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

(11) EP 3 816 534 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
04.08.2021 Bulletin 2021/31

(43) Date of publication A2:
05.05.2021 Bulletin 2021/18

(21) Application number: **20203117.5**

(22) Date of filing: **21.10.2020**

(51) Int Cl.:
F24H 3/06 *(2006.01)* ***F24F 1/0003*** *(2019.01)*
F24F 5/00 *(2006.01)* ***F24H 9/00*** *(2006.01)*
F25B 1/06 *(2006.01)* ***F25B 1/08*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **28.10.2019 US 201962926768 P**

(71) Applicant: **Carrier Corporation**
Palm Beach Gardens, FL 33418 (US)

(72) Inventors:
- **ELSHERBINI, Abdelrahman**
  East Hartford, CT Connecticut 06108 (US)
- **ALAHYARI, Abbas A.**
  East Hartford, CT Connecticut 06108 (US)

(74) Representative: **Dehns**
St. Bride's House
10 Salisbury Square
London EC4Y 8JD (GB)

(54) THERMALLY ENHANCED HEATING

(57) A thermally enhanced heating system (100) and a method for thermally enhancing a HVAC system are provided. The thermally enhanced heating system (100) preferably includes an outdoor HVAC unit (200) and an indoor HVAC unit (300). The indoor HVAC unit (300) includes a first heat exchanger (310) for transferring heat from a refrigerant, a second heat exchanger (320) for transferring heat from a fuel source, and a third heat exchanger (330) for transferring heat to the refrigerant. The outdoor HVAC unit (200) includes an outdoor heat exchanger (210) for transferring heat from an outdoor air to the refrigerant, a pump (220) configured to circulate the refrigerant, and an ejector (230) configured to combine the refrigerant from the outdoor heat exchanger (210) and the third heat exchanger (330). Preferably the outdoor HVAC unit (220) is operated to circulate the refrigerant through a first refrigerant circuit (500) and a second refrigerant circuit (400), and combine refrigerant in the first refrigerant circuit (500) and the second refrigerant circuit (400).

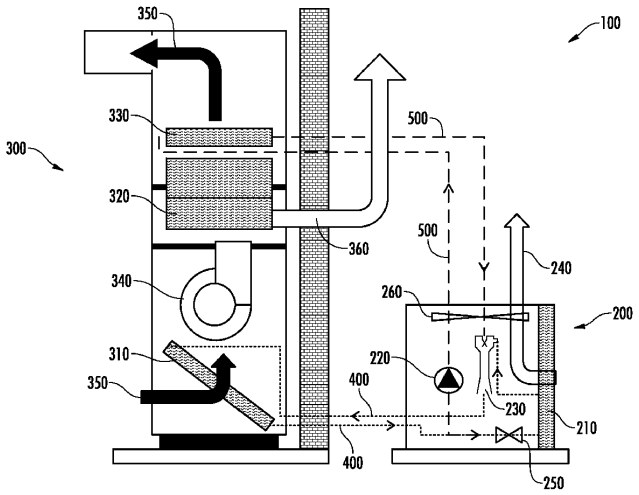

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 3117

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 301 662 A (WHITNAH GORDON R) 24 November 1981 (1981-11-24)	1,2,6-10	INV. F24H3/06
A	* column 2, last paragraph - column 5; figure *	3-5, 11-15	F24F1/0003 F24F5/00 F24H9/00

X	STEFAN ELBEL ED - FOURNAISON LAURENCE ET AL: "Historical and present developments of ejector refrigeration systems with emphasis on transcritical carbon dioxide air-conditioning applications", INTERNATIONAL JOURNAL OF REFRIGERATION, ELSEVIER, AMSTERDAM, NL, vol. 34, no. 7, 27 November 2010 (2010-11-27), pages 1545-1561, XP028388556, ISSN: 0140-7007, DOI: 10.1016/J.IJREFRIG.2010.11.011 [retrieved on 2010-12-03]	1,2,6-10	F25B1/06 F25B1/08
A	* page 1547 - page 1549; figure 2 *	3-5, 11-15	

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A	* the whole document *	1-10	

A	US 2018/156228 A1 (HANCOCK STEPHEN STEWART [US]) 7 June 2018 (2018-06-07) * paragraphs [0030] - [0032]; figure 2 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)
F24H
F25B
F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 June 2021	von Mittelstaedt, A

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

EPO FORM 1503 03.82 (P04C01)

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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
EP 20 20 3117

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

A thermally enhanced heating system comprising:
an indoor HVAC unit comprising:
a first heat exchanger for transferring heat from a refrigerant;
a second heat exchanger for transferring heat from a fuel source; and
a third heat exchanger for transferring heat to the refrigerant; and an outdoor HVAC unit comprising:
an outdoor heat exchanger for transferring heat from an outdoor air to the refrigerant;
a pump operably coupled to the first heat exchanger and the third heat exchanger, the pump configured to circulate the refrigerant; and
an ejector including a first inlet, a second inlet, and an outlet; wherein the first inlet is operably coupled to the outdoor heat exchanger, the second inlet is operably coupled to the third heat exchanger, and the outlet is operably coupled to the first heat exchanger.

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2. claims: 11-15

A method for thermally enhancing a HVAC system, the method comprising:
operating an outdoor HVAC unit to circulate a refrigerant through a first refrigerant circuit and a second refrigerant circuit;
operating a heat exchanger to transfer heat to the first refrigerant circuit; and
operating the outdoor HVAC unit to combine the refrigerant in the first refrigerant circuit and the second refrigerant circuit.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 20 3117

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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29-06-2021

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		WO 2013185164 A1	19-12-2013
US 2018156228 A1	07-06-2018	NONE	

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