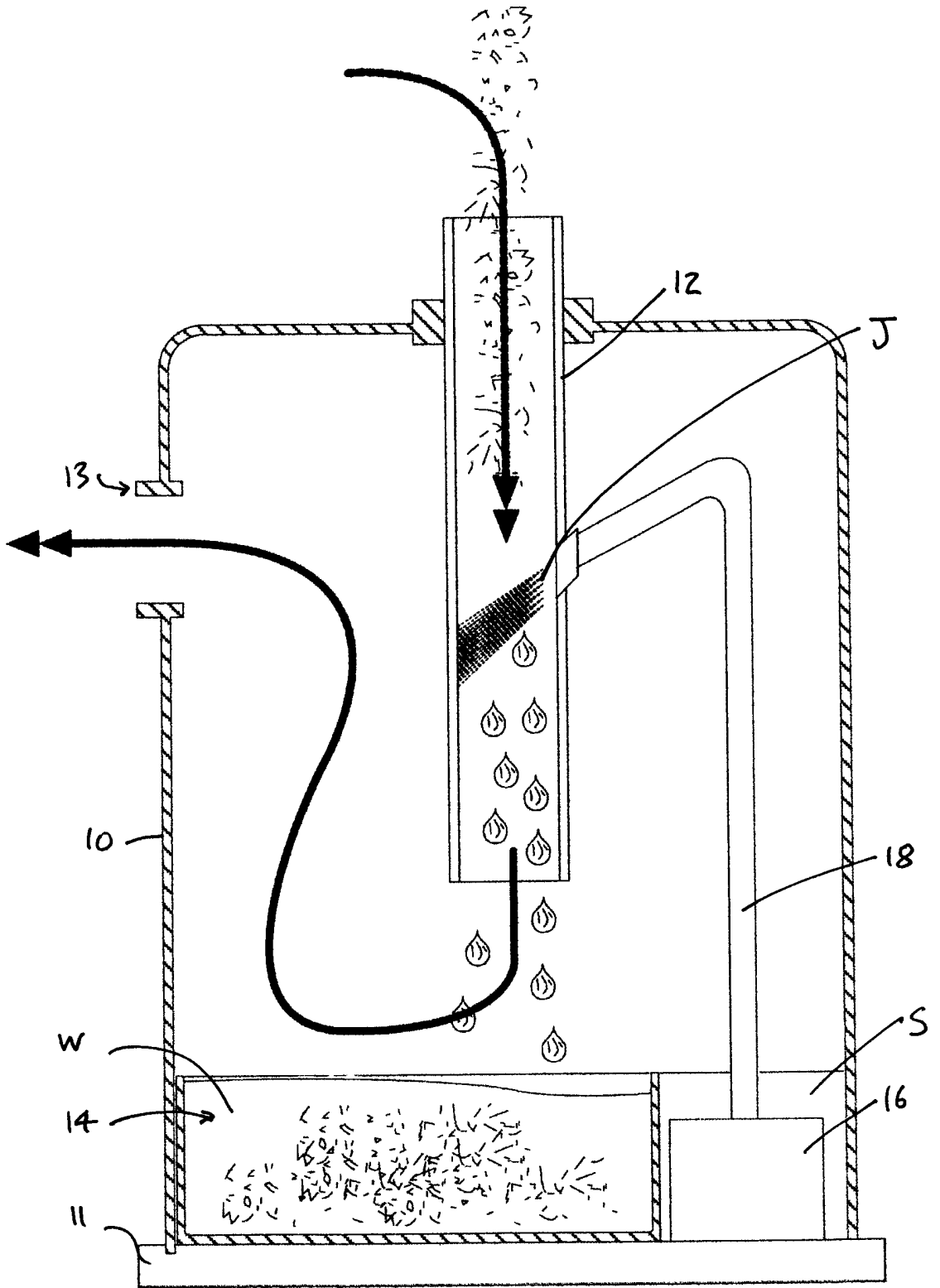


Figure 3

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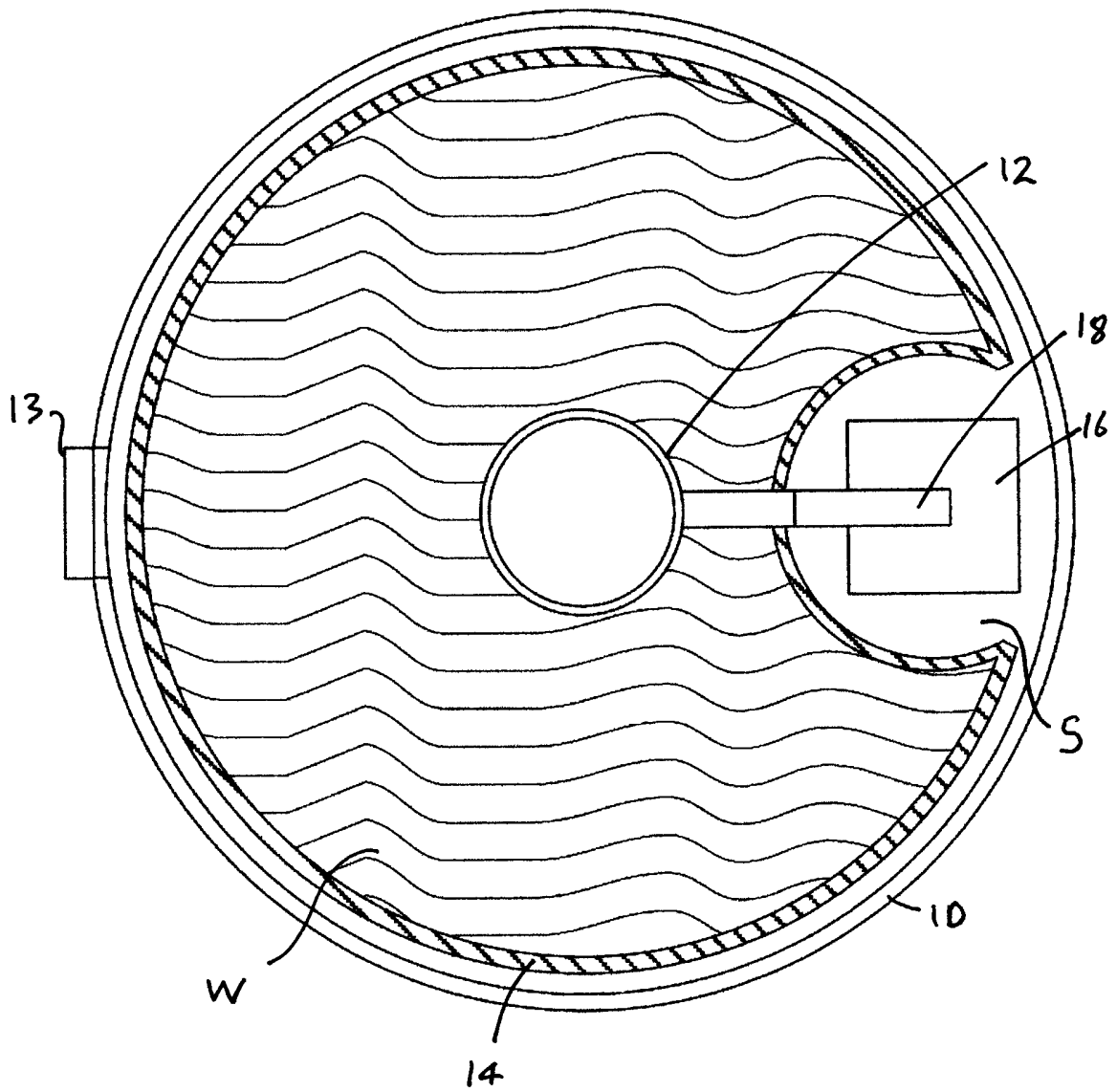


Figure 4

Water jet filter

The present invention relates to a filter for removing particles from air or other gas, and particularly to a filter which uses a jet or spray of water or other liquid for the removal of such particles.

5 In accordance with the present invention, there is provided a filter which comprises an enclosure having a port for the application of suction, a tubular inlet for an incoming flow of particle-laden air or other gas, means for injecting water or other liquid into said tubular inlet, and a vessel for
10 collecting water or other liquid issuing from said tubular inlet.

In use, the suction applied to the suction port creates a partial vacuum within the enclosure, which acts to draw particle-laden air or other gas into the enclosure. The
15 injected water or other liquid attaches to the particles in the incoming stream of air or other gas, making these particles heavy such that, upon issuing from the tubular inlet, they fall under gravity into the collection vessel. The incoming air or gas, free of the particles, flows out through the suction port.

20 Preferably the collection vessel or reservoir is arranged for the water or other liquid to overflow therefrom, the collected particles settling to the bottom of the vessel, and the overflowing water or other liquid being used as a source for the liquid injected into the tubular inlet of the
25 filter.

Preferably the tubular inlet is disposed vertically, its lower end being spaced above the collection vessel or reservoir.

30 Preferably the injection means is arranged to direct the injected water or other liquid into the tubular inlet in a direction which is radial of the tubular inlet and inclined in the direction of flow of the incoming air or other gas.

Preferably the injection means is arranged to inject the water or other liquid into the tubular inlet as a jet or

spray, for example the injection means having a nozzle formed with one or more orifices.

An embodiment of the present invention will now be described by way of example only and with reference to the
5 accompanying drawings, in which:

FIGURE 1 is a side view of a filter in accordance with the present invention;

FIGURE 2 is a similar side view of the filter, indicating the inlet flow of particle-laden air and the outlet
10 flow of particle-free air;

FIGURE 3 is an enlarged vertical section through the filter shown in Figures 1 and 2; and

FIGURE 4 is a cross-section through the filter shown in Figures 1 to 3.

15 Referring to the drawings, there is shown a filter which comprises a cylindrical housing 10 which is closed at its top and has an open bottom, the housing 10 being disposed with its open bottom mounted on and sealed to a flat base 11. An inlet tube 12, for the inflow I of particle-laden air, extends
20 vertically through the top of the housing 10, to terminate at a point spaced above the base 11 of the filter, and below the mid-height of the housing 10. An outlet port 13, for the outflow O of particle-free air, is formed in the side of the housing 10, adjacent its top.

25 An open-top vessel or reservoir 14 is mounted on the base 11, within the housing 10, and is filled with water W. The vessel 14 is circular in cross-section and has an outer diameter only slightly smaller than the inner diameter of the housing 10: at one side, however, the wall of the vessel 14
30 follows a re-entrant profile to provide a space S in which a submersible water pump 16 is disposed, mounted on the base 11. A tube 17 extends upwardly from the outlet of the pump 16, then bends radially inwardly and downwardly, its end being coupled into the side of the vertical air inlet tube 12 of the filter:
35 the arrangement serves to inject water as a jet or spray J into

the tube 12, in a direction radially of the air inlet tube but inclined downwardly.

In use, a suction source (not shown) is coupled to the air outlet port 13 of the filter, in order to create a partial vacuum within the air-tight enclosure provided by the housing 10 and its base 11: air is accordingly drawn into the enclosure through the inlet tube 12, this air being laden with particles. The vessel 14 is pre-filled with water and the space S in which the pump 16 is located is also partly filled with water: the pump 16 pumps water up its outlet tube 18, to inject this water into the air inlet tube 12 as a jet or spray J. The injected droplets of water attach to the particles with which the incoming air I is laden, so increasing the mass of these particles: these heavy and wet particles now fall down and from the open end of the air inlet tube 23, into the vessel 14.

The particles settle to the bottom of the vessel 14, whilst clean water flows over the rim of the vessel 14, acting as a weir, into the space S in which the pump 16 is located. Accordingly, it will be appreciated that the water is continuously re-circulated, whilst particles from the incoming air stream are collected as a slurry in the vessel 14.

Claims

1. A filter for removing particles from a gas, the filter comprising an enclosure having a port for the application of suction, a tubular inlet for an incoming flow of particle-laden
5 air or other gas, means for injecting water or other liquid into said tubular inlet, and a collection vessel for collecting water or other liquid issuing from said tubular inlet.
2. A filter according to claim 1, wherein the collection vessel or reservoir is arranged for the water or other liquid
10 to overflow therefrom, the collected particles settling to the bottom of the vessel, and the overflowing water or other liquid being used as a source for the liquid injected into the tubular inlet of the filter.
3. A filter according to claim 1 or claim 2, wherein the
15 tubular inlet is disposed vertically, its lower end being spaced above the collection vessel or reservoir.
4. A filter according to any preceding claim, wherein the injection means is arranged to direct the injected water or other liquid into the tubular inlet in a direction which is
20 radial of the tubular inlet and inclined in the direction of flow of the incoming air or other gas.
5. A filter according to claim 4, wherein the injection means is arranged to inject the water or other liquid into the tubular inlet as a jet or spray.
- 25 6. A filter according to claim 5, wherein when the liquid is injected as a spray the injection means has a nozzle formed with one or more orifices.
7. A filter according to any preceding claim, wherein the tubular inlet extends vertically through the top of a housing
30 which forms part of the enclosure to terminate at a point spaced above the base of the filter, and below the mid-height of the enclosure.
8. A filter according to any preceding claim, wherein an outlet port for the outflow of particle-free air, is formed in
35 the side of the housing, adjacent its top.

9. A filter according to any preceding claim, wherein the collection vessel is mounted on a base which together with the housing forms the enclosure, said collector being within the enclosure.

5 10. A filter according to any preceding claim, wherein the collection vessel is circular in cross-section and has an outer diameter only slightly smaller than the inner diameter of the enclosure.

11. A filter according to any preceding claim, wherein at
10 one side, the wall of the collection vessel follows a re-entrant profile to provide a space in which a submersible water pump is disposed, mounted on the base of the enclosure.

12. A method of removing particles from a gaseous source wherein a suction source is coupled to an air outlet port of
15 a filter enclosed within an enclosure in order to create a partial vacuum within the air-tight enclosure provided by a housing and its base; air is drawn into the enclosure through an inlet tube, this air being laden with particles, water is pumped to an outlet tube, to inject the water into the air
20 inlet tube as a jet or spray with the injected droplets of water becoming attached to the particles so said particles fall down and from the open end of the air inlet tube into a collection vessel contained within the housing.

13. A method according to claim 12, where clean water is
25 allowed to flow over the rim of the collection vessel which acts as a weir, into a space in which the pump is located so that the water can be continuously re-circulated, whilst particles from the incoming air stream are collected as a slurry in the collection vessel.

30 14. A filter as substantially described herein, with reference to and as illustrated in the accompanying Figures.

15. A method of removing particles from a gas as substantially described herein, with reference to and as illustrated in the accompanying Figures.



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Application No: GB0409908.1

Examiner: Dave Mobbs

Claims searched: 1-15

Date of search: 27 April 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1	GB2220587 A (AGRITEC LTD) - note, in figure 1; port for application of suction 9; tubular inlet 3; means for injecting 7; collection vessel 13.
X	1	US6312504 B (CFT GMBH COMPACT FILTER TECHNIC) - note, in figure 1; port for application of suction 45; tubular inlet 8; means for injecting 3; collection vessel 13.
X	1	US6214097 B (MARSULEX ENVIRONMENTAL TECHNOLOGIES) - note, in figure 1; port for application of suction 124; tubular inlet 112, 118; means for injecting 120; collection vessel 130.
X	1	US3841063 A (ABSHER) - note, in figure 1; port for application of suction 20; tubular inlet 24; means for injecting, water jets; collection trough.
X	1-3	US3651620 A (FULLER COMPANY) - note, in figure 1; port for application of suction 18; tubular inlet 20; means for injecting 24, 25; collection vessel 12.
X	1	JP01277142 A (DAINIPPON PRINTING CO LTD) - note, in figure 1; port for application of suction 4; tubular inlet 1, 20; means for injecting 23; collection vessel 24.
X	1	SU997756 A (KIEV ENG-CONS INST) - note, in figure 1; port for application of suction 8; tubular inlet 1; means for injecting 3; collection vessel 7, 9.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:



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Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

B1R

Worldwide search of patent documents classified in the following areas of the IPC⁰⁷

B01D

The following online and other databases have been used in the preparation of this search report

ONLINE: EPODOC, WPI