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(71) Applicant: **Ariston S.p.A.**
60044 Fabriano (AN) (IT)

(72) Inventors:
- **CANESTRARI, Paolo**
  60044 Fabriano (IT)
- **CECCACCI, Lorenzo**
  60015 Falconara Marittima (IT)

(74) Representative: **Meloni, Francesca**
MAR.BRE S.R.L.
Via San Filippo, 2
60044 Fabriano (AN) (IT)

(54) WATER HEATER WITH DOUBLE REFRIGERANT CIRCUIT

(57) The object of the present disclosure is a heating or more generally a storage water conditioning system with a heat pump wherein the heat transfer fluid is divided into at least two distinct and independent refrigerant circuits, between which there is no passage of fluid.

The two circuits define the same heat exchanger body with a tank. It is advantageous to make the exchanger with the micro channel technology which allows greater efficiency and flexibility in designing the heat exchange surfaces for a plurality of circuits on the same tank.

Compared to a single circuit heat pump, one with two distinct circuits and equal overall power, for each circuit it has less fluid charge and less power required to the compressor.

Furthermore, it is more robust with respect to a failure: a hole at any point in the circuit causes the loss of only part of the heat transfer fluid.

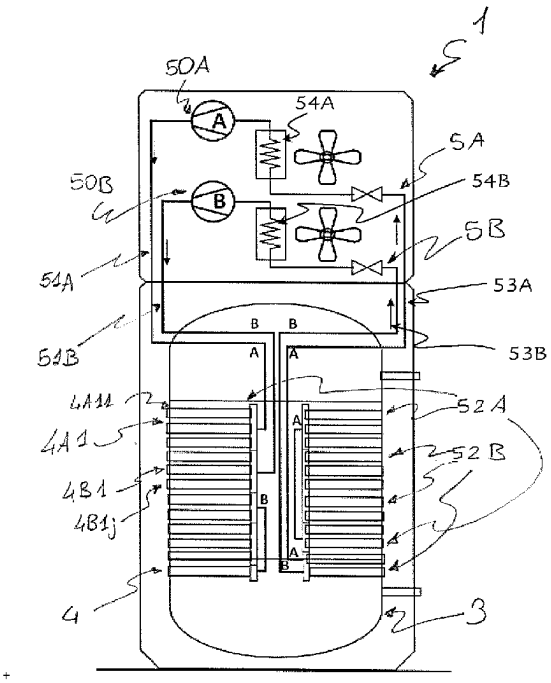

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 24 19 1366

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 4 201 065 A (GRIFFIN CHARLES K [US]) 6 May 1980 (1980-05-06) * column 3, line 4 - column 5, line 51; figures 1,2 *	1-10	
A	US 2016/025384 A1 (KIMURA KEIICHI [JP] ET AL) 28 January 2016 (2016-01-28) * paragraph [0026] - paragraph [0040]; figures 1-4 *	1-10	
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A	CN 201 875 887 U (GUANGDONG PHNIX ENERGY SAVING EQUIPMENT CO LTD) 22 June 2011 (2011-06-22) * the whole document *	11	TECHNICAL FIELDS SEARCHED (IPC) F25B F24H F24D F28F F28D
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 March 2025	Lucic, Anita

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10

Heat pump system with double crossed circuit, comprising two separate refrigerant circuits, having no fluid communication from one refrigerant circuit to the other refrigerant circuit, wherein:- the two refrigerant circuits share the same heat exchanger body, associated to a body to be heated or cooled, the heat exchanger body configured to be traversed by a heat transfer fluid through two flow paths each belonging to one of the two refrigerant circuits, each flow path comprising a plurality of channels connected to each other to create a seamless passage from an inlet connection section located upstream of each flow path to an outlet connection section located downstream,- and wherein on a heat exchange surface between the heat exchanger body and the body to be heated or cooled at least part of the channels of each flow path is alternated with channels of the other flow pathcharacterised in that the channels of a same circuit are associated in one or more groups of side-by-side channels and in a thermal exchange relationship with the body to be heated or cooled.

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2. claim: 11

Method to heat a double tank water heater comprising two tanks connected in series wherein a first tank is configured to serve as input tank for cold water, the second tank configured to serve as output tank for hot water, the double tank water heater further two heat pumps, each heat pump comprising a condenser heat exchanger, the condenser heat exchangers configured to exchange heat with the tanks, and at least one condenser heat exchanger configured to exchange heat with both tanks and at least one condenser heat exchanger configured to exchange more heat with the output tank than with the input tank, the method comprising the steps:- switching on and maintaining active a first heat pump comprising a condenser heat exchanger configured to exchange more heat with the output tank than with the input tank until the water in the output tank has reached a set temperature,- optionally switching off the first heat pump and,- maintaining active at least one of the heat pumps comprising a condenser heat exchanger configured to exchange heat with the input tank until the water in the input tank has reached a set temperature.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 19 1366

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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10-03-2025

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82