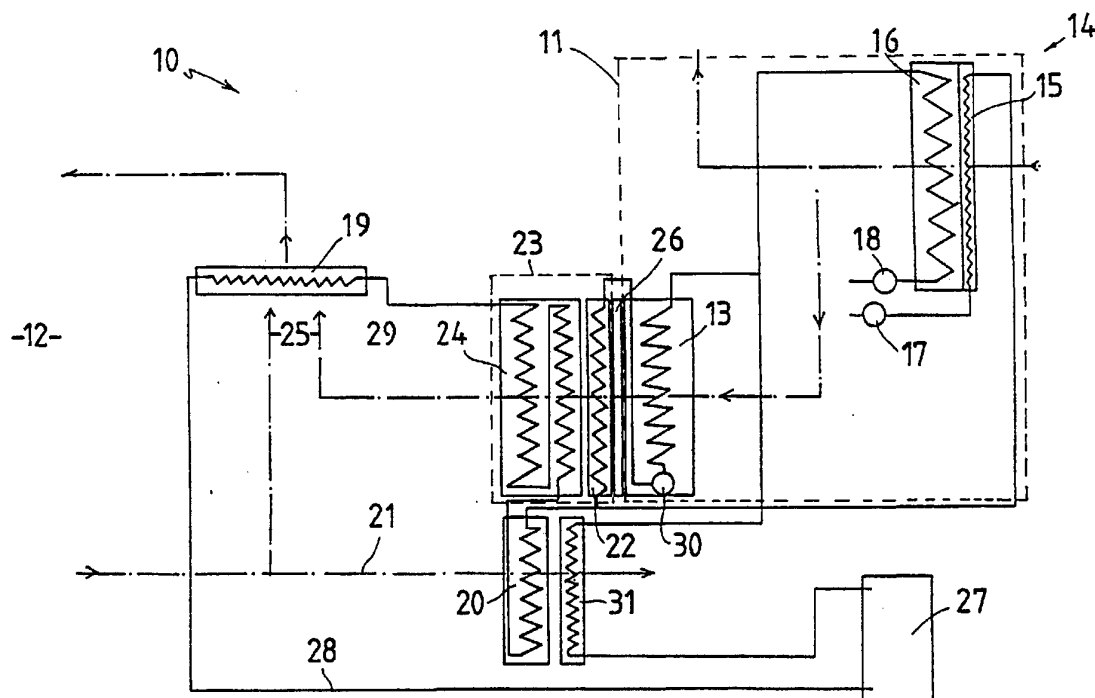




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(21) International Application Number: PCT/AU94/00078 (22) International Filing Date: 22 February 1994 (22.02.94) (30) Priority Data: PL 7437 22 February 1993 (22.02.93) AU (71) Applicant (for all designated States except US): GREEN- HALGH REFRIGERATION PTY. LTD. [AU/AU]; 41 Allen Street, Caloundra, QLD 4551 (AU). (72) Inventor; and (75) Inventor/Applicant (for US only): GREENHALGH, Keith, Mathew [AU/AU]; 56 Grigor Street, Caloundra, QLD 4551 (AU). (74) Agent: INTELLPRO; G.P.O. Box 1339, Brisbane, QLD 4001 (AU).	(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, TJ, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	

(54) Title: IMPROVEMENTS IN OR IN RELATION TO DEHYDRATION UNITS



(57) Abstract

A dehydration unit (10) employs a preconditioner contained within box (11) for preconditioning ambient air entering the unit. The preconditioner is located upstream of a dehydration chamber (12) holding product to be dried. Ambient air flows through the preconditioner which is adapted to account for variations in prevailing ambient air conditions to provide conditioned air to the dehydration chamber, the conditioned air having predetermined characteristics substantially independent of the prevailing ambient conditions.

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"IMPROVEMENTS IN OR IN RELATION TO DEHYDRATION UNITS"**TECHNICAL FIELD OF THE INVENTION**

THIS INVENTION relates to improvements in or in relation to dehydration units and in particular but not limited to medium temperature dehydration units.

5

BACKGROUND ART

Existing dehydration units suffer from a number of disadvantages. The quality of dried product produced in existing units is prone to vary according to prevailing ambient conditions. This effects quality control. In addition, existing units are not as energy efficient as is desirable.

10

OUTLINE OF THE INVENTION

In one aspect therefore, there is provided in a dehydration unit an improvement to improve quality control in dehydrated product comprising a preconditioner for ambient air entering the unit, the preconditioner being upstream of a dehydration chamber holding product to be dried, the preconditioner being adapted to account for variations in prevailing ambient air condition to provide conditioned air to the dehydration chamber, the conditioned air having predetermined characteristics substantially independent of the prevailing ambient conditions.

In another aspect, there is provided in a dehydration unit an improvement to save energy comprising a recuperative heating means having heat collection means downstream of a dehydration chamber holding product being dried and a heat delivery means upstream of the dehydration chamber, the heat collection means being adapted to collect heat from saturated relatively warm air and deliver the collected heat to the heat delivery means, the heat delivery means being adapted to deliver the collected heat received from the heat collection means to relatively cold air upstream of the dehydration chamber. Preferably, the heat collection means and heat delivery means employ a single stage heat transfer medium to transfer the collected heat from the heat collection means to the heat delivery means.

In a further aspect, there is provided in a dehydration unit an improvement to save energy comprising a controllable source of heat transfer medium for circulation through air conditioning means supplying heated conditioned air to

a dehydration chamber holding product being dried, control means controlling supply of the medium to the air conditioning means so that during final stages of product drying, the heat transfer medium delivered to the air conditioning means is controlled in accordance with demand for heated conditioned air. Preferably, the control means includes time delay means adapted to limit introduction of ambient air into the dehydration unit until conditions within the dehydration chamber satisfy predetermined conditions.

In a still further aspect, there is provided in a dehydration unit having a dehydration chamber holding product being dried an improvement to limit bacterial activity within the dehydration chamber, the unit having conditioned air being recycled through the product in the dehydration chamber, the unit having heat exchange means for delivering heat to the air being recycled through the product, the heat exchange means being adapted to inhibit exposure of the recycled air to an environment conducive to bacterial activity. To further inhibit bacterial activity, it is preferable to employ a filter upstream of the dehydration chamber to remove bacteria and other foreign matter before it enters the dehydration chamber. The filter is preferably located upstream of a heating stage so that relatively cold air is filtered. The filter is preferably located between the preconditioner and the heating stage.

The preconditioner can be any means suitable for extracting heat from ambient air. In a preferred form, the preconditioner employs a vent evaporator for drying fresh air to provide preconditioned low temperature, low dewpoint relatively dry air to the heating stage. Typically, the preconditioner also includes an evaporator employed upstream of the vent evaporator to provide heat load during an initial heating cycle. The evaporator is preferably equipped with first and second heat exchangers, the second heat exchanger being a liquid to air heat exchanger to supplement heat load during low temperature ambient conditions. The liquid to air heat exchanger typically includes a heat transfer medium controller for controlling mass flow of medium to the liquid to air heat exchanger. The first heat exchanger typically includes a thermostatic expansion valve through which heat exchange medium is delivered to the first heat exchanger.

The heating stage downstream of the preconditioner typically employs the

heat delivery means of the recuperative heating means to raise the temperature of the preconditioned air while maintaining its dewpoint. This provides relatively hot air to the dehydration chamber.

The control means typically employs a transducer means monitoring conditions in the dehydration chamber in order to control operation of the source of heat transfer medium and control the duration of the time delay means.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention can be more readily understood and be put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the present invention and wherein:-

Figure 1 is a schematic diagram illustrating a dehydration unit according to the present invention;

Figure 2 is a schematic side view illustrating a typical dehydration unit according to the present invention embodying the features of Figure 1;

Figure 3 is a schematic side view illustrating operation of the dehydration unit of Figure 2 during an initial heating cycle; and

Figure 4 is a schematic side view illustrating operation of the dehydration unit of Figure 2 after the initial heating cycle is complete.

METHOD OF PERFORMANCE

Referring to the drawings and initially to Figure 1, there is illustrated a dehydration unit 10 employing a preconditioner contained within box 11 for preconditioning ambient air entering the unit. The preconditioner is located upstream of a dehydration chamber 12 holding product to be dried. As can be seen, ambient air flows through the preconditioner which is adapted to account for variations in prevailing ambient air conditions to provide conditioned air to the dehydration chamber, the conditioned air having predetermined characteristics substantially independent of the prevailing ambient conditions.

In the illustrated embodiment, the central element of the preconditioner 11 is a vent evaporator 13. In addition to the vent evaporator 13, a heat exchanger 14 including a liquid to air heat exchanger 15 and a second heat exchanger 16 are employed upstream of the vent evaporator 13. Control of mass flow of refrigerant to the heat exchanger 15 is through a solenoid valve 17 while

a maximum operating pressure thermostatic expansion valve 18 is employed to control the pressure of refrigerant delivered to the heat exchanger 16. The evaporator 14 is employed to provide heat load to the condenser 19 during an initial heating cycle.

5 The dehydration unit employs a recuperative heating means including a heat exchanger 20 for collecting heat from relatively warm air leaving the unit at 21 and a heat delivery means in the form of heat exchanger 22 which delivers heat to the relatively cold air leaving the vent evaporator 13. The heat exchanger 22 represents a first stage heat exchanger forming part of a heating stage shown
10 generally within the box 23. The heating stage employs a heat exchanger 24 as well as the heat exchanger 22. Air flowing from the heat exchanger 24 is introduced into a stream of air 25 being circulated through the dehydration chamber 12.

 It will be appreciated from the illustrated embodiment that the condenser
15 19 operates at relatively high temperature and therefore inhibits bacterial activity within the dehydration chamber 12. Bacterial activity is also inhibited by the use of a filter 26 immediately after the vent evaporator 13 and before the heating stage 23.

 A compressor 27 is employed to drive refrigerant about the refrigerant
20 circuit. As can be seen, the recuperative heating means employs a single stage heat transfer medium to transfer heat from the outgoing air stream 21 to the incoming air stream from the vent evaporator 13.

 With the arrangement illustrated, the dehydration unit can operate adequately over a wide range of ambient conditions and typically a range from
25 5°C and 80% relative humidity up to 45°C and 50% relative humidity can be tolerated by the present embodiment.

 The flow of refrigerant through the refrigerant circuit involves superheating followed by sub-cooling, evaporation and condensing.

 In the present specification, the following terms have the following
30 meanings.

 To superheat:-

 To add heat and increase temperature without a phase change in the

condition of a gas or liquid.

To sub-cool:-

To remove heat and lower temperature without a phase change in a gas or liquid.

5 To condense:-

To create a phase change from a high temperature, high pressure gas to a liquid, at the same pressure and temperature, by the removal of heat (latent heat of condensing).

To evaporate:-

10 To create a phase change from a liquid to a gas by reducing pressure, absorbing heat, and evaporating the liquid without a change in the lowered pressure (latent heat of evaporation).

With this in mind, typical refrigerant conditions which apply in the dehydration unit of Figure 1 involves firstly the compressor 27 delivering a high pressure superheated refrigerant gas along line 28 at a temperature of approximately 120°C to the condenser 19. Under typical operating conditions, the refrigerant leaves the condenser at a temperature of 50°C having been partially condensed to a flash gas. It then enters the heat exchanger 24 and leaves the heat exchanger 24 at a temperature of around 25°C as a high pressure liquid. The high pressure liquid then enters the heat collection heat exchanger 20 where it takes on board sensible heat from the relatively warm saturated air stream 21. The refrigerant then flows to the heat exchanger 22 as a high pressure liquid at about 45°C. Heat is then delivered to the air stream leaving vent evaporator 13 and the refrigerant exits the heat exchanger 22 at about 10°C and expands through the thermostatic expansion valve 30 in the vent evaporator to exit the vent evaporator 13 at about 2°C. The refrigerant then flows back through a heat exchanger 31 where it takes on board more sensible heat from the exiting gas stream 21 to provide a low pressure suction gas at about 25°C to the inlet side of the compressor 27.

30 The dehydration unit depicted in Figure 1 is actually assembled according to the schematic illustrated in Figure 2 and where appropriate, like numerals have been used to illustrate like features. Air flow through the unit is controlled using

fans 32, 33 and 34 with the fan 32 being described herein as an outside fan, the fan 33 being described as a recirculation fan and the fan 34 being referred to as a vent fan. The fan 34 has flaps associated therewith to close off venting of air from the unit and likewise, the fan 32 includes flap valves shown generally at 35.

5 As can be seen, the unit comprises an air conditioning section 36 and a dehydration chamber 12 separated by connecting ducts 37 and 38. Product 39 being dried is stored as a bed inside the dehydration chamber 12.

Operation of the dehydration unit is illustrated and described as follows in relation to Figures 3 and 4.

10 Initial Heating Cycle

Recirculating fan 33 on; outside fan 32 on; flap valve 35 open; vent fan 34 off, vent fan flap valve closed; compressor 27 running.

Outside ambient air is introduced through the evaporator 16 and heat is extracted, the cold air being returned back outside through the outside fan 32 and flap valve 35. This provides a heat load on the compressor 27 from which the
15 high temperature discharge gas is passed to the condenser 19 where it is condensed providing initial heat to heat the product 39 in the dehydration chamber 12.

The evaporator 16 is specifically designed to allow for variations in ambient air temperatures ranging from a low of 5°C and 80% relative humidity,
20 to a high of 45°C and 50% relative humidity, by controlling the mass flow of refrigerant through solenoid valve 17 and the use of a MOP (Maximum Operating Pressure) thermostatic expansion valve 18.

To provide additional heat load during low temperature ambient conditions
25 a liquid to air heat exchanger 15 is fitted to the front of the evaporator 16.

During this heating cycle, the compressor saturated suction temperatures are controlled to give maximum possible heating capacity, consistent with the design limits of the compressor 27.

The change from initial heating cycle to dehydration cycle is automatically
30 controlled by signals from electronic thermostats (not shown) and relative humidity control sensors (humidistats) (not shown) located in the recirculated return air duct 38.

Dehydration Cycle

Recirculating fan 33 on; outside fan 32 off, flap 35 valve closed; vent fan 34 on, vent fan flap valve open; compressor 27 running.

5 High temperature high pressure superheated refrigerant gas is discharged from the compressor 27 at 120°C, and passes into the condenser 19. Recirculated air flows through the condenser, and is raised in temperature to 50°C. More heat is transferred to the recirculated air, and the refrigerant gas is partially condensed to a flash gas. (A mixture of gas with some liquid refrigerant.)

10 The flash gas then continues on to heat exchanger 24 where further heat is transferred to the incoming air finally raising its temperature to 40°C and completing the condensing of the refrigerant to a full liquid, at 50°C. The liquid refrigerant is then further sub-cooled in heat exchange 24 to 25°C.

15 On to heat exchanger 20 where the liquid refrigerant takes up heat from the outgoing air, reducing its temperature and raising the liquid refrigerant to 40°C.

On to heat exchanger 22 where heat is transferred to the incoming air, sub-cooling the liquid refrigerant to 10°C.

20 The 10°C liquid refrigerant then feeds through the thermostatic expansion valve 30 of the vent evaporator 13. The valve 30 is a restrictor metering device. The vent evaporator 13 reduces the temperature of the incoming air to 2°C and the liquid refrigerant is evaporated to a gas at a temperature of 2°C.

25 The 2°C suction gas is then passed through heat exchanger 31 where it takes up heat from the outgoing air, dropping the air temperature to 28°C and approximately 95% relative humidity. The refrigerant or suction gas is superheated to a temperature of 25°C. The outgoing air then passes through the vent fan 34 and its flap valve to the outside atmosphere.

The superheated suction gas adds additional superheat to the compressor discharge gas through the compression cycle, the extra superheat being taken up by the recirculated air in the drying chamber through the condenser 19.

30 The energy efficiency of the system design is established by the recovery of sensible heat by heat exchangers 20 and 31 which reduce the temperature of the outgoing air to the dry bulb temperature of the ambient air, and return this

recovered heat back into the incoming air and recirculated air through heat exchanger 22 and the condenser 19.

The dehydration control cycle is designed to give variable control of the drying cycle by being able to vary the dewpoint temperature of incoming air through the vent evaporator 13. This is achieved by varying the air velocity with a three speed vent fan motor for vent fan 34, with timer control of each speed, thus giving the ability to set the time for each dehydration step.

Towards the latter stages of dehydration, when moisture content of the product 39 is low, the vapour pressure difference between the vapour pressure of various layers of water left in the product and the vapour pressure of the recirculated air may be low enough that the mass transfer of water for evaporation requires less heat than that being introduced into the recirculated air, causing a rise in temperature of the recirculated air.

At this stage and under these circumstances, the compressor 27 will cycle off, and the product will heat soak until enough latent heat evaporating the water being transferred is absorbed, thus lowering the temperature of the recirculated air. This allows time for the product to absorb the heat available and stabilise the vapour pressures in the various molecular layers. Once the temperature of the dehydration chamber drops to a set point of the thermostats measuring recirculated air temperature, the compressor 27 will cycle back on.

If, during the stage when the compressor 27 is off, the relative humidity is still within set point ranges of the humidistat measuring humidity of the recirculated air, the vent fan 34 will continue to run, and the heat sink of the mass of the vent evaporator 13 and heat exchangers will still provide a low dewpoint air into the dehydration chamber until equilibrium temperature is reached in coils of the heat exchangers.

When the compressor cycles back on, irrespective of drying chamber conditions, the vent fan 34 will cycle off. A set timer allows time for the vent evaporator coil to reach design apparatus dewpoint temperature before the vent fan 34 comes back on, ensuring that low dewpoint air is introduced into the dehydration chamber.

This cycling of the compressor 27 maintains good energy efficiency with

decreased power consumption during the latter stages of dehydration.

A consideration in the research and development of the dehydration unit was the possibility of increased bacterial count, (particularly with food products), caused by condensed water in the dehydration chamber and on low temperature evaporator coils over which recirculated air may pass. It was decided that, to overcome this, all outside air only was to be introduced into the dehydration chamber, and this should be conditioned before coming into contact with the product, and after leaving the product.

In the illustrated embodiment, all outside air only is introduced and the removable, cleanable filter 26 is provided between the vent evaporator 13 and heat exchanger 22. This filters out any extraneous matter which may be introduced from outside. All recirculated air passes over high temperature coils only.

Additional filters and UV light chambers to sterilise incoming air may be fitted, if deemed necessary, in front of the outside air evaporator, to limit bacteria and spores from entering the unit.

This illustrated dehydration unit has versatility and can be programmed to suit a variety of dehydration conditions, and the recuperative heat exchanger efficiency is achieved by systematic design using the refrigerant itself as the first stage heat transfer medium.

Using this form of relatively low temperature dehydration, with stable vapour pressure gradients, at product temperatures below 45°C, water activity is reduced, and thus protein breakdown by enzyme action, oxidation and chemical reaction on carbohydrates, salts and lipids is averted. It will also minimise the breakdown of cell wall membranes, allowing for a high quality of dehydrated product, which may be readily rehydrated with colour retention, flavour, minimum protein loss, and stable molecular structure.

This form of dehydration can also be carried out with constant consistency of rates of dehydration and ultimately product consistency during adverse and varying ambient conditions.

It will therefore be appreciated that whilst the above has been given by way of illustrative example of the present invention, many variations and

modifications thereto will be apparent to those skilled in the art without departing from the broad ambit and scope of the invention as set forth in the appended claims.

CLAIMS

1. In a dehydration unit, an improvement to improve quality control in dehydrated products comprising a preconditioner for ambient air entering the unit, the preconditioner being upstream of a dehydration chamber holding product to be dried, the preconditioner being adapted to account for variations in prevailing ambient air conditions to provide conditioned air to the dehydration chamber, the conditioned air having predetermined characteristics substantially independent of the prevailing ambient conditions.
2. The dehydration unit according to claim 1 further comprising a recuperative heating means having heat collection means downstream of the dehydration chamber holding product being dried and a heat delivery means upstream of the dehydration chamber, the heat collection means being adapted to collect heat from saturated relatively warm air and deliver the collected heat to the heat delivery means, the heat delivery means being adapted to deliver the collected heat received from the heat collection means to relatively cold air upstream of the dehydration chamber.
3. The dehydration unit according to claim 1 or claim 2 further comprising a controllable source of heat transfer medium for circulation through air conditioning means supplying heated conditioned air to the dehydration chamber holding product being dried, the control means controlling supply of the heat transfer medium to the air conditioning means so that during final stages of product drying, the heat transfer medium delivered to the air conditioning means is controlled in accordance with demand for heated conditioned air.
4. The dehydration unit according to claim 1 or claim 2 wherein the unit has conditioned air being recycled through the product in the dehydration chamber, the unit having heat exchange means for delivering heat to the air being recycled through the product, the heat exchange means being adapted to inhibit exposure of the recycled air to an environment conducive to bacterial activity.
5. The dehydration unit according to claim 3 wherein the unit has conditioned air being recycled through the product in the dehydration chamber, the unit having heat exchange means for delivering heat to the air being recycled through the product, the heat exchange means being adapted to inhibit exposure

of the recycled air to an environment conducive to bacterial activity.

6. In a dehydration unit an improvement to save energy comprising a recuperative heating means having heat collection means downstream of a dehydration chamber holding product being dried and a heat delivery means upstream of the dehydration chamber, the heat collection means being adapted to collect heat from saturated relatively warm air and deliver the collected heat to the heat delivery means, the heat delivery means being adapted to deliver the collected heat received from the heat collection means to relatively cold air upstream of the dehydration chamber.

7. The dehydration unit of claim 2 or claim 6 wherein the heat collection means and heat delivery means employ a single stage heat transfer medium to transfer the collected heat from the heat collection means to the heat delivery means.

8. In a dehydration unit an improvement to save energy comprising a controllable source of heat transfer medium for circulation through air conditioning means supplying heated conditioned air to a dehydration chamber holding product being dried, control means controlling supply of the heat transfer medium to the air conditioning means so that during final stages of product drying, the heat transfer medium delivered to the air conditioning means is controlled in accordance with demand for heated conditioned air.

9. The dehydration unit according to claim 3 or claim 8 wherein the control means includes time delay means adapted to limit introduction of ambient air into the dehydration unit until conditions within the dehydration chamber satisfy predetermined conditions.

10. In a dehydration unit having a dehydration chamber holding product being dried an improvement to limit bacterial activity within the dehydration chamber, the unit having conditioned air being recycled through the product in the dehydration chamber, the unit having heat exchange means for delivering heat to the air being recycled through the product, the heat exchange means being adapted to inhibit exposure of the recycled air to an environment conducive to bacterial activity.

11. The dehydration unit according to claim 5 or claim 10 wherein there is

provided a filter upstream of the dehydration chamber to remove bacteria and other foreign matter before the filtered air enters the dehydration chamber, the filter being located upstream of a heating stage so that relatively cold air is filtered.

12. The dehydration unit according to claim 1 wherein the preconditioner employs a vent evaporator upstream of a heating stage, the vent evaporator drying fresh air to provide preconditioned low temperature, low dewpoint relatively dry air to the heating stage.

13. The dehydration unit according to claim 12 wherein there is provided a filter upstream of the dehydration chamber to remove bacteria and other foreign matter before the filtered air enters the dehydration chamber, the filter being located upstream of a heating stage so that relatively cold air is filtered, the filter being located between the preconditioner and the heating stage.

14. The dehydration unit according to claim 12 wherein the preconditioner includes an evaporator employed upstream of the vent evaporator to provide heat load during an initial heating cycle.

15. The dehydration unit according to claim 14 wherein the evaporator is equipped with first and second heat exchangers, the second heat exchanger being a liquid to air heat exchanger to supplement heat load during low temperature ambient conditions.

16. The dehydration unit according to claim 15 wherein the liquid to air heat exchanger includes a heat transfer medium controller for controlling mass flow of medium to the liquid to air heat exchanger.

17. The dehydration unit according to claim 15 wherein the first heat exchanger includes a thermostatic expansion valve through which heat exchange medium is delivered to the first heat exchanger.

18. The dehydration unit according to claim 2 employing a heating stage downstream of the preconditioner, the heating stage downstream of the preconditioner employing heat delivery means of the recuperative heating means to raise the temperature of the preconditioned air while maintaining its dewpoint.

19. The dehydration unit according to claim 8 wherein the control means includes time delay means adapted to limit introduction of ambient air into the

dehydration unit until conditions within the dehydration chamber satisfy predetermined conditions, the control means employing a transducer means monitoring conditions in the dehydration chamber in order to control operation of the source of heat transfer medium and control the duration of operation of the time delay means.

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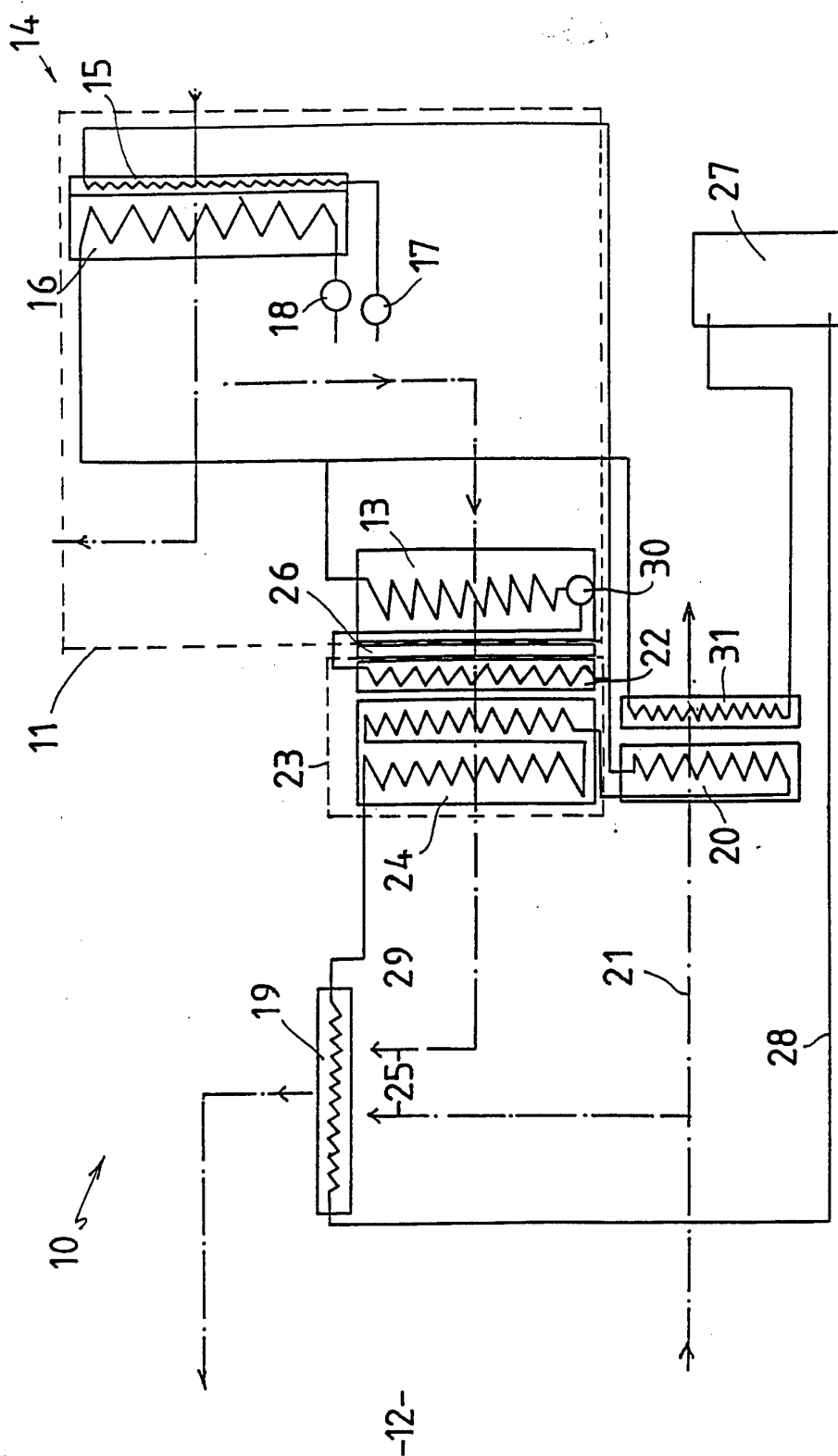


FIG. 1

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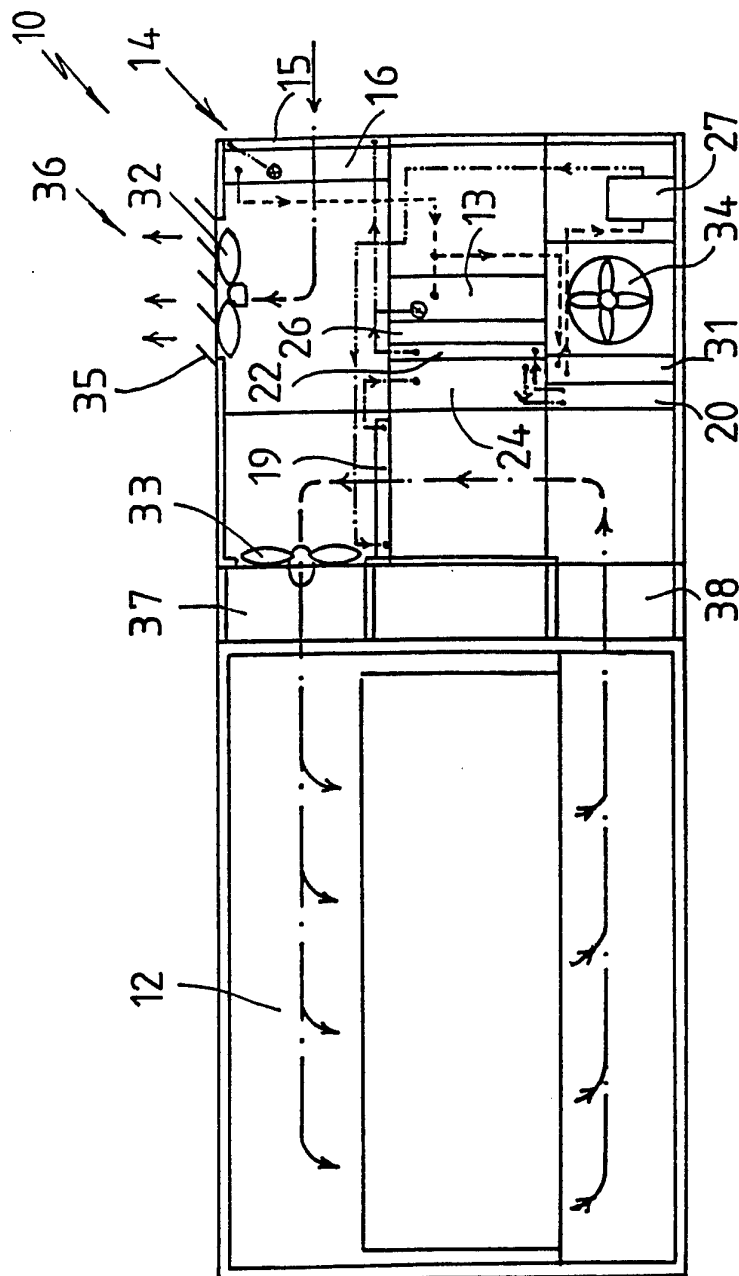


FIG. 2

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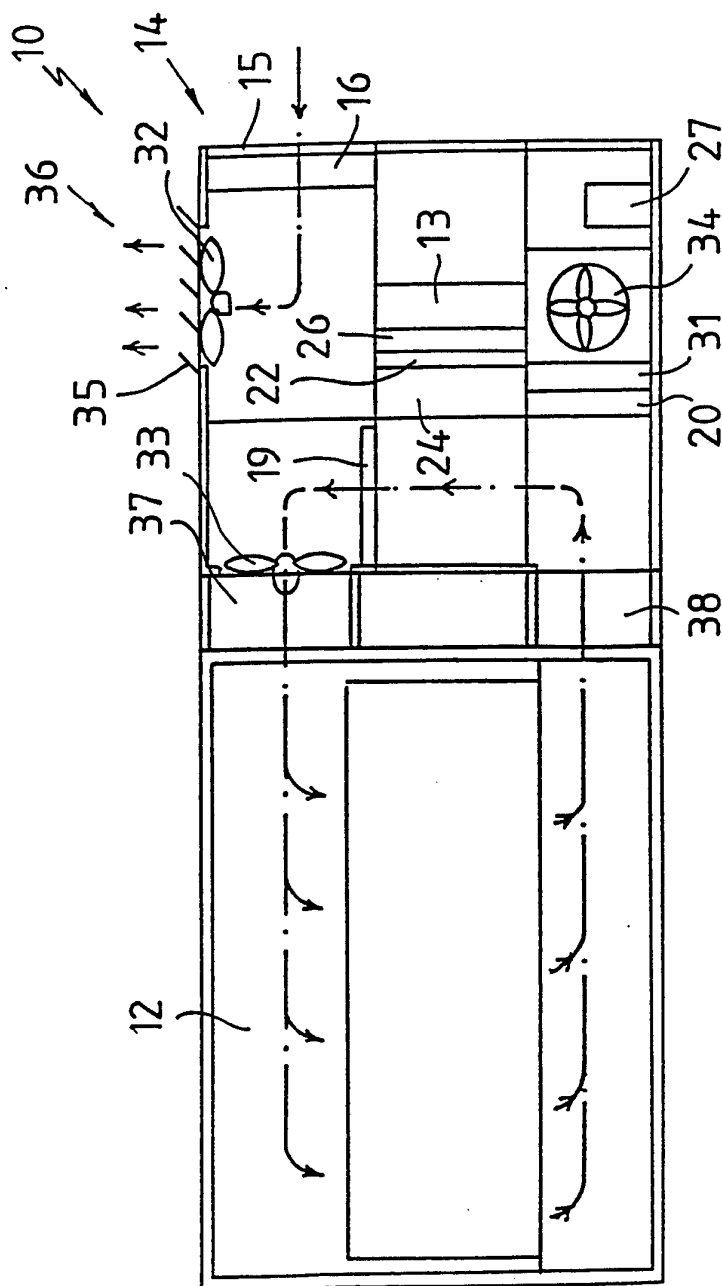


FIG. 3

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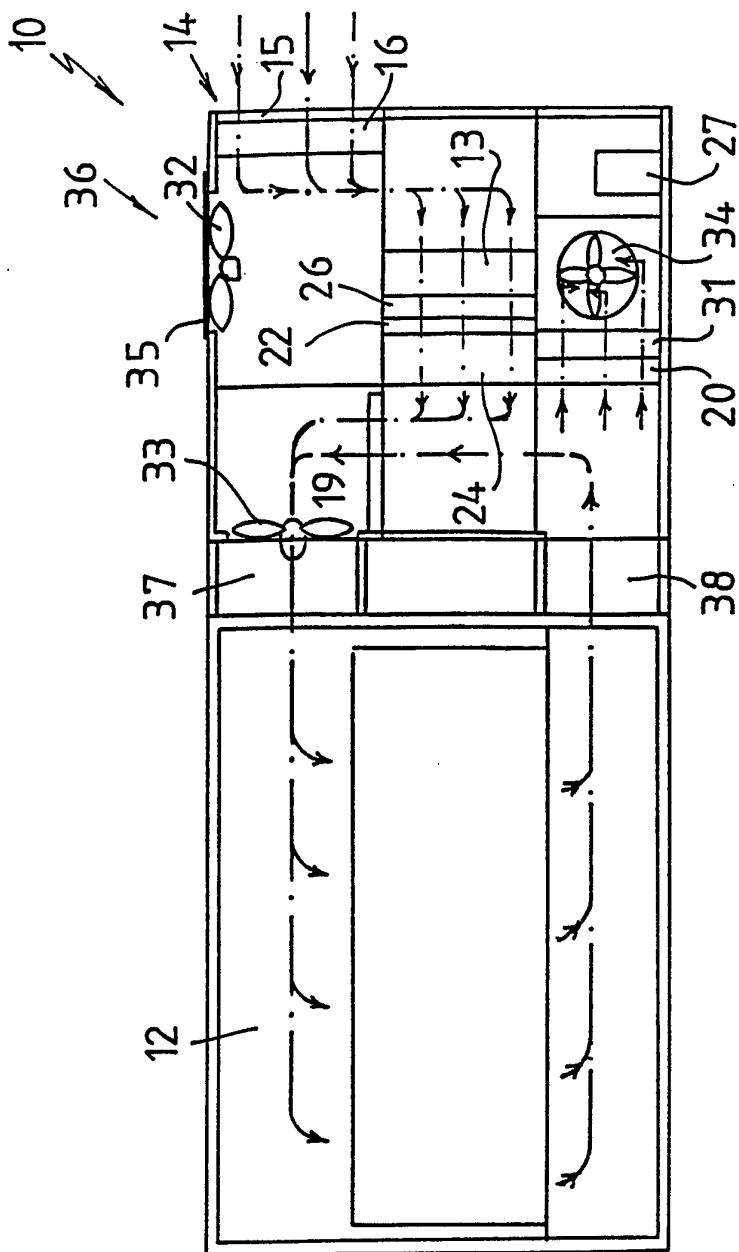


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 94/00078

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ F26B 9/06, 21/04, 21/06, 21/00 According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC F26B 9/06, 21/04, 21/06, 21/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
A	AU,B, 21144/53 (159753) (ROHDE) 2 September 1954 (02.09.54)			
A	AU,B, 52061/79 (517820) (C.E.A.F. Spa) 1 May 1980 (01.05.80)			
A	AU,A, 33675/84 (W. AND R. JACK LIMITED) 4 April 1985 (04.04.85)			
A	Derwent Abstract Accession No. 87-114167/16, Class Q75 Q76, SU,A, 1252629 (KAZA CHEM TECHN INS) 23 August 1986 (23.08.86)			
A	Derwent Abstract Accession No. 90-035601/05, Class Q76, SU,A, 1474416 (LATV WKS DES INST) 23 April 1989 (23.04.89)			
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.				
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Date of the actual completion of the international search 6 June 1994 (06.06.94)		Date of mailing of the international search report 16 June 1994 (16.06.94)		
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer  B. NGUYEN Telephone No. (06) 2832306		

INTERNATIONAL SEARCH REPORT

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
A	Derwent Abstract Accession No. 88-192351/28, Class Q76, GB,A, 2199644 (DEAVIN RW) 13 July 1988 (13.07.88)	
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A	Patent Abstracts of Japan, M-1216, page 144, JP,A, 3-267683 (KUBOTA CORP) 28 November 1991 (28.11.91)	
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