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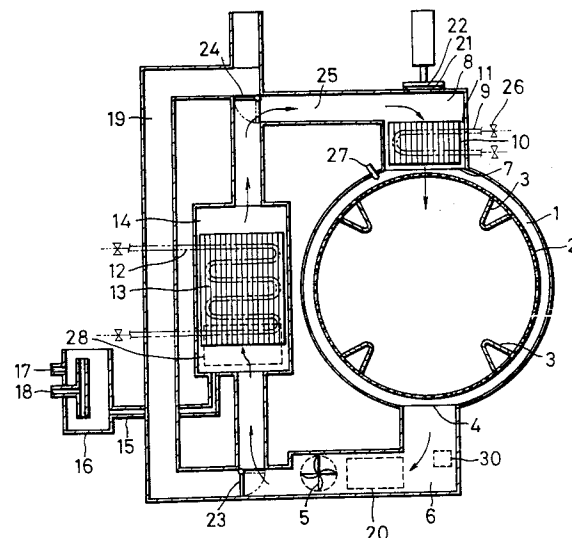
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APPARATUS FOR DRYING CLOTHES AND THE LIKE AND METHOD THEREOF.

Heated air is delivered into a drying chamber, a solvent contained in an article to be dried which is housed in a drying drum in the drying chamber is evaporated together with moisture, this air containing the vapor of solvent and the moisture is cooled and the moisture and the vapor of solvent are separated in liquefied conditions. An air blower (5) is provided in an exhaust path (6) of the drying chamber (1) provided with a drying drum (2). A heating chamber (11) is provided in an air intake path (8) of the drying chamber (1). A cooling chamber (14) communicating with a solvent recovery path (15) is allowed to communicate with the air intake path (8) and the exhaust path (6), to thereby form a solvent recovery circulating path (25). An openable outdoor air introducing opening (21) for introducing outdoor air is provided in the air intake path (8). A change-over damper (24) for selectively allowing the air intake path (8) to communicate with an air exhaust path on the side of outlet of the cooling chamber. The vapor of solvent contained in the exhausted air can be recovered as much as

possible to be released to the atmosphere in a low odor condition.



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TECHNICAL FIELD

The present invention relates to a drying device and method for drying and at the same time removing cleaning solvent from clothes and other fabric which have been cleaned using petroleum-based dry-cleaning solvent.

BACKGROUND ART

Conventional dryers for drying clothes and other fabric which have been cleaned using petroleum-based dry-cleaning solvent call for, as described in, for example, Japanese Utility Model Laid Open No. 73298/1984, recycling air by conveying air heated in a heating chamber into a drying chamber, cooling the air exhausted from the drying chamber in a cooling chamber, liquifying solvent vapor and moisture contained in the exhaust air, then heating the air again, from which solvent vapour has been removed, in the heating chamber and conveying it into the drying chamber in order to dry said items while recovering dry-cleaning solvent.

Widely known among such dryers is a mechanism for detecting the solvent concentration inside the circulating route in order to intake the outside atmosphere into the drying chamber and exhausting the air which has passed through the drying chamber to the outside of the device when detecting the concentration to be high enough to present the danger of explosion of the solvent vapor - a high concentration may be caused by a stoppage or decrease in ventilation - so that said explosion could be prevented.

When solvent vapor becomes highly concentrated, dryers having a conventional structure as above are able to dilute the concentration of the solvent vapor in the drying chamber by intaking the outside air, thereby eliminating the danger of an explosion. On the other hand, instead of recovering solvent vapor, they discharge it together with exhaust air into the outside atmosphere, which presents the problem of releasing the disagreeable smell of the solvent vapor.

In case of drying laundered clothes, too, conventional dryers pass air through a cooling chamber equipped with a condenser in the same manner as when drying dry-cleaned items. As a result, when drying laundered objects, the drying efficiency is poor due to high ventilation resistance.

An object of the present invention is the provision of a device and a method for drying clothes and other similar fabric which solves the above problems of conventional cloth dryers by means of cooling air passed through the drying chamber before exhausting it into the outside atmosphere, in order to recover as much solvent vapor from the

exhaust air as possible and also reduce, by means of cooling, the smell of however little solvent vapor which might remain in the exhausted air.

Another object of the present invention is the provision of a method for drying clothes and other similar fabric which recovers cleaning solvent from dry-cleaned items while drying them in the solvent recovery circulating process and, in case of drying laundered clothes and other fabric which do not use petroleum-based dry-cleaning solvent, makes exhaust air pass through a ventilation route with low ventilation resistance, thereby achieving high drying efficiency.

DISCLOSURE OF INVENTION

A drying device according to the present invention has a solvent recovery circuit which is formed with a drying chamber provided with a drying drum, and air discharge channel connected to an exhaust port of the drying chamber and provided with a blower, an air intake channel connected to an air intake port of the drying chamber and provided with a heating chamber, and a cooling chamber to which a solvent recovery channel, as well as said air discharge channel and the air intake channel, are connected, said cooling chamber positioned between the air discharge channel and the air intake channel; wherein the air intake channel of the solvent recovery circuit is provided with an open air inlet port which is capable of opening and closing in order to direct the outside atmosphere into the air intake channel; and a switching damper is installed at the outlet end of the cooling chamber in order to cause the outlet end to be selectively connected to said air intake channel or an exhaust vent.

When drying clothes or other objects to be dried in the drying chamber, air heated in the heating chamber is conveyed into the drying chamber to vaporize solvent and moisture contained in the objects in the drying drum; air containing the vaporized solvent and moisture is conveyed into the cooling chamber to be cooled therein so that the moisture and the solvent is liquified and thus separated from the air; and the cooled air is heated again in the heating chamber and then conveyed into the drying chamber. Thus, air circulates in order from the heating chamber to drying chamber and the cooling chamber, recovering solvent in the process. When the concentration level of solvent vapor becomes too high or when introducing the outside atmosphere in the circulation process of solvent recovery or discharging air in the drying chamber into the outside air at the end of the drying process, air is cooled before being exhausted. The solvent vapor in the air is liquified and separated from the air by cooling and is thus

recovered. Therefore, recovery efficiency is improved, and even if some solvent still remains in the air discharged into the open air, its odor is relatively low because it has been cooled.

The cooling chamber of a clothes dryer according to the present invention is provided with a condenser therein as well as a viewport formed at a side thereof, through which the inside of the cooling chamber can be seen from the outside.

As the inside of the cooling chamber can be easily observed from the outside through the viewport, equipment of the cooling chamber, such as the condenser can be easily maintained and checked.

A clothes dryer according to the present invention is also provided with a concentration sensor which detects concentration of solvent vapor in the solvent recovery channel and, when the concentration level is detected to be in a preset range, opens the said open air inlet port and switches the switching damper at the same time so that the outlet end of the cooling chamber becomes connected to the open air end of the exhaust vent.

With the configuration as above, when the concentration sensor detects during the solvent recovery circulating process that concentration of solvent vapor is in a specified range, the open air inlet port is opened while the outlet end of the cooling chamber becomes connected to the open air end of the exhaust vent by means of switching the damper at the outlet end of the cooling chamber in order to lower the temperature in the drying chamber and reduce the concentration of solvent vapor, thereby preventing an explosion.

A clothes dryer according to the present invention is further provided with a temperature sensor which detects temperature in the solvent recovery channel and, when detecting temperature to exceed a specified degree, opens the open air inlet port and switches the switching damper in order to connect the outlet end of the cooling chamber to the open air end of the exhaust vent.

With the configuration as below, when the temperature sensor detects during the circular process of solvent recovery that the temperature has been increased to exceed a specified degree, the open air inlet port is opened while the outlet end of the cooling chamber becomes connected to the open air end of the exhaust vent by means by switching the damper at the outlet end of the cooling chamber in order to lower the temperature in the drying chamber and as well as the temperature of the solvent vapor, thereby preventing an explosion.

A clothes dryer according to the present invention is further provided with an exhaust vent which is formed parallel to the cooling chamber of the solvent recovery circuit and open to the outside atmosphere, an open air inlet port in the air intake

channel of the solvent recovery circuit, said open air inlet port capable of opening and closing for introducing the outside air, and a switching damper selectively connecting the cooling chamber or the exhaust vent to the outlet end of the air discharge channel.

With the configuration as above, when drying clothes and other objects cleaned without using dry-cleaning solvent but other means such as laundry, the damper is switched to connect the exhaust vent to the outlet end of the air discharge channel while the open air inlet port is opened to introduce the outside atmosphere into the air intake channel; air heated by the heater is introduced into the drying chamber where moisture contained in the objects is vaporized; and the air containing the vapor is exhausted through the air discharge channel to the outside atmosphere, thus bypassing the cooling chamber. As the air does not go through the cooling chamber, heated air efficiently moves through the drying chamber because of low ventilation resistance, thereby achieving effective drying performance.

The method for drying clothes and other objects according to the present invention has the solvent recovery circulating process which consists of supplying air heated in the heating chamber into the drying chamber in which a drying drum is installed, vaporizing solvent from the objects, introducing solvent vapor and air from the exhaust port of the drying chamber into the cooling chamber through the air discharge channel, recovering solvent from the solvent recovery channel by means of liquifying the solvent vapor, and reheating the air in the heating chamber and directing it into the drying chamber; and the open air introduction process which consists of opening an open/shut open air inlet port to supply the outside air into said drying chamber, introducing solvent vapor and the air in the drying chamber into the cooling chamber through the air discharge channel, recovering solvent from the solvent recovery channel by means of liquifying solvent vapor, and discharging the air through an exhaust vent which is connected to the outlet end of said cooling chamber, said method selectively and alternatively performing said solvent recovery circulating process and said open air introduction process by turns.

The method according to the present invention also calls for supplying the outside air from an open air inlet port of the air intake channel into the drying chamber for the purpose of lowering the temperature in the drying chamber as well as reducing the concentration of solvent vapor, thereby preventing an explosion.

The method for drying clothes and other objects according to the present invention calls for switching and repeating, at predetermined regular

intervals, the solvent recovery circulating process and the open air introduction process.

The method for drying clothes and other objects according to the present invention further calls for detecting the concentration of solvent vapor in the drying chamber in the solvent recovery circuit and switching the solvent recovery circulating process to the open air introduction process when detecting the concentration to be in a specified range.

The method for drying clothes and other objects according to the present invention further calls for detecting the temperature in the drying chamber in the solvent recovery circuit and switching the solvent recovery circulating process to the open air introduction process when detecting the temperature to be more than a specified degree.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a preferred embodiment of a clothes dryer according to the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

For the sake of better understanding the present invention, explanation is given hereunder, referring to the attached drawing.

Numeral 1 denotes a drying chamber, in which generally cylindrical-shaped drying drum 2 made of punching metal or other similar materials and having numerous ventilation holes therearound is installed. Objects to be dried, such as clothes, can be put in and taken out of drying drum 2 through a door (not shown) on the front panel of said drying chamber 1. Stirring fan 3 for stirring objects to be dried is installed in drying drum 2.

Exhaust port 4 is open at the bottom of drying chamber 1, and air discharge channel 6 provided with blower 5 is connected to said exhaust port 4. Air intake port 7 is open at the top of drying chamber 1, and heating chamber 11 provided with heater 10 which has steam pipe 9 is formed in air intake channel 8 connected to said air intake port 7.

Cooling chamber 14, provided with condenser 13 which has cooling water pipe 12, is connected to air discharge channel 6, the outlet end of cooling chamber 14 leading to said air intake channel 8. Solvent recovery channel 15, to which solvent/moisture separator 16 is attached, is connected to the bottom of cooling chamber 14, solvent/moisture separator 16 having solvent discharge port 17 and water discharge port 18, which are vertically arranged in relation to each other in order to separate solvent and water by means of

the difference in their specific gravities.

Exhaust vent 19 installed parallel to cooling chamber 14 is connected to the outlet end of air discharge channel 6, the outlet end of exhaust vent 19 opening to the outside air.

Air discharge channel 6 is provided with Linton filter 20 which is installed at the intake side of blower 5.

Open/shut open air intake port 21 for taking in the outside air is bored in air intake channel 8, open air intake port 21 being provided with the first damper 22 which can be opened and closed by such means as an air cylinder, a hydraulic cylinder, an electromagnetic device, etc.

The second damper 23 for the selective connection of air discharge channel 6 to cooling chamber 14 or exhaust vent 19 is installed at the outlet end of exhaust channel 6. The third damper 24 for switching connection of cooling chamber 14 to said air intake channel 8 or exhaust vent 19 is installed at the outlet end of cooling chamber 14, both dampers 23 and 24 capable of opening and closing by such means as an air cylinder, a hydraulic cylinder, an electromagnetic device, etc.

With the configuration as above, solvent recovery circuit 25 is formed with said drying chamber 1, air discharge channel 6 connected to exhaust port 4 of drying chamber 1, and cooling chamber 14 connected to the outlet end of exhaust channel 6, the outlet end of cooling chamber connected to air intake channel 8.

Steam pipe 9 of said heater 10 is provided with adjusting valve 26, which can be adjusted, allowing heated 10 to heat the air to an appropriate temperature for objects to be dried.

Drying chamber 1 is also provided with raw steam blowing nozzle 27.

Cooling chamber 14, which has condenser 13, is also provided with open/shut viewport 28, through which the inside of the cooling chamber can be seen from the outside.

With the configuration as above, clothes and other objects to be dried which have been cleaned with petroleum-based dry-cleaning solvent are put in drying drum 2 of drying chamber 1. Solvent recovery circuit 25 is formed by closing open air inlet port 21 of air intake channel 8 with the first damper 22, connecting the outlet end of air discharge channel 6 to cooling chamber 14 by means of the second damper 23, and connecting the outlet end of cooling chamber 14 to air intake channel 8 by means of the third damper 24.

Then, by means of circulating steam through steam pipe 9 of heater 10 and driving blower 5, air heated by heater 10 of air intake channel 8 is introduced into drying chamber 1, petroleum-based dry-cleaning solvent and moisture contained in the drying objects in drying drum 2, which is being

rotated, is vaporized and directed through air discharge channel 6 into cooling chamber 14 to be liquified therein by cooling.

The liquidized solvent moisture is discharged into solvent recovery channel 15, and solvent which is introduced from solvent recovery channel 15 into solvent/moisture separator 16 is separated due to the differences in specific gravities and recovered from solvent discharge port 17, and moisture is discharged from water discharge port 18 located below solvent discharge port 17. The air, divested of solvent and moisture, is introduced into air intake channel 8 and reheated by heater 10. As this process is sequentially repeated, the objects are dried, and the solvent is recovered.

During this solvent recovery circulating process, raw steam is injected from raw steam blowing nozzle 27 into drying chamber 1 at appropriate times in order to increase the humidity in drying chamber 1 and give some moisture to the objects in drying drum 2, thereby preventing generation of static electricity and, consequently, explosion of solvent vapor that might otherwise be caused by electrostatic discharge.

When the above solvent recovery circulating process has continued for a period of, for example, 15 minutes, open air inlet port 21 for continually introducing the outside air into air intake channel 8 is opened by the first damper 22 using a timer control, while the third damper 24 is switched to connect the outlet end of cooling chamber 14 to the open air through exhaust vent 19, in order to direct the outside air from open air inlet port 21 of air intake channel 8 into drying chamber 1, thereby lowering the temperature in drying chamber 1, reducing the concentration of the solvent vapor and, consequently, preventing an explosion. At that time, the outlet end of air discharge channel 6 remains to be connected to cooling chamber 14 by means of the second damper 23.

Solvent vapor and air discharged from drying chamber 1 is directed through air discharge channel 6 into cooling chamber 14, where vaporized solvent is liquified and recovered through the solvent recovery channel, and the cooled air is exhausted through exhaust vent 19. Thus, the open air introduction process and the exhausting process described above are conducted for a period of, for example, 5 seconds. Then, the system is switched without a break to the previously described solvent recovery circulating process by closing, with the first damper 22, open air inlet port 21 for introducing the outside air into air intake channel 8, and connecting the outlet end of cooling chamber 14 to air intake channel 8 by means of switching the third damper 24 while maintaining the connection of the outlet end of air discharge channel 6 into cooling chamber 14 by means of the second damper 23,

and the solvent recovery circulating process is conducted for the period of, for example, 30 seconds. These two processes, i. e. the open air introduction process and the solvent recovery circulating process, are alternatively conducted for the period of, for example, 5 - 10 minutes. As the air exhausted during the open air introduction process is chilled, the solvent recovery ration increases, and even if some amount of solvent vapor remains in the exhaust air, there will not be much smell.

After the cycle operation of the open air introduction process and the solvent recovery circulating process, the circular cooling process is initiated, without halting the system, by means of the timer control; open air inlet port 21 for introducing the outside air into air intake channel 8 is closed by the first damper 22, the outlet end of air discharge channel 6 is connected to cooling chamber 14 by means of the second damper 23, the outlet end of cooling chamber 14 is connected to air intake channel 8 by means of switching the third damper 24, heater 10 of air intake channel 8 is stopped, and the air cooled in cooling chamber 14 is circulated to drying chamber 1, thereby cooling drying chamber 1 as well as the objects to be dried in drying drum 2. After conducting this circular cooling operation for a period of, for example, 5 - 10 minutes, and then without break, the timer control opens open air inlet port 21 to introduce the outside air into air intake channel 8 with the first damper 22 and switches the third damper 23 to connect the outlet end of cooling chamber 14 to the outside air through exhaust vent 19, while keeping the outlet end of air discharge channel 6 to be connected to cooling chamber 14 by means of the second damper 23. In this state, heater 10 is stopped, the outside air is supplied from open air inlet port 21 into air intake channel 8 to cool drying chamber 1 with its low temperature and is cooled in cooling chamber 14 and then exhausted to the outside from the open air end of exhaust vent 19. Thus, drying chamber 1 is deodorized, and the odor of the exhaust air is also reduced by cooling. After this deodorizing process is conducted for the period of, for example, 1 minute, the entire drying process is completed.

In case of drying objects laundered without using petroleum-based dry-cleaning solvent, open air inlet port 21 for introducing the outside air into air intake channel 8 is opened by the first damper 22, the outlet end of air discharge channel 6 is connected to exhaust vent 19 by the second damper 23, and the inlet end of air intake channel 8 is closed by the third damper 24. Then, when steam is circulated through steam pipe 9 of heater 10 while blower 5 is driven, the air heated by heater 10 of air intake channel 8 is introduced into drying

chamber 1, where moisture contained in the objects in drying drum 2, which is being rotated, is vaporized, and the vaporized moisture is then exhausted together with the air through air discharge channel 6 and exhaust vent 19 into the outside air. As the air thus exhausted to the outside does not pass through cooling chamber 14, it moves smoothly without receiving much ventilation resistance, and the drying efficiency is therefore improved.

Air discharge channel 6 of drying chamber 1 is provided with temperature sensor 30 so that when temperature sensor 30 detects the temperature of the air discharged from drying chamber 1 to exceed a specified degree, signals from temperature sensor 30 cause the first damper 22 of open air inlet port 21 to open and switch the third damper 24 to connect the outlet end of cooling chamber 14 to the open-air end of exhaust vent 19.

With the configuration as above, when temperature sensor 30 detects the temperature to exceed a specified degree during the solvent recovery circulating process, open air inlet port 21 is opened, while the third damper 24 at the outlet end of cooling chamber 14 is switched to connect the outlet end of cooling chamber 14 to the open air end of exhaust vent 19, thereby lowering the temperature of solvent vapor, as well as the temperature in drying chamber 1, and consequently preventing an explosion. After conducting the open air introduction process for a specified time period, open air inlet port 21 is closed while the third damper 24 at the outlet end of cooling chamber 14 is switched to connect the outlet end of cooling chamber 14 to air intake channel 8. After conducting this solvent recovery circulating process for a specified time period, the system switches to perform the open air introduction process again, and after alternatively repeating the open air introduction process and the solvent recovery circulating process, the entire drying process is completed with the aforementioned cooling process which is followed by the deodorizing process.

Further, it is possible to install a concentration sensor for detecting the concentration of solvent vapor instead of said temperature sensor 30 so that when the concentration sensor detects the concentration of solvent vapor to be in a specified range where there is the strong possibility of explosion of solvent vapor, signals from the concentration sensor cause said open air inlet port 21 to open and switch the third damper 24 at the outlet end of cooling chamber 14 to connect the outlet end of cooling chamber 14 to the open air end of exhaust vent 19.

With the configuration as above, when concentration sensor 30 detects the concentration of solvent vapor to be in a specified range, e. g. 1% -

6%, during the solvent recovery circulating process, open air inlet port 21 is opened, while the third damper 24 at the outlet end of cooling chamber 14 is switched to connect the outlet end of cooling chamber 14 to the open air end of discharged air duct 19, thereby reducing the concentration of the solvent vapor, as well as lowering the temperature of the temperature in drying chamber 1, and consequently preventing an explosion. After conducting the open air introduction process for a specified time period, open air inlet port 21 is closed while the third damper 24 at the outlet end of cooling chamber 14 is switched to connect the outlet end of cooling chamber 14 to air intake channel 8.

After conducting this solvent recovery circulating process for a specified time period, the system switches to perform the open air introduction process again, and after alternatively repeating the open air introduction process and the solvent recovery circulating process, the entire drying process is completed with the aforementioned cooling process which is followed by the deodorizing process.

Furthermore, as the inside of cooling chamber 14 can be easily observed from the outside through viewport 28, equipment of the cooling chamber, such as the condenser, can be easily maintained and checked.

Although the above embodiment is explained assuming that condenser 13 of cooling chamber 14 uses cooling water pipe 12, it is possible to use circulated water or other cooling agent chilled by a cooling device.

INDUSTRIAL APPLICABILITY

The present invention is suitable for drying clothes and other objects cleaned with petroleum-based dry-cleaning solvent.

Claims

1. A drying device for drying clothes and other such items, said drying device having a solvent recovery circuit which is formed with a drying chamber provided with drying drum, an air discharge channel having a blower and connected to an exhaust port of said drying chamber, an air intake channel having a heating chamber and connected to an air intake port of said drying chamber and a cooling chamber which is installed between and connected to said exhaust channel and the air intake channel and is also connected to a solvent recovery channel; wherein:

the air intake channel of said solvent recovery circuit is provided with an open air inlet

- port for introducing the outside air into the air intake channel, said open air inlet being capable of easily opening and closing; and
 a switching damper is installed at the outlet end of said cooling chamber in order to selectively connect said outlet end to said air intake channel or the open air end of an exhaust vent.
2. A drying device of Claim 1 for drying clothes and other such items, wherein the cooling chamber is provided with a condenser, which is installed therein, and a viewport through which the inside of the the cooling chamber can be observed from the outside.
3. A drying device for drying clothes and other such items of Claim 1, which is provided with a concentration sensor for detecting the concentration of solvent vapor in the solvent recovery channel, wherein, when detecting the solvent vapor concentration to be in a specified range, said concentration sensor causes the open air inlet port to be opened and the switching damper to be switched to connect the outlet end of the cooling chamber to the open air end of the exhaust vent.
4. A drying device of Claim 1 for drying clothes and other such items, which is provided with a temperature sensor for detecting the temperature of the solvent recovery circuit, wherein, when detecting the temperature above a specified degree, said temperature sensor causes the open air inlet port to be opened and the switching damper to be switched to connect the outlet end of the cooling chamber to the open air end of the exhaust vent.
5. A drying device for drying clothes and other such items, said drying device having a solvent recovery circuit which is formed with a drying chamber provided with a drying drum, an air discharge channel having a blower and connected to the exhaust port of said drying chamber, an air intake channel having a heating chamber and connected to the air intake port of said drying chamber and a cooling chamber which is installed between and connected to said exhaust channel and the air intake channel and is also connected to a solvent recovery channel; wherein:
 an exhaust vent is formed parallel to said cooling chamber;
 the air intake channel of said solvent recovery circuit is provided with an open air inlet port for introducing the outside air into the air intake channel, said open air inlet port being capable of easily opening and closing; and
 a switching damper is installed at the outlet end of said air discharge channel in order to be selectively connected to the open air of said cooling chamber or chamber or the exhaust vent.
6. A method for drying clothes and other such items, which includes the solvent recovery circulating process consisting of supplying air heated in a heating chamber into a drying chamber provided with a drying drum, vaporizing solvent from objects to be dried, introducing the solvent vapor and the air from the the exhaust port of the drying chamber into a cooling chamber through an air discharge channel, liquifying and recovering the solvent vapor from a solvent recovery channel, reheating the air in said heating chamber and supplying the reheating air into the drying chamber; and
 the open air introduction process consisting of opening and open/shut open air inlet port to supply the outside air into said drying chamber, introducing vaporized solvent and the air in the drying chamber into the cooling chamber through the air discharge channel, liquifying and recovering the solvent from the solvent recovery channel and exhausting from the open air end of the exhaust vent which is connected to the outlet end of said cooling chamber; wherein:
 said method calls for alternatively performing said solvent recovery circulating process and said open air introduction process.
7. A drying method of Claim 6 for drying clothes and other such items, wherein the solvent recovery process and the open air introduction process are repeated, the system switching between said two processes at specified intervals of time.
8. A drying method of Claim 6 for drying clothes and other such items, which calls for detecting the concentration of solvent vapor in the drying chamber in the solvent recovery circuit, and, when detecting the concentration level in a specified range, switching the system from the solvent recovery circulating process to the open air introduction process.
9. A drying method of Claim 6 for drying clothes and other such items, which calls for detecting the temperature in the drying chamber in the solvent recovery circuit, and, when detecting the temperature above a specified degree, switching the system from the solvent recovery

circulating process to the open air introduction process.

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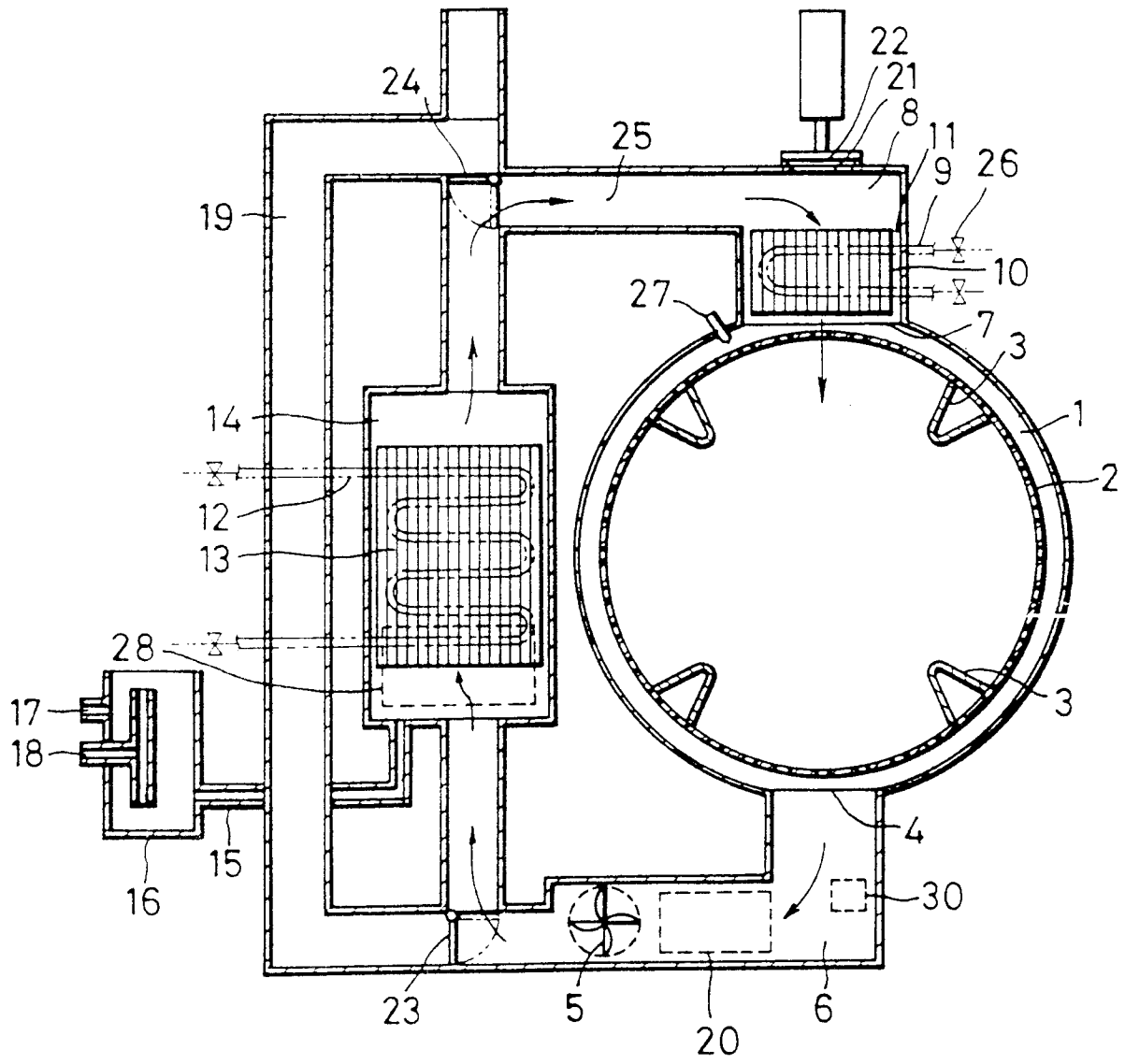
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INTERNATIONAL SEARCH REPORT

International Application No PCT/JP91/00564

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|---|--|-------------------------------------|--|--|
| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ | | | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC | | | | |
| Int. Cl ⁵ D06F43/08 | | | | |
| II. FIELDS SEARCHED | | | | |
| Minimum Documentation Searched ⁷ | | | | |
| Classification System | Classification Symbols | | | |
| IPC | D06F43/00-43/08 | | | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ | | | | |
| Jitsuyo Shinan Koho | 1912 - 1991 | | | |
| Kokai Jitsuyo Shinan Koho | 1971 - 1991 | | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ | | | | |
| Category ⁹ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ | | |
| Y | JP, Y2, 63-42953 (Sanyo Electric Co., Ltd.), February 10, 1988 (10. 02. 88), (Family: none) | 1, 4, 9 | | |
| Y | JP, A, 59-44572 (Asahi Chemical Industry Co., Ltd.), March 13, 1984 (13. 03. 84), (Family: none) | 1, 5-7 | | |
| Y | JP, Y2, 59-24319 (Sanyo Electric Co., Ltd.), July 18, 1984 (18. 07. 84), (Family: none) | 1, 4 | | |
| A | JP, B1, 49-49426 (Fukuji Obata), December 27, 1974 (27. 12. 74), (Family: none) | 1-9 | | |
| <p>[*] Special categories of cited documents: ¹⁰</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; border: none;"> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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</p> <p>"8" document member of the same patent family</p> </td> </tr> </table> | | | <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> | <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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</p> <p>"8" document member of the same patent family</p> |
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| IV. CERTIFICATION | | | | |
| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report | | | |
| July 29, 1991 (29. 07. 91) | July 29, 1991 (29. 07. 91) | | | |
| International Searching Authority | Signature of Authorized Officer | | | |
| Japanese Patent Office | | | | |