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Australian Patent Declaration Form

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AUSTRALIA

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DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of
Applicant(s)

In support of the application No. 14905/88
MIDORI ANZEN INDUSTRY CO., LTD.

PLEASE ADD NAME
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SIGNING, LEGIBLY.

Name(s) and
address(es)
of person(s)
making
declaration

for a patent for an invention entitled AIR STREAM VISUALIZATION APPARATUS

I/We, Motok Matsumura President
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Tokyo 150, Japan

do solemnly and sincerely declare as follows:-

1. I am/we are the applicant(s) for the patent, or authorised by the abovementioned applicant to make this declaration on its behalf.
2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing
date and name
of Applicant
for the or
each basic
application

in Japan on 18th April, 19 87
 by Midori Anzen Industry Co., Ltd.
 in Japan on 24th July, 19 87
 by Midori Anzen Industry Co., Ltd.

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

4. The actual inventor(s) of the said invention is/are

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5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-

The said applicant is the assignee of the actual inventors

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DECLARED at Tokyo this 12 day of January 19 89

Motok Matsumura

(12) PATENT ABRIDGMENT (11) Document No. AU-B-14905/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 605279

(54) Title
AIR STREAM VISUALIZATION APPARATUS

International Patent Classification(s)
(51)⁴ **G01M 009/00 B05B 007/00 B05B 007/14 G01N 001/28**

(21) Application No. : **14905/88** (22) Application Date : **23.03.88**

(87) WIPO Number : **WO88/08125**

(30) Priority Data

(31) Number	(32) Date	(33) Country
62-94311	18.04.87	JP JAPAN
62-184748	24.07.87	JP JAPAN

(43) Publication Date : **04.11.88**

(44) Publication Date of Accepted Application : **10.01.91**

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(56) Prior Art Documents
EP 293872

(57) Claim

1. An air stream visualization apparatus comprising a steam generating device, an insulating chamber in which a liquid refrigerant such as liquid nitrogen is enclosed, a pipe for connecting said steam generating device and said insulating chamber, and for introducing steam from said steam generating device to said insulating chamber, said insulating chamber being provided with an outlet pipe for delivering a misty tracer generated by way of cooling down said steam by means of said refrigerant.

12. An air stream visualising device, comprising:
a steam generating first container device, having heating means therein, said first container being disposed to receive a steam producing liquid therein, a vertical steam

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delivery pipe with a valve extending out of said first container, a heated horizontal carrying pipe coupled to said valve to receive delivered steam;

pressure sensing means coupled to said first container to detect changes in steam pressure in said container so as to control a switch operating the electricity supply to the heating means;

an insulating second container, with a bottom member, said second container being designed to hold a liquid refrigerant such as liquid nitrogen over said bottom member, a vertical steam inlet pipe member coupled to said horizontal carrying pipe and extending down into said second container for feeding steam therein from the lower end of said pipe member;

a liquid level controller in said second container cooperating with a control mechanism outside said second container, said control mechanism acting to raise or lower one of said members with respect to the other of said member in response to signals from said liquid level controller so as to define a predetermined depth between the liquid level of the refrigerant in said second container and the lower end of said pipe member;

an outlet pipe extending vertically out from said second container ending in a mist delivery pipe with mist delivery apertures; and,

temperature control means connected to said outlet pipe.

PCT

AU-AI-14905/88

世界知的所有権機関
国際事務局



特許協力条約に基づいて公開された国際出願

605279

WO 88/08125

(51) 国際特許分類 4
G01N 1/28, G01M 9/00
B05B 7/00, 7/14

A1

(43) 国際公開日

1988年10月20日 (20.10.88)

(21) 国際出願番号 PCT/JP88/00300
(22) 国際出願日 1988年3月23日 (23. 03. 88)
(31) 優先権主張番号 特願昭62-94311
特願昭62-184748
(32) 優先日 1987年4月18日 (18. 04. 87)
1987年7月24日 (24. 07. 87)
(33) 優先権主張国 JP

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(81) 指定国
AU, BR, CH, DK, IT (欧州特許).
添付公開書類

国際調査報告書

A.O.J.P. 8 DEC 1988

AUSTRALIAN
- 4 NOV 1988
PATENT OFFICE

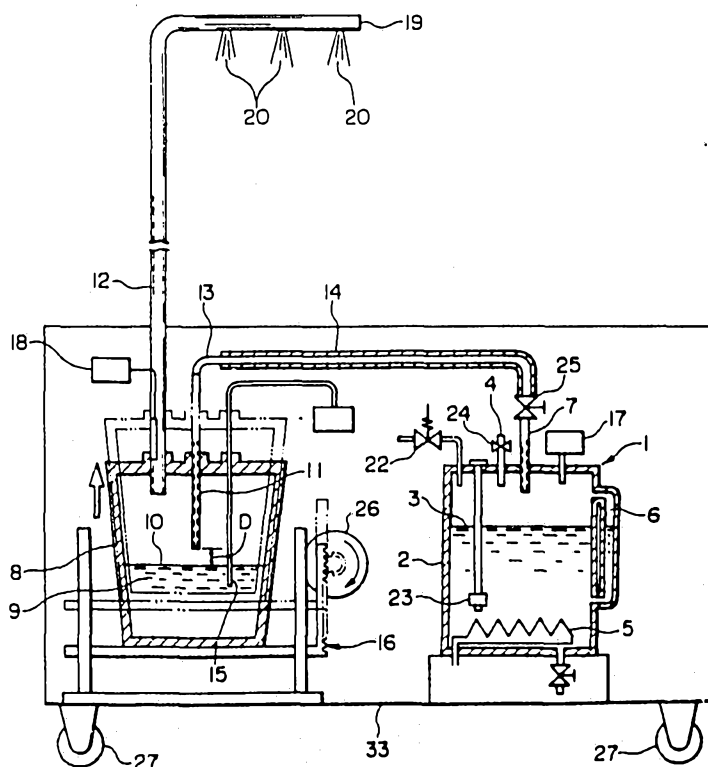
This document contains the
amendments made under
Section 49 and is correct for
printing.

(54) Title: AIR STREAM VISUALIZATION APPARATUS

(54) 発明の名称 気流可視化装置

(57) Abstract

This invention relates to an air stream visualization apparatus which feeds a clean steam generated by a steam generator into an insulated tank storing therein a refrigerant such as liquid nitrogen to cool it rapidly and to generate a mist-like tracer, then sends this tracer directly to an air stream to be visualized or sends it after controlling it to a temperature at which it is easily carried on the air stream.



(57) 要約

蒸気発生装置で発生させた清浄な蒸気を液体窒素その他の冷媒の入れてある断熱槽へ送り込んで急激に冷却して霧状トレーサーを発生させ、このトレーサーを可視化しようとする気流に直接送り出し、あるいはその気流に乗りやすい温度にコントロールして送り出すように構成した気流可視化装置。

情報としての用途のみ

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SPECIFICATION

Title of Invention

Air Stream Visuvalization Apparatus

Technical Field

This invention relates to an appavatus for realizing visual recognition of nonvisible air stream, and particularly relates to an apparatus for realizing visual recognition of air stream which utilizes especially clean mist that is generated for the purpos of recognizing air stream in a clean room employed for industrial purposes.

Background Art

Known devices for realizing visual recognition of non-visible air stream are exemplified as follows:

- (1) a device which utilizes mosquito-repellent incense smoke;
- (2) a device which utilizes smoke generated by a chemical reaction of chemicals. such as titanium tetrachloride;
- (3) a device which utilizes oil mist generated by heating oil; and
- (4) a device which generates pure water mist utilizing pure water as in an ultrasonic humidifier.

However, the aforementioned devices which utilize mosquito-repellent incense, the smoke generated by the chemical reaction of chemicals, and the oil mist encounter following problems: namely, when visual recognition of clean air stream which has been introduced into a clean room for industrial purposes is attempted, not only the clean air is contaminated but also the clean room and machines and equipment in the clean room are contaminated. As a result of this, the manufacturing process for the products which need cleanness is contaminated.



Consequently, the aforementioned devices become impossible to be used. Especially, in a case wherein the smoke generated by the chemical reaction of chemicals is utilized, it is dangerous because of their toxicity. In a case wherein the pure water
5 mist generated, the amount of the mist which can be generated is insufficient. If the sufficient amount of mist is generated, droplets drop to floor surfaces or work tables. Furthermore, the mist generated is eliminated in a short time after being introduced in an air stream, as a result of which, the long-distance visual recognition of the air stream becomes impossible. Furthermore, the mist tends to flow downward because of gravitation, and separate from the air stream, as a result of which, an accurately visual recognition of the air stream becomes impossible.

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An object of the present invention is to provide an air stream visualization apparatus.

20
Disclosure of the Invention

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According to one aspect of the present invention there is provided an air stream visualization apparatus comprising a steam generating device, an insulating chamber in which a liquid refrigerant such as liquid nitrogen is enclosed, a pipe for connecting said steam generating device and said insulating chamber, and for introducing steam from said steam generating device to said insulating chamber, said insulating chamber being provided with an outlet pipe for delivering a misty tracer generated by way of cooling down said steam by means of said refrigerant.



According to another aspect of the present invention there is provided an air stream visualising device, comprising:

5 a steam generating first container device, having heating means therein, said first container being disposed to receive a steam producing liquid therein, a vertical steam delivery pipe with a valve extending out of said first container, a heated horizontal carrying pipe coupled to said valve to receive delivered steam;

10 pressure sensing means coupled to said first container to detect changes in steam pressure in said container so as to control a switch operating the electricity supply to the heating means;

15 an insulating second container, with a bottom member, said second container being designed to hold a liquid refrigerant such as liquid nitrogen over said bottom member, a vertical steam inlet pipe member coupled to said horizontal carrying pipe and extending down into said second container for feeding steam therein from the lower end of said pipe member;

20 a liquid level controller in said second container cooperating with a control mechanism outside said second container, said control mechanism acting to raise or lower one of said members with respect to the other of said member in response to signals from said liquid level controller so as to define a predetermined depth between the liquid level of the refrigerant in said second container and the lower end of said pipe member;

25 an outlet pipe extending vertically out from said second container ending in a mist delivery pipe with mist



delivery apertures; and,

temperature control means connected to said outlet pipe.

5 Since the present invention has said construction, the present invention is to be capable of realizing a long-distance visual recognition of air stream, of delivering a misty tracer after adjusting the misty tracer to be easily capable of being captured by an air stream, of generating a large quantity of a clean and non-poisonous misty tracer, of
10 generating a misty tracer in such a manner that the generating of droplets can be minimized and of generating a misty tracer with a safety operation ensured.

15 Brief Description of Drawings

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

Fig. 1 illustrates an example of the structure of an air stream visualization apparatus according to the present invention;

25 Fig. 2 illustrates a modified example of the aforementioned structure;

Fig. 3 is a schematic view illustrating another example of the air stream visualization apparatus according to the present invention;

30 Fig. 4 illustrates an example in which the aforementioned structure is modified in part;



Fig. 5 is a schematic view illustrating an example of a control mechanism of the aforementioned structure; and,

Fig. 6 is a schematic view illustrating another example of the control mechanism of the aforementioned structure.

Best mode for Carrying Out the Invention

Referring to Figs. 1 and 2, an embodiment of the present invention will now be described. Reference numeral 1 represents a steam generating device which comprises a water supply pipe 4 for supplying water 3 to a tank 2, a heater 5 for heating the water 3, a water level gauge 6 for measuring the level of the water 3, and a steam delivering pipe 7. Reference numeral 8 represents an insulating chamber in which liquid nitrogen 9 as an example of a refrigerant is enclosed. The insulating chamber 8 comprises an inlet pipe 11 which is supported at a predetermined distance D away from the liquid level 10 of the liquid nitrogen 9_____



and an outlet pipe 12 for delivering steam which has been cooled down in the insulating chamber 8. Reference numeral 13 represents a pipe for introducing steam from the steam generating device 1 to the insulating chamber 8. One end of the pipe 13 is connected to the steam delivering pipe 7, while other end is connected to the inlet pipe 11. Reference numeral 14 represents a heater which is fitted to the pipe 13, and reference numeral 15 represents a liquid level controller for detecting the liquid level 10.

Reference numeral 16 represents a control mechanism for controlling the distance D between the liquid level 10 and the inlet pipe 11 to constant. The control mechanism 16 is operated by means of a detecting signal from the liquid level controller 15. Reference numeral 17 represents a pressure switch which is provided to the steam generating device 1, and which detects the change in steam pressure in the tank 2 for the purpose of controlling a switch which switches the electricity supply to the heater 5. Reference numeral 18 represents a temperature controller which is provided to the outlet pipe 12, and reference numeral 19 represents a mist delivering pipe which is connected to the outlet pipe 12, and which delivers mist into an air stream.

In the air stream visualization apparatus having said structure, water 3 is supplied to the tank 2 through the water supply pipe 4, and the supplied water 3 is then heated by the heater 5 so as to generate steam. The generated steam is introduced into the insulating chamber 8 through the steam delivering pipe 7, the pipe 13, and the inlet pipe 11. The introduced steam is rapidly cooled down by liquid nitrogen 9, and is delivered into the air stream in the form of a mist 20 the temperature of which is slightly higher than that of the air stream



through the outlet pipe 12 and the mist delivering pipe 19. The delivered mist 20 has a long visible duration and a tendency of being easily captured by the air stream.

During the aforementioned delivery of the mist 20 into the air stream the liquid nitrogen 9 is gradually gasified, as a result of which, its liquid level is lowered. This lowering is detected by the liquid level controller 15, whereby the control mechanism 16 is so operated in accordance with the detected signal that the distance D between the liquid level 10 and the inlet pipe 11 can be kept constant. If the steam pressure in the tank 2 exceeds a predetermined level, the pressure switch 17 detects the fact, and controls so as to prevent current supply to the heater 5. As a result of this, the generation of the steam can be controlled to a predetermined amount. The heater 14 heats the pipe 13 so as to prevent the return of the steam to water because of fall in temperature.

The tank 2 is provided with a drain pipe 21, a relief valve 22 for relieving excessive steam, and a float switch 23 which acts to stop the current supply to the heater 5 in order to prevent the tank 2 from overheating when the amount of the water 3 becomes insufficient. A water supply valve 24 is provided to the water supply pipe 4. The steam delivering pipe 7 is provided with a control valve 25 which acts to control the flow rate of the steam and stop the supply of the steam. Heat insulating material or a heater may be fitted to the outlet pipe 12 so as to control the temperature of the delivered mist 20 with respect to that of the air stream. The temperature controller 18 may be used examining how the mist 20 flows in accordance with the change in the temperature of the cooled steam which passes through the outlet pipe 12, or for stopping current supply to



the heater 5 or closing the control valve 25 if the temperature of the inside of the insulating chamber 8 rises because the liquid nitrogen in the insulating chamber 8 becomes exhausted. The control mechanism 16 may, as shown in Fig. 1, be constituted: as the liquid level 10 lowers, the insulating chamber 8 is raised by means of a motor 26. Or, the control mechanism 16 may be constituted by, as shown in Fig. 2: as the liquid level 10 lowers, the inlet pipe 11 is lowered by means of the motor 26. The inlet pipe 11 may be manually controlled without using the control mechanism 16. The steam generating device 1 and the insulating chamber 8 may be installed on a car 33 to which casters are fitted for the purpose of realizing a free movement, or it may be fixed to a predetermined place.

Referring to Figs. 3 through 6, another embodiment of the present invention will now be described. Reference numeral 1 represents a steam generating device which is provided with a water supply pipe 4 for supplying water 3 to a tank 2, a heater 5 for heating the water 3, and a pipe 7 for delivering steam 6. Reference numeral 8 represents an insulating chamber in which liquid nitrogen 9 as an example of a refrigerant is enclosed, and which is provided with an inlet pipe 11 and an outlet pipe 13 for delivering misty tracer 12 generated after steam 6 has been cooled down in the insulating chamber 8. Reference numeral 14 represents a pipe for introducing the steam 6 from the steam generating device 1 to the insulating chamber 8. One end of the pipe 14 is connected to the pipe 7, while the other end is connected to the inlet pipe 11. Reference numeral 15 represents a liquid level gauge which is provided to the insulating chamber 8, and which detects the liquid level 10 and indicates the amount of the



liquid nitrogen 9. Reference numeral 16 represents a by-pass pipe one end of which is branched from the pipe 7, while the other end is connected to the outlet pipe 13. Reference numeral 17 represents a control valve which is connected to the intermediate position of the by-pass pipe 16, and which uses, for example, a electromagnetic valve. Reference numeral 18 represents a temperature contrller which is provided to the outlet pipe 13, and which so controls the control valve 17 to open when the temperature of the tracer 12 passing through the outlet pipe 13 falls belows a predetermined temperature. Reference numeral 19 represents a pressure switch which is provided to the steam generating device 1, and which detects the change in pressure of the steam 6 in the tank 2 and controls the operation of a switches the current supply to the heater 5. Reference numeral 20 represents a tracer delivering pipe which is connected to the pipe 13, and which delivers the tracer 12 into an air stream 30 to be visually recognized.

In the air stream visualization apparatus having said structure, the supplied water 3 is heated by the heater 5 so as to generate the steam 6. The generated steam 6 is introduced into the insulating chamber 8 through the pipes 7 and 14 and the inlet pipe 11. The introduced steam 6 is rapidly cooled down by means of the liquid nitrogen 9, as a result of which, the misty tracer 12 is generated. The generated tracer 12 is passed through the outlet pipe 13, and is delivered through the tracer delivering pipe 20.

Since the control valve 17 is opened in accordance with a control signal from the temperature controller 18 when the temperature of the tracer 12 is below a predetermined temperature which has been set at the temperature controller 18, the steam 6 which passes through the pipe 7 is in part supplied to the outlet pipe



13 through the by-pass pipe 16. As a result of this, the temperature of the tracer 12 is raised up to the aforementioned predetermined temperature. When the temperature of the tracer 12 reaches the aforementioned predetermined temperature, the control valve 17 is closed in accordance with the control signal from the temperature controller 18. As a result of this, the supply of the steam 6 to the outlet pipe 13 is stopped and rise in temperature of the tracer 12 is prevented. Thanks to the aforementioned control carried out by the temperature controller 18, the tracer 12 is delivered through the tracer delivering pipe 20 with the temperature of the tracer 12 kept at a predetermined temperature. A temperature to be set at the temperature controller 18 is determined after consideration of the temperature and humidity of the clean room in which the air flow 30 is passed through, and so forth. The temperature is determined to that at which the tracer 12 can be easily captured by the air flow 30, for example, when the temperature in the clean room is 23°C to 25°C, the temperature of the tracer 12 is a predetermined value in the vicinity of the range of 50 C, or a predetermined range of the same.

The tracer 12 flows mixed with the ambient air after the tracer 12 is discharged from the pipe 20. Since the relative humidity of the tracer 12 is 100%, while that of air in the room is usually 50 to 80%, the relative humidity of the tracer 12 falls immediately after the tracer 12 is mixed with the air in the room if the temperature of the tracer 12 is the same as room temperature. As a result, small water drops in the tracer 12 start to evaporate resulting in a decrease in their diameter. Consequently, they vaporize and become invisible.

However, if the temperature of the tracer 12 is higher



than room temperature, the temperature of the tracer 12 falls, and the maximum vapor pressure also falls as soon as the tracer 12 is mixed with the ambient air. As a result, the small water drops do not evaporate for a certain distance downstream from the position at which the tracer 12 starts flowing. In fact, they condense, and the tracer 12 further flows until it is sufficiently mixed with the room air, whereupon the small water drops evaporate. As described above, the distance through which the tracer 12 does not evaporate can be increased, so that the tracer 12 can be made visible for a longer distance.

In the embodiment shown in Figs. 1 and 2, the temperature of the misty tracer 20 is raised so as to exceed room temperature by controlling the distance between the liquid level 10 and the inlet pipe 11. In the embodiment shown in Figs. 3 to 6, the temperature of the tracer 12 is raised so as to exceed room temperature by controlling the amount of vapor supplied from the by-pass 16 to the outlet pipe 13.

In a state in which the steam generating device 1 is generating the steam 6, if the steam pressure in the tank 2 exceeds a predetermined level, the pressure switch 19 detects the fact, and controls to stop the current supply to the heater 5, whereby the generating of steam 6 is controlled to a predetermined level.

The tank 2 is provided with a drain valve 21, a relief valve 22 for relieving excessive steam, a drain pan 31, a float switch 23 for stopping the current supply to the heater 5 if the amount of the water 3 becomes insufficient, and an water level gauge 32 for measuring the water level of the water 3. Pure water is used as the water 3. A water supply valve 24 is provided to the

water supply pipe 4. A control valve 25 for controlling the flow of the steam 6 and stops the supply of the steam 6 is provided to the pipe 7. The pipe 16 may be, as shown in Fig. 2, connected to the tank 2 through the control valve 25' with no branching from the pipe 7 employed. The pipes 14 and 16 may be provided with heat insulating material or a heater for the purpose of preventing the fall in temperature of the steam 6 and the return to water while it passes through the pipe 14. The temperature controller 18 may be used for stopping the current supply to the heater 5 or controlling the control valve 25 or the control valves 25 and 25' to close when a temperature inside the insulating chamber 8 rises because of exhausted liquid nitrogen 9 in the insulating chamber 8. During the delivery of the tracer 12 into the air flow 30, the liquid level 10 of the liquid nitrogen 9 is lowered because of the gradual gasfication of the liquid nitrogen 9. In this state, the distance D between the liquid level 10 and the inlet pipe 11 must be controlled to be kept contact. The way of this control is exemplified, as shown in Fig. 3, by a mechanism 27 wherein as the liquid level 10 is lowered, the inlet pipe 11 is adapted to be lowered by means of a motor 26 in accordance with a detecting signal from the liquid level gauge 15. Another mechanism 29 is exemplified, as shown in Fig. 4, in which as the liquid level 10 is lowered, the insulating chamber 8 is adapted to be raised by means of a motor 28 in accordance with a detecting signal from the liquid level gauge 15. As an alternative to the aforementioned mechanism, manual control of the inlet pipe 11 may be employed. The steam gerating device 1 and the insulating chamber 8 may be installed on a car provided with casters so as to freely move, or they may be installed at a predetermined place.



Since the present invention is constituted as mentioned above, the device according to the present invention displays the following advantages: the visible amount of the misty tracer can be increased up to 100% of the generated steam because the generated steam is rapidly cooled down by jetting it to a refrigerant, while in a device in which generated steam is not cooled down by a refrigerant, the amount of the visible misty tracer is limited to only a part of the generated steam.

By way of positively controlling the temperature of the delivered misty tracer to make it compatible with the air stream to be visually recognized, duration of the misty tracer kept in the air stream can be lengthened. The misty tracer can be delivered a long distance depending only upon the effect of the air stream while being mixed with the air stream without occurrence of the separation from the air stream, that is, while being well captured by the air stream. Consequently, the visual recognition of the state of the air stream can be accurately realized by means of the lines and patterns drawn by the tracer.

A large quantity of clean, nonpoisonous, and safety misty tracer can be easily generated. Furthermore, the generating of droplets can be significantly reduced in comparison to the conventional device which generates pure water mist.

When the visual recognition of clean air stream in a clean room for the industrial purposes is realized, the clean room itself, as well as the machines and the devices which are or are to be installed in the clean room and the manufacturing process which uses the aforementioned machines and the devices can be kept clean without any bad influence such as pollution or the like.

The visual recognition of the air stream can be realized



even while the machines and the devices are operated, or they are operated by workers.

Safety can be secured during the operation of the device.

5 Industrial Applicability.

The device according to the present invention can apply to a device for realizing the visual recognition of a clean air stream in a super-clean space. The device can also apply to a device for studying the position and layout of machines and devices in a clean room for the industrial purposes or other spaces in which air streams. _____



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An air stream visualization apparatus comprising a steam generating device, an insulating chamber in which a liquid refrigerant such as liquid nitrogen is enclosed, a pipe for connecting said steam generating device and said insulating chamber, and for introducing steam from said steam generating device to said insulating chamber, said insulating chamber being provided with an outlet pipe for delivering a misty tracer generated by way of cooling down said steam by means of said refrigerant.

2. An air stream visualization apparatus according to Claim 1, wherein a tracer of a temperature higher than that of the air stream to be visualised is discharged.

3. An air stream visualization apparatus according to Claim 1 or Claim 2, wherein said steam generating device and said outlet pipe are connected by means of a by-pass pipe to which a control valve is connected, said outlet pipe being provided with a temperature controller for controlling said control valve to open when the temperature of said tracer which passes through said outlet pipe falls below a predetermined temperature.

4. An air stream visualization apparatus according to Claim 3, wherein said by-pass pipe is braced from said pipe for introducing steam from said steam generating device to said insulating chamber.

5. An air stream visualization apparatus according to any one of Claims 1 to 3, wherein said insulating chamber is provided with an inlet pipe which is supported at a



predetermined distance away from the liquid level of refrigerant which is enclosed in said insulating chamber, said pipe for introducing steam being connected to said inlet pipe.

6. An air stream visualization apparatus according to Claim 5, wherein said inlet pipe is provided with a control mechanism for moving said inlet pipe, keeping a predetermined distance from said liquid level in accordance with the change in said liquid level which is detected by a liquid level controller or a liquid level gauge for detecting said liquid level of refrigerant enclosed in said insulating chamber.

7. An air stream visualization apparatus according to Claim 5, wherein said insulating chamber is provided with a control mechanism for moving said insulating chamber when said liquid level is changed for the purpose of keeping the distance between said inlet pipe and said liquid level constant by means of a liquid level of controller or a liquid level gauge for detecting said liquid level refrigerant enclosed in said insulating chamber.

8. An air stream visualization apparatus according to either one of Claim 1 to Claim 7, wherein a valve is provided along said pipe for introducing steam into said insulating chamber.

9. An air stream visualization apparatus according to any one of Claims 1 to 8, wherein said steam generating device is provided with a pressure switch for detecting a change in steam pressure and controlling the operation of a heating means disposed in said steam generating device.



10. An air stream visualization apparatus according to anyone of Claims 1 to 9, wherein a tank which forms said steam generating device is provided with a water level gauge for measuring water level in said tank.

11. An air stream visualization apparatus according to any one of Claims 1 to 10, wherein a temperature controller for detecting the temperature of the delivered steam is provided to a steam delivering port of said insulating chamber.

12. An air stream visualising device, comprising:

a steam generating first container device, having heating means therein, said first container being disposed to receive a steam producing liquid therein, a vertical steam delivery pipe with a valve extending out of said first container, a heated horizontal carrying pipe coupled to said valve to receive delivered steam;

pressure sensing means coupled to said first container to detect changes in steam pressure in said container so as to control a switch operating the electricity supply to the heating means;

an insulating second container, with a bottom member, said second container being designed to hold a liquid refrigerant such as liquid nitrogen over said bottom member, a vertical steam inlet pipe member coupled to said horizontal carrying pipe and extending down into said second container for feeding steam therein from the lower end of said pipe member;

a liquid level controller in said second container cooperating with a control mechanism outside said second container, said control mechanism acting to raise or lower one



of said members with respect to the other of said member in response to signals from said liquid level controller so as to define a predetermined depth between the liquid level of the refrigerant in said second container and the lower end of said pipe member;

an outlet pipe extending vertically out from said second container ending in a mist delivery pipe with mist delivery apertures; and,

temperature control means connected to said outlet pipe.

13. A device as claimed in claim 12 wherein said control mechanism acting to raise or lower one of said members includes rack and pinion gearing.

14. A device as claimed in claim 12 wherein the liquid level controller extends into the refrigerant and the control mechanism which is outside the second container raises and lowers said bottom member.

15. A device as claimed in claim 12 wherein the liquid level controller extends into the refrigerant and the control mechanism raises and lowers the steam pipe member.

16. An air stream visualization apparatus substantially as herein described with reference to and as illustrated in any one or more of the accompanying drawings.

Dated this 11th day of October, 1990

MIDORI ANZEN INDUSTRY CO. LTD.
By It's Patent Attorneys:

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Fellows Institute of Patent
Attorneys of Australia



FIG. 1

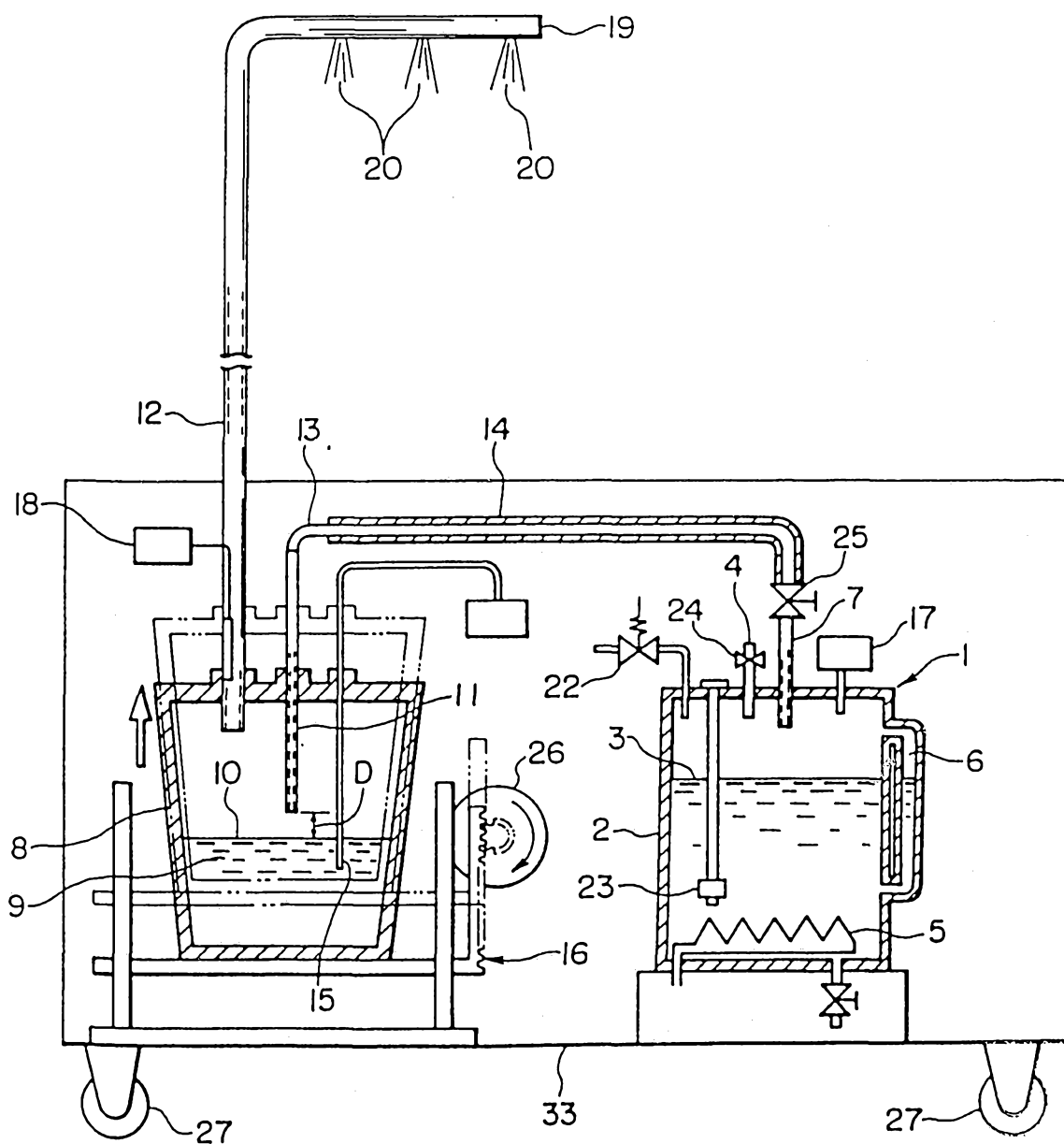


FIG. 2

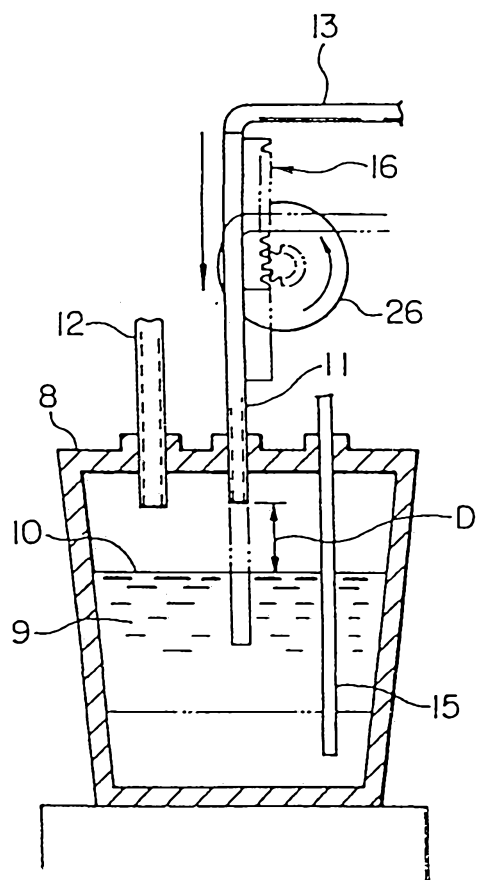


FIG. 3

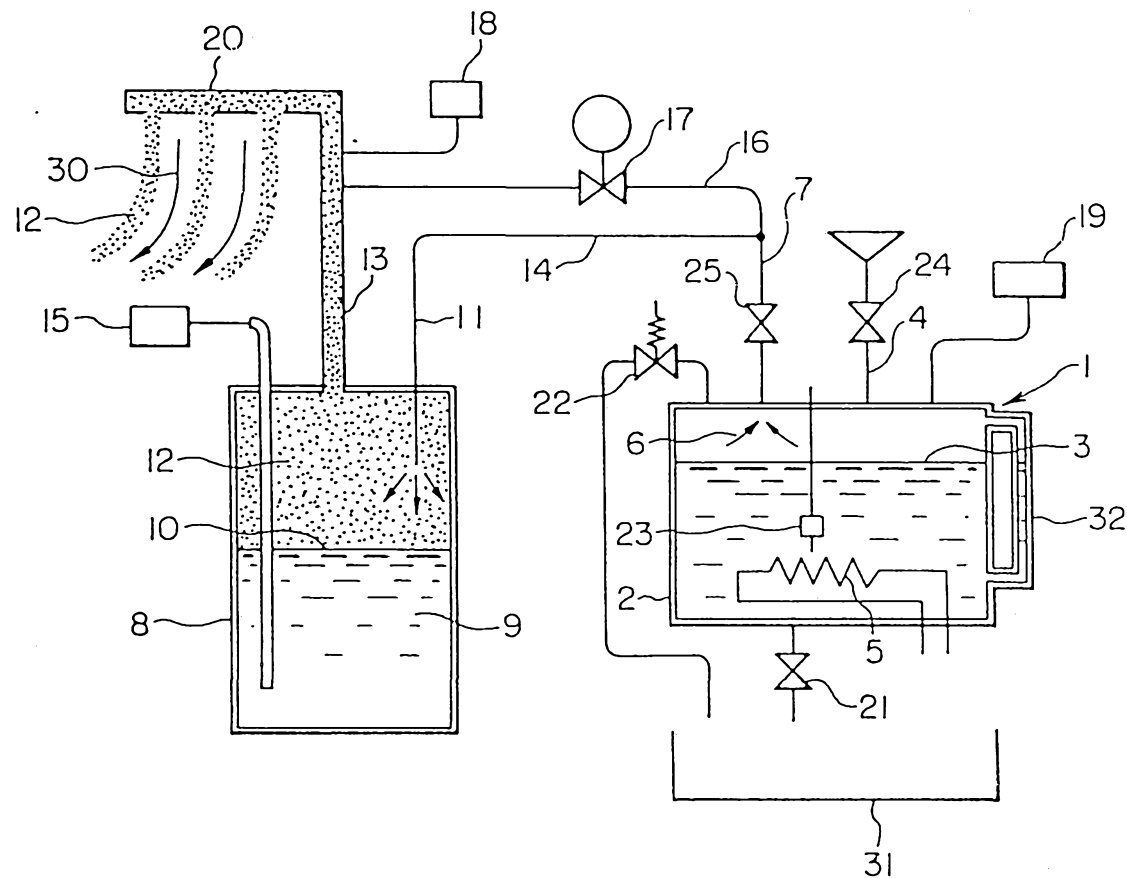


FIG. 4

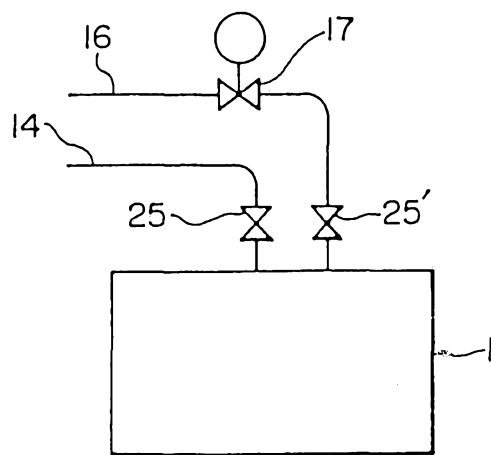


FIG. 5

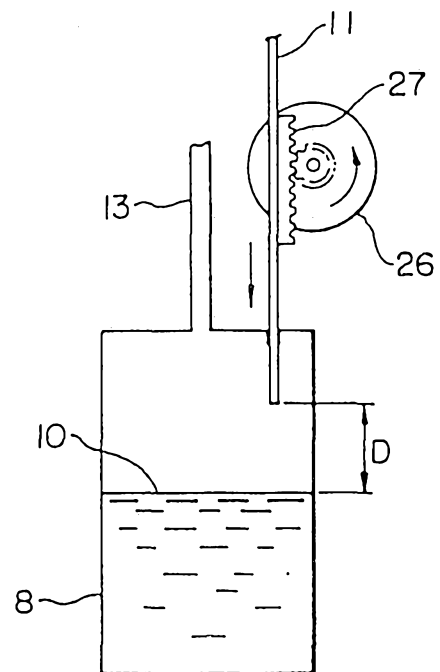
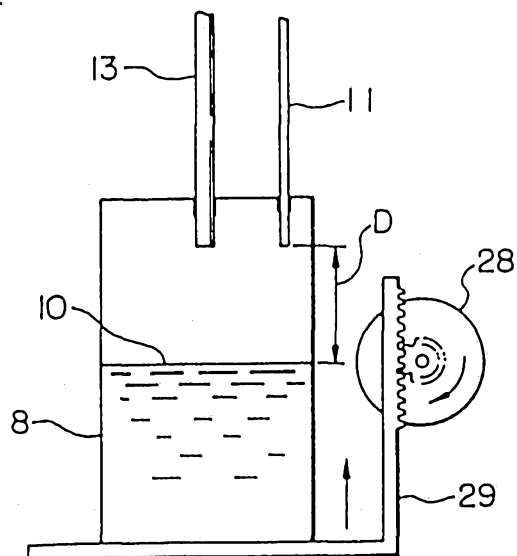


FIG. 6



INTERNATIONAL SEARCH REPORT

International Application No PCT/JP88/00300

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl ⁴ G01N1/28, G01M9/00, B05B7/00, B05B7/14		
II. FIELDS SEARCHED		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC	G01N1/28, G01M9/00, B05B7/00, B05B7/14	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
Jitsuyo Shinan Koho	1926 - 1987	
Kokai Jitsuyo Shinan Koho	1971 - 1987	
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
P	JP, U, 62-193564 (Mitsubishi Electric Corporation) 9 December 1987 (09. 12. 87) (Family: none) *	1, 5
* Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document 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) "O" document referring to an oral disclosure, use, exhibition or other means "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 "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		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
June 13, 1988 (13. 06. 88)	June 27, 1988 (27. 06. 88)	
International Searching Authority	Signature of Authorized Officer	
Japanese Patent Office		

国 際 調 査 報 告

国際出願番号PCT/JP 88/ 00300

I. 発明の属する分野の分類		
国際特許分類 (IPC) Int. Cl. G 0 1 N 1 / 2 8, G 0 1 M 9 / 0 0, B 0 5 B 7 / 0 0, B 0 5 B 7 / 1 4		
II. 国際調査を行った分野		
調 査 を 行 っ た 最 小 限 資 料		
分 類 体 系	分 類 記 号	
IPC	G 0 1 N 1 / 2 8, G 0 1 M 9 / 0 0, B 0 5 B 7 / 0 0, B 0 5 B 7 / 1 4	
最小限資料以外の資料で調査を行ったもの		
日本国実用新案公報 1926-1987年 日本国公開実用新案公報 1971-1987年		
III. 関連する技術に関する文献		
引用文献の カテゴリー	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	請求の範囲の番号
P	JP, U, 62-193564 (三菱電機株式会社) 9. 12月. 1987 (09. 12. 87) (ファミリーなし)	1, 5
引用文献のカテゴリー 「A」 特に関連のある文献ではなく、一般的技術水準を示すもの 「E」 先行文献ではあるが、国際出願日以後に公表されたもの 「L」 優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献 (理由を付す) 「O」 口頭による開示、使用、展示等に言及する文献 「P」 国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献 「T」 国際出願日又は優先日の後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの 「X」 特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの 「Y」 特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの 「&」 同一パテントファミリーの文献		
IV. 認 証		
国際調査を完了した日 13. 06. 88	国際調査報告の発送日 27. 06. 88	
国際調査機関 日本国特許庁 (ISA/JP)	権限のある職員 特許庁審査官 菊 井 広 行	2 G 7 3 2 4