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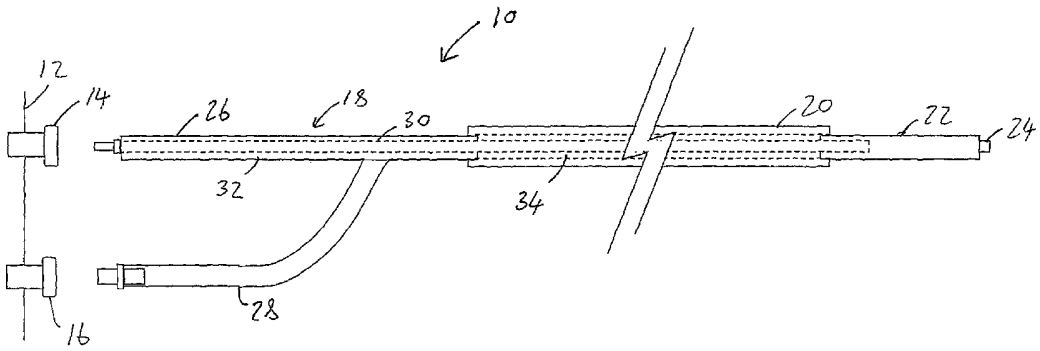
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** A DEVICE FOR AND METHOD OF DELIVERING SUPERHEATED LIQUID AND GAS FOR BIOCIDAL TREATMENT



(57) **Abstract:** A device (10) is disclosed for biocidal treatment of vegetation and/or pests, the device (10) comprising an inner tube (30) connectable to a source of one of heated pressurised gas and heated pressurised water, an outer tube (26) disposed over the inner tube so that a space is defined between the inner tube and the outer tube, and a wand (22) in communication with the inner tube (30) and the outer tube (26). The wand (22) has an outlet aperture and the outer tube (26) is connectable to a source of the other of heated pressurised gas and heated pressurised water. The heated air and water mix in the wand (22) immediately prior to passing through the outlet aperture.

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A DEVICE FOR AND METHOD OF DELIVERING SUPERHEATED LIQUID AND GAS FOR BIOCIDAL TREATMENT

Field of Invention

The present invention relates to a device for and method of delivering superheated liquid and gas such as water and air, in particular for biocidal treatment of vegetation and/or pests.

Background of the Invention

It is known to effect vegetation and pest control by direct application of heat including the application, at elevated temperatures, of water, foam and/or air, or application of flames.

Traditionally, the delivery of pressurised superheated water and air for the biocidal treatment of vegetation and pests has been through the use of separate tubes joined at an application wand. However, this method results in the tubes and associated insulative and protective layers being heavy to use when connected to the wand. In addition, since the air is conveyed into the wand typically using a 20 metre hose, the air is often at or close to ambient temperature even if the air has been heated prior to entering the tube due to a heat exchange effect between the air hose and the outside ambient air temperature. The traditional hose arrangement described above is also inconvenient to attach and detach from the heating equipment since attachment and detachment requires the use of spanners.

Summary of the Invention

The inventor of the present invention has discovered that the temperature of air at the wand of a biocidal treatment

device is critical to the extent that a reduction in the air temperature at the wand dramatically alters the effectiveness of the biocidal treatment.

In accordance with a first aspect of the present invention, there is provided a device for biocidal treatment of vegetation and/or pests, the device comprising:

an inner tube connectable to a source of one of heated pressurised gas and heated pressurised water;

an outer tube disposed over the inner tube so that a space is defined between the inner tube and the outer tube, the outer tube being connectable to a source of the other of heated pressurised gas and heated pressurised water; and

a wand in communication with the inner tube and the outer tube, the wand having an outlet aperture;

wherein the heated air and water mix in the wand immediately prior to passing through the outlet aperture.

In this way, since the inner tube carrying one of air and water is disposed inside the outer tube carrying the other of air and water, the temperature of the air and water at the wand remains relatively high. In addition, cumbersome tube arrangements are avoided.

The outer tube may form part of a manifold, the outer tube and the inner tube defining a first annular space and the manifold comprising a branch tube in fluid communication with the first annular space.

In one arrangement, the device further comprises a flexible hose extending from the inner and outer tubes to the wand, the inner tube extending through the hose to the wand, and the inner tube and the hose defining a second annular space in fluid communication with the first annular space.

The device may further comprise a first quick release connection associated with heated air to be dispensed by the device and a second quick release connection associated with heated water to be dispensed by the device, the first and second connections being connectable to a source of pressurised heated air and water.

The inner tube may formed of Teflon material.

In one arrangement, the device further comprises insulation disposed around at least part of the outer tube, and/or the wand.

In one arrangement, the device further comprises insulation disposed around at least part of the hose.

In accordance with a first aspect of the present invention, there is provided a method of biocidally treating vegetation and/or pests, the method comprising:

providing an inner tube;

connecting the inner tube to a source of one of heated pressurised gas and heated pressurised water;

providing an outer tube over the inner tube so that a space is defined between the inner tube and the outer tube;

connecting the outer tube to a source of the other of heated pressurised gas and heated pressurised water;

providing a wand in communication with the inner tube and the outer tube, the wand having an outlet aperture; and

mixing heated air and water in the wand immediately prior to passing through the outlet aperture.

Description of the Drawings

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

Figure 1 is a cross sectional view of a device for delivering superheated liquid and gas for biocidal treatment in accordance with an embodiment of the present invention; and

Figure 2 is a cross-sectional view of a manifold of the device shown in Figure 1.

Detailed Description of an Embodiment of the Invention

Referring to the drawings, there is shown a device 10 for delivering superheated liquid and air for biocidal treatment.

In the present example, the device 10 is used for delivering superheated water and air for biocidal treatment, although it will be understood that other gases and liquids may be used, the important aspect being that when the liquid and gas are heated to a sufficient temperature, the liquid and gas are capable of biocidally treating vegetation and pests.

The device 10 is connectable to a suitable source of gas and liquid, in this example a source 12 of heated pressurised air and pressurised superheated water. For this purpose, the source 12 includes an air outlet 14 and a water outlet 16. In this example, the air and water outlets 14, 16 are of quick-release type so as to enable the device 10 to be selectively easily released from engagement with the source 12. However, it will be

understood that other connection arrangements are envisaged.

The device 10 includes a manifold 18 releasably connectable to the source 12 of the pressurised heated air and pressurised superheated water, a flexible hose 20, in this example formed of heat resistant rubber material, and a wand 22 provided with a nozzle 24.

The manifold 18 in this example is formed of stainless steel material, although it will be understood that any suitable heat resistant relatively strong material is envisaged.

The manifold 18 includes an outer tube 26 integral with a branch tube 28. Extending through the outer tube 26 is an inner tube 30, in this example formed of heat resistant material with a low coefficient of expansion, such as Teflon tubing.

As can be seen in Figure 1, the inner tube 30 also extends through the hose 20 and into the wand 22, an end of the inner tube 30 opening into the wand 22. The outer tube 26 and the inner tube 30 define a first annular space 32 in fluid communication with the branch tube 28. Likewise, the hose 20 and the inner tube 30 define a second annular space 34 in fluid communication with the first annular space 32. The second annular space 34 is in fluid communication with the wand 22.

The wand 22 may be formed of any suitably strong heat resistant material, in this example aluminium.

During use, when the device 10 is engaged with the source 12 of pressurised heated air and pressurised superheated water, pressurised heated air flows through the inner tube 30 and thereby directly into the wand 22. At the same

time, pressurised superheated water flows through the branch tube 28, the first and second annular spaces 32, 34 and into the wand 22.

It will be understood that the pressurised air and pressurised superheated water are kept separate by the device 10 until the air and water reach the wand 22. At the wand 22, the air and water mix and are ejected from the nozzle 24.

The pressurised air and water mix in the application wand before exiting the wand under pressure and at an ideal velocity of around 60 kmh to take advantage of the wind chill effect.

The aluminum wand may have an insulation layer with a PVC outer casing to stop heat loss and to protect the human operator from the heat of the application wand.

It will be understood that by ensuring that the air and water do not mix until immediately prior to ejection from the wand 22, the temperature of the ejected air and water can be maintained relatively high and thereby the efficiency of the biocidal treatment device maintained relatively high.

It will also be appreciated that since the inner tube 30 which carries the heated pressurised air is disposed inside the outer tube 26 and hose 30 which carry the pressurised superheated water, the temperature of the air at the wand 22 can be maintained relatively high and thereby the efficiency of the biocidal treatment device maintained relatively high.

As shown more particularly in Figure 2, the outer and branch tubes 26, 28 of the manifold 18 are provided with first and second quick release couplings 36 and 38

respectively, the first and second quick release couplings 36, 38 being connected to the outer and branch tubes 26, 28 using first and second screw threaded portions 40 and 42 respectively.

The hose 20 may be fixed to the outer tube 26 in any suitable way, for example using a clamp 44.

The tubes and/or hose of the device described may be protected with an appropriate insulation layer. Disposed over the hose insulation layer may be a neoprene jacket and a nylon spiral wrap to protect against abrasion when dragging the hose on the ground.

While the above embodiment is described in relation to a device wherein heated pressurized air flows through the inner tube and heated pressurized water flows through the annular space between the inner tube and the outer tube, it will be understood that as an alternative, heated pressurized water may flow through the inner tube and heated pressurized air may flow through the annular space between the inner tube and the outer tube.

Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention.

CLAIMS:

1. A device for biocidal treatment of vegetation and/or pests, the device comprising:

an inner tube connectable to a source of one of heated pressurised gas and heated pressurised water;

an outer tube disposed over the inner tube so that a space is defined between the inner tube and the outer tube, the outer tube being connectable to a source of the other of heated pressurised gas and heated pressurised water; and

a wand in communication with the inner tube and the outer tube, the wand having an outlet aperture;

wherein the heated air and water mix in the wand immediately prior to passing through the outlet aperture.

2. A device as claimed in claim 1, wherein the outer tube forms part of a manifold, the outer tube and the inner tube defining a first annular space and the manifold comprising a branch tube in fluid communication with the first annular space.

3. A device as claimed in claim 1 or claim 2, further comprising a flexible hose extending from the inner and outer tubes to the wand, the inner tube extending through the hose to the wand, and the inner tube and the hose defining a second annular space in fluid communication with the first annular space.

4. A device as claimed in any one of the preceding claims, further comprising a first quick release connection associated with heated air to be dispensed by the device and a second quick release connection associated with heated water to be dispensed by the device, the first and second connections being connectable to a source of pressurised heated air and water.

5. A device as claimed in any one of the preceding claims, wherein the inner tube is formed of Teflon material.

6. A device as claimed in any one of the preceding claims, further comprising insulation disposed around at least part of the outer tube, and/or the wand.

7. A device as claimed in claim 3, further comprising insulation disposed around at least part of the hose.

8. A method of biocidally treating vegetation and/or pests, the method comprising:

providing an inner tube;

connecting the inner tube to a source of one of heated pressurised gas and heated pressurised water;

providing an outer tube over the inner tube so that a space is defined between the inner tube and the outer tube;

connecting the outer tube to a source of the other of heated pressurised gas and heated pressurised water;

providing a wand in communication with the inner tube and the outer tube, the wand having an outlet aperture; and

mixing heated air and water in the wand immediately prior to passing through the outlet aperture.

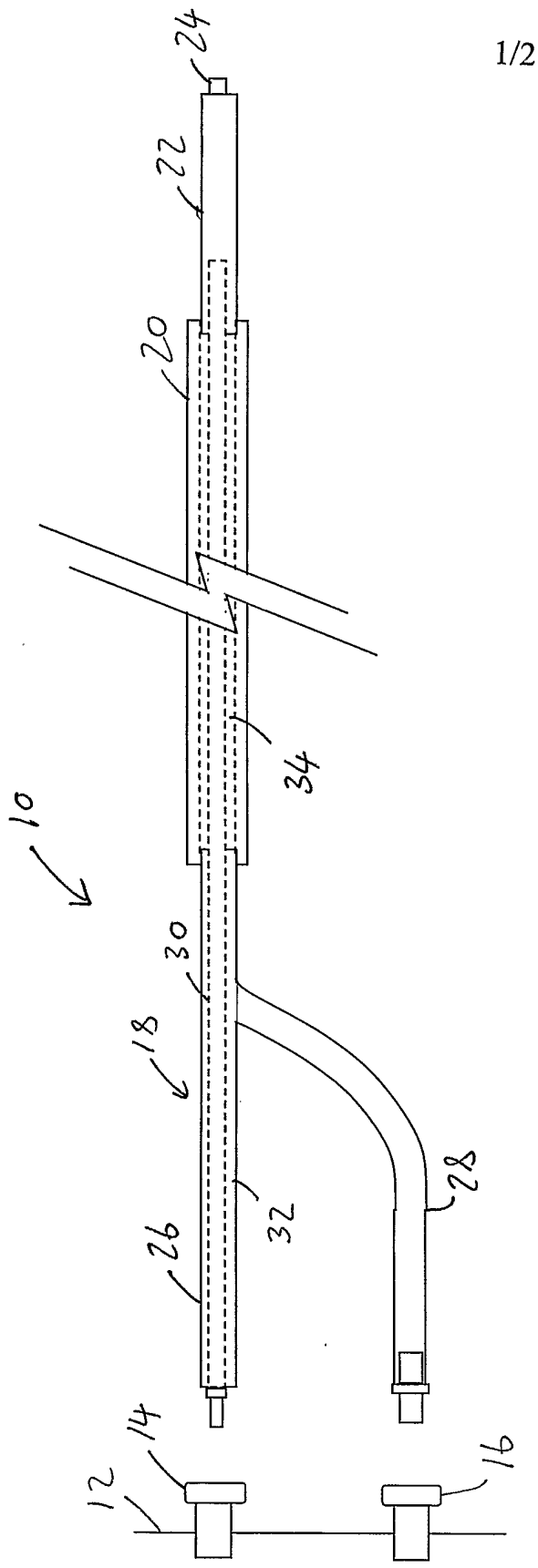


Fig. 1

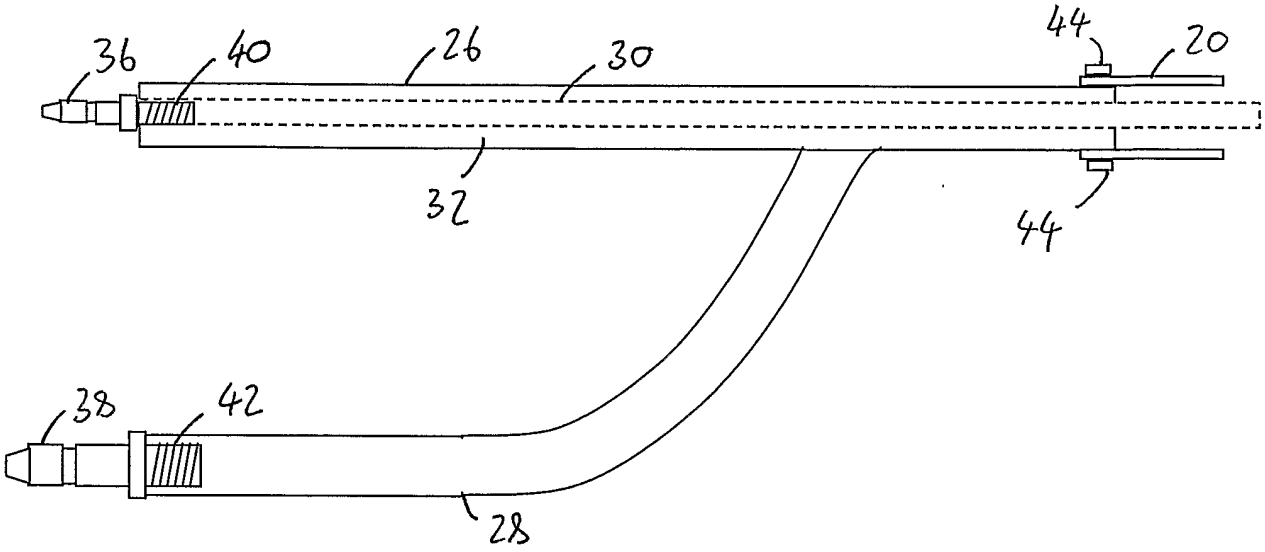


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ***A01M 21/04*** (2006.01) ***A01M 7/00*** (2006.01) ***A01M 19/00*** (2006.01)

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)

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)

DWPI IPC A01M 7/-, 19/-, 21/-, E01H 11/00 and keywords: TUBE, CONDUIT, INNER, OUTER, CO-AXIAL, LIQUID, WATER, AIR, GAS and similar terms

DWPI IPC A01M 7/-, 19/-, 21/- and keywords: STEAM, HOT, WATER, SUPERHEATED and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002065138 A (KANEKO NOKI KK) 5 March 2002 Figures and Derwent Abstract (Accession No. 2002-300120/34; Class P11)	1-8
A	US 5575111 A (RAJAMANNAN) 19 November 1996 See whole document	1-8
A	WO 2000/022926 A1 (BORAL ENERGY LIMITED) 27 April 2000 See whole document	1-8

[X] Further documents are listed in the continuation of Box C [X] 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)

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"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	Date of mailing of the international search report
30 May 2006	9 JUN 2006

Name and mailing address of the ISA/AU	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2006/000368

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU65573/99 (721456) B3 (SCOTT) 6 July 2000 See whole document	1-8
A	WO 2004/070269 A2 (VAUGHAN) 19 August 2004 See whole document	1-8
A	WO 1996/003036 A1 (ADEY ET AL.) 8 February 1996 See whole document	1-8
A	FR 2753516 A1 (TECNOMA S.A.) 20 March 1998 See whole document	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2006/000368

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
JP	2002065138						
US	5575111						
WO	2000/022926	AU	11397/00	CA	2348055	EP	1122999
		NZ	511660	US	6505437	ZA	200103839
AU	65573/99	AU	21278/01	AU	72149/00	AU	2005202397
		US	2004016819	WO	0141563		
WO	2004/070269	CA	2418548	CA	2515380	EP	1599092
		US	2005279293				
WO	1996/03036	AU	29923/95	CA	2197093	EP	0782387
		NZ	289934	US	5946851		
FR	2753516						

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX