(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 480 062 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
28.01.1998 Bulletin 1998/05

(21) Application number: **91908178.6**

(22) Date of filing: **25.04.1991**

(51) Int Cl.[6]: **D06F 43/08**

(86) International application number:
PCT/JP91/00564

(87) International publication number:
WO 91/16489 (31.10.1991 Gazette 1991/25)

(54) **APPARATUS FOR DRYING CLOTHES AND THE LIKE AND METHOD THEREOF**

VERFAHREN UND VORRICHTUNG ZUM TROCKNEN VON WÄSCHE ODER DERGLEICHEN

PROCEDE ET APPAREIL DE SECHAGE DU LINGE OU ANALOGUE

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI SE

(30) Priority: **26.04.1990 JP 111428/90**
26.04.1990 JP 111429/90

(43) Date of publication of application:
15.04.1992 Bulletin 1992/16

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(56) References cited:
FR-A- 1 092 058
FR-A- 1 246 680
JP-A- 5 944 572
JP-B- 4 949 426
JP-Y- 5 924 319
JP-Y- 6 342 953
US-A- 3 831 294
US-A- 4 281 465

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EP 0 480 062 B1

Printed by Jouve, 75001 PARIS (FR)

Description

TECHNICAL FIELD

The present invention relates to a drying device 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 vapor 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 toghether with exhaust air into the outside atmoshpere, 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 efficency is poor due to high ventilation resistance.

For details of a drying device breadly according to the classifying portion of claim 1 herein, the reader is directed to the disclosure in US-A-4 281 465.

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 device 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.

According to the present invention there is provided a drying device for drying clothes and other such items, including a solvent recovery circuit and comprising a drying chamber having a drying drum, an air discharge channel provided with a blower and connected to an exhaust port of said drying chamber, an air intake channel connected to an air intake port of said drying chamber, which air intake channel includes a heater, and a cooling chamber located between and connected by means of a first exhaust duct to the air intake channel and to the air discharge channel, which cooling chamber is a part of a solvent recovery circuit which includes said first exhaust duct and wherein:

- the air intake channel of the solvent recovery circuit has an open air inlet port for introducing outside air into the air intake channel, said open air inlet port being capable of easily opening and closing;
- a switching damper at the outlet end of said cooling chamber and an atmospheric air vent for the said first exhaust duct which damper is constructed and arranged to selectively connect the outlet of the cooling chamber to that atmospheric air vent or to said solvent recovery circuit,

characterized by a second exhaust duct being arranged in parallel with said first exhaust duct including the cooling chamber, to permit selective bypassing of the cooling chamber by air discharged from the drum; and

a further switching damper between the air discharge channel, the inlet end of said first exhaust duct which includes the cooling chamber and between an inlet of said second exhaust duct which further damper is constructed and arranged to permit air discharged from the drying chamber to either pass through said first exhaust duct including the cooling chamber or to pass through said second exhaust duct.

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 can be 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 can also be 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 can further be 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 above, 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 of 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 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 drycleaning 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.

A method for dryingclothes and other objects with a device according to the present invention uses a solvent recovery circulating process which consists of supplying air heated in the heating chamber into the drying chamber in which the 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 liquidifying 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 device according to the present invention can also supply 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 can require 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 may further provide 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 may further provide 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.

A 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. A 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 outelt 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 heater 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 liquefied solvent and 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 ratio 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 as well 1 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 form 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, including a solvent recovery circuit (25) and comprising a drying chamber (1) having a drying drum (2), an air discharge channel (6) provided with a blower (5) and connected to an exhaust port (4) of said drying chamber (1), an air intake channel (8) connected to an air intake port(7) of said drying chamber (1), which air intake channel (8) includes a heater (10), and a cooling chamber (14) located between and connected by means of a first exhaust duct to the air intake channel (8) and to the air discharge channel (6), which cooling chamber (14) is a part of a solvent recovery circuit (25) which includes said first exhaust duct and wherein:

   the air intake channel (8) of the solvent recovery circuit (25) has an open air inlet port (21) for introducing outside air into the air intake channel (8), said open air inlet port (21) being capable of easily opening and closing;
   a switching damper (24) at the outlet end of said cooling chamber (14) and an atmospheric air vent for the said first exhaust duct which damper (24) is constructed and arranged to selectively connect the outlet of the cooling chamber (14) to that atmospheric air vent or to said solvent recovery circuit (25),

   characterized by a second exhaust duct (19) being arranged in parallel with said first exhaust duct including the cooling chamber (14), to permit selective bypassing of the cooling chamber (14) by air discharged from the drum (2); and

   a further switching damper (23) between the air discharge channel (6), the inlet end of said first exhaust duct which includes the cooling chamber (14) and between an inlet of said second exhaust duct (19) which further damper (23) is constructed and arranged to permit air discharged from the drying chamber (1) to either pass through said first exhaust duct including the cooling chamber (14) or to pass through said second exhaust duct (19).

2. A drying device as claimed in Claim 1, which is provided with a concentration sensor for detecting the concentration of solvent vapour in the solvent recovery channel, wherein, when detecting the solvent vapour concentration to be in a specified range, said concentration sensor can cause the

open air inlet port (21) to be opened and the switching damper (24) to be switched to connect the outlet end of the cooling chamber (14) to the open air end of the first exhaust duct.

3. A drying device as claimed in Claim 1 further including a temperature sensor (30) for detecting the temperature in the solvent recovery circuit (25), wherein, upon detecting a temperature above a specified temperature, said sensor (30) causes the open air inlet port (21) to be opened and the said switching damper (24) to be switched to connect the outlet end of the cooling chamber (14) to the open air end of the first exhaust duct.

4. A drying device as claimed in any preceding claim wherein the outlet of the second exhaust duct (19) is connected to the outlet end of the first exhaust duct including the cooling chamber (14), and the outlet of the cooling chamber (14) is connected to the air intake channel (8) in the region of the damper (24).

Patentansprüche

1. Vorrichtung zum Trocknen von Wäsche und dergleichen, einschließlich eines Lösungsmittelwiedergewinnungskreislaufs und umfassend,

   eine Trocknungskammer (1), die eine Trockentrommel (2), und einen Luftauslaßkanal (6) besitzt, der mit einem Gebläse (5) versehen und mit einer Auslaßöffnung (4) der Trocknungskammer (1) verbunden ist, einen Lufteinlaßkanal (8), der mit einer Lufteinlaßöffnung (7) der Trocknungskammer (1) verbunden ist, wobei der Lufteinlaßkanal (8) eine Heizvorrichtung (10) umfasst, und wobei eine Kühlungskammer (14) zwischen dem Lufteinlaßkanal (8) und dem Luftauslaßkanal (6) angeordnet und mittels eines ersten Auslaßkanals mit dieser verbunden ist, wobei die Kühlungskammer (14) Teil eines Lösungsmittelwiedergewinnungskreislaufs (25) ist, der den ersten Auslaßkanal umfasst,
   und wobei der Lufteinlaßkanal (8) des Lösungsmittelwiedergewinnungskreislaufs
   (25) eine Freilufteinlaßöffnung (21) zum Einlassen von Außenluft in den Lufteinlaßkanal (8) besitzt, und wobei sich die Freilufteinlaßöffnung (21) leicht Öffnen und Schliessen lässt,
   einen Verschiebungsdämpfer (24) am Auslaßende der Kühlungskammer (14) und eine Entlüftungsöffnung zur Atmosphäre hin für den ersten Auslaßkanal, wobei der Dämpfer (24) derart aufgebaut und angeordnet ist, daß er selektiv den Auslaß der Kühlungskammer (14) mit der atmosphärischen Entlüftungsöffnung oder mit dem Lösungsmittelwiedergewinnungskreislauf (25) verbindet,

   gekennzeichnet durch einen zweiten Auslaßkanal (19), der parallel zum ersten Auslaßkanal, einschließlich der Kühlungskammer (14) angeordnet ist, um ein wahlweises Umgehen der Kühlungskammer (14) durch Luft zu ermöglichen, die aus der Trommel (2) abgelassen wird, und
   einen weiteren Verschiebungsdämpfer (23) zwischen dem Luftauslaßkanal (6), dem Einlaßende des ersten Auslaßkanals, der die Kühlungskammer (14) umfasst, und zwischen einem Einlaß des zweiten Auslaßkanals (19), wobei dieser weitere Dämpfer (23) derart aufgebaut und angeordnet ist, daß er von der Trocknungskammer abgelassene Luft entweder durch den ersten Auslaßkanal, einschließlich der Kühlkammer (14), oder durch den zweiten Auslaßkanal (19) strömen läßt.

2. Vorrichtung zum Trocknen nach Anspruch 1, die mit einem Konzentrationssensor versehen ist, um die Konzentration des Lösungsmitteldampfes im Lösungsmittelwiedergewinnungskanal zu ermitteln, und wobei, wenn die Lösungsmitteldampfkonzentration in einem besonderen Bereich erfaßt wird, der Konzentrationssensor die offene Freilufteinlaßöffnung (21) öffnen und den Verschiebungsdämpfer (24) verschieben kann, um das Auslaßende der Kühlungskammer (14) zum Freiluftende des ersten Auslaßkanals zu verbinden.

3. Vorrichtung zum Trocknen nach Anspruch 1, ferner umfassend
   einen Temperatursensor (30), zum Erfassen der Temperatur im Lösungsmittelwiedergewinnungskreislauf (25), und wobei nach Erfassen einer Temperatur oberhalb einer vorgegebenen Temperatur der Sensor bewirkt, daß die Freilufteinlaßöffnung (21) geöffnet wird und der Verschiebungsdämpfer (24) verschoben wird, um das Auslaßende der Kühlungskammer (40) mit dem Freiluftende des ersten Auslaßkanals zu verbinden.

4. Vorrichtung zum Trocknen nach irgendeinem vorstehenden Anspruch, bei der der Auslaß des zweiten Auslaßkanals (19) mit dem Auslaßende des ersten Auslaßkanals, einschließlich der Kühlungskammer (14) verbunden ist, und wobei der Auslaß der Kühlungskammer (14) mit dem Lufteinlaßkanal (8) im Bereich des Dämpfers (24) verbunden ist.

Revendications

1. Appareil de séchage pour sécher des vêtements et autres articles analogues, comprenant un circuit de

récupération d'un solvant (25) et comportant une chambre de séchage (1) ayant un tambour de séchage (2), un conduit de sortie d'air (6) équipé d'un ventilateur (5), relié à une ouverture de sortie (4) de ladite chambre de séchage (1), un conduit d'entrée d'air (8) relié à un conduit d'entrée d'air (7) de ladite chambre de séchage (1), lequel conduit d'entrée d'air (8) comporte un chauffage (10), et une chambre de refroidissement (14) disposée entre le conduit d'entrée d'air (8) et le conduit de sortie d'air (6), et reliée au moyen d'une première canalisation d'échappement au conduit d'entrée d'air, laquelle chambre de refroidissement (14) fait partie d'un circuit de récupération de solvant (25) lequel comprend ladite première canalisation d'échappement et dans lequel:

le conduit d'entrée d'air (8) du circuit de récupération de solvant (25) comporte une ouverture d'entrée d'air extérieur (21) pour introduire de l'air extérieur dans le conduit d'entrée d'air (8), ladite ouverture d'entrée d'air extérieur (21) étant apte à s'ouvrir et à se fermer facilement ; un volet de commutation (24) à l'extrémité de sortie de ladite chambre de refroidissement (14) et une ouverture de communication avec l'air atmosphérique pour ladite première canalisation de sortie, lequel volet (24) est construit et agencé pour relier sélectivement la sortie de la chambre de refroidissement (14) à ladite ouverture de communication avec l'air atmosphérique ou audit circuit de récupération de solvant (25),

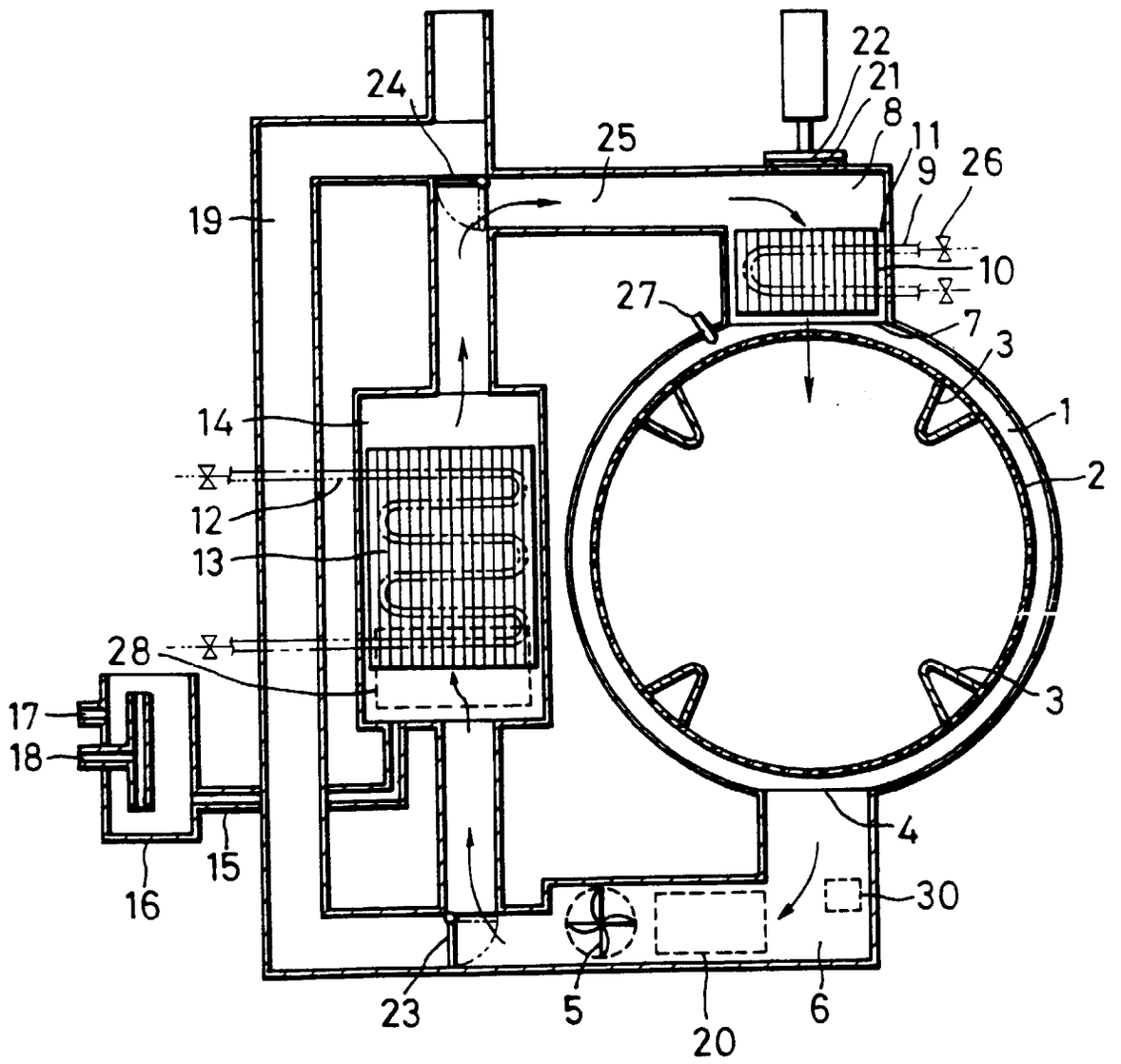
caractérisé par une seconde canalisation de sortie (19) disposée en parallèle avec ladite première canalisation de sortie comprenant la chambre de refroidissement (14), pour permettre à l'air sortant du tambour (2) de passer en dérivation sélective par rapport à la chambre de refroidissement (14) ; et

un autre volet de commutation (23) entre ledit conduit de sortie d'air (6), l'extrémité d'entrée de ladite première canalisation de sortie qui comprend la chambre de refroidissement (14) et entre une entrée de ladite seconde canalisation de sortie (19), lequel autre volet (23) est construit et agencé pour permettre à l'air sortant de la chambre de séchage (1) ou bien de passer par ladite première canalisation de sortie comportant la chambre de refroidissement (14) ou bien de passer par ladite seconde canalisation de sortie (19).

2. Appareil de séchage selon la revendication 1, lequel est équipé d'un détecteur de concentration pour détecter la concentration de vapeur de solvant dans le conduit de récupération de solvant, dans lequel, lorsqu'il détecte une concentration de vapeur de solvant située dans une plage spécifiée, ledit détecteur de concentration peut faire ouvrir l'ouverture d'entrée d'air extérieur (21) et peut faire commuter le volet de commutation (24) pour relier l'extrémité de sortie de la chambre de refroidissement (14) à l'extrémité d'air extérieur de la première canalisation de sortie.

3. Appareil de séchage selon la revendication 1 comprenant encore un détecteur de température (30) pour détecter la température du circuit de récupération de solvant (25), dans lequel, ledit détecteur (30), quand il détecte une température supérieure à une température spécifiée, fait ouvrir l'ouverture d'entrée d'air extérieur (21) et fait commuter ledit volet de commutation (24) pour relier l'extrémité de sortie de la chambre de refroidissement (14) à l'extrémité d'air extérieur de la première canalisation de sortie.

4. Appareil de séchage selon l'une quelconque des revendications précédentes dans lequel la sortie de ladite seconde canalisation de sortie (19) est reliée à l'extrémité de sortie de la première canalisation de sortie comprenant la chambre de refroidissement (14), et la sortie de la chambre de refroidissement (14) est reliée au conduit d'entrée d'air (8) dans la région du volet (24).


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