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(72) Inventors:
 • **Ryan, Paul Thomas**
Cambridgeshire
PE28 4AQ (GB)
 • **Mazzani, Luigi**
21020 Bardello
Varese (IT)

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(74) Representative: **Martin, Philip John**
Marks & Clerk LLP
62-68 Hills Road
Cambridge
CB2 1LA (GB)

(71) Applicant: **B.D.G. el S.r.l.**
21020 Bardello (IT)

(54) **Temperature control systems**

(57) We describe systems and methods for controlling the internal temperature of cooling apparatus without using a temperature sensor inside the cooled zone. In one embodiment a refrigerator comprises: a thermally insulated cooled zone with a door to enable user access; a cooling system to cool the cooled zone; a control unit coupled to control the cooling system; and a temperature sensor coupled to the control unit. The temperature sensor is outside the cooled zone to sense an ambient tem-

perature of the refrigerator and stores apparatus characterising data characterising a relationship between a pattern of operation of the cooling system and a temperature of the cooled zone for a plurality of different ambient temperatures. The control unit controls the pattern of operation of the cooling system responsive to the sensed ambient temperature and stored apparatus characterising data to adjust the temperature of the cooled zone towards a target temperature.

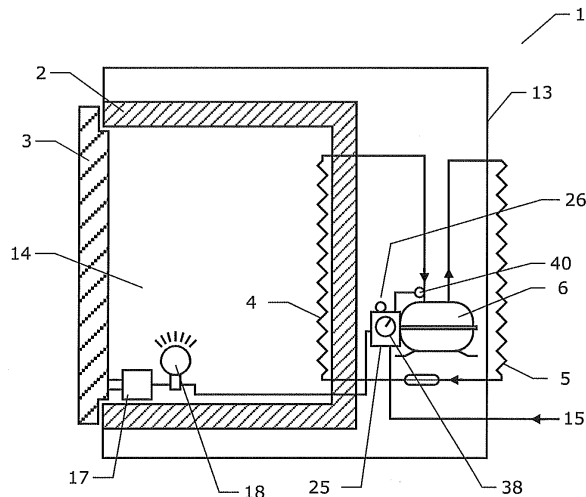


Fig 6



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 0133

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	EP 0 509 476 A2 (MERLONI ELETTRODOMESTICI SPA [IT] MERLONI ELETTRODOMESTICI SPA [LI]) 21 October 1992 (1992-10-21)	1,3-5, 9-11	INV. F25D29/00
Y	* abstract; figure 1 *	8	
A	* column 2, line 57 - column 3, line 8 * * column 5, lines 24-31 *	2,6,7	
Y	DE 10 2006 040370 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 6 March 2008 (2008-03-06) * paragraphs [0020] - [0023] *	8	
-----			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		26 June 2012	Salaün, Eric
CATEGORY OF CITED DOCUMENTS		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	
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			

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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:
1-11(completely); 13(partially)
- 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).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 12 15 0133

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: 1-11(completely); 13(partially)

Refrigerator with a cooled zone, a door, a cooling system, a control unit, a temperature sensor outside said cooled zone, wherein the control unit stores apparatus characterising data and is configured to control a pattern of operation of the cooling system in response to the sensed ambient temperature and said stored data. Corresponding method.

2. claims: 12(completely); 13(partially)

Refrigerator with a cooled zone, a door, a cooling system, a control unit, a mains power supply voltage sensor, wherein the control unit stores apparatus characterising data and is configured to control a pattern of operation of the cooling system in response to the sensed voltage and said stored data. Corresponding method.

3. claim: 14(partially)

Cooling apparatus with a cooled zone, data (?) characterising a relationship between a temperature of said cooled zone, a pattern of operation of a cooling system for said cooled zone and an ambient temperature, means for measuring said ambient temperature, and means for using said relationship to control said pattern of operation.

4. claim: 14(partially)

Cooling apparatus with a cooled zone, data (?) characterising a relationship between a temperature of said cooled zone, a pattern of operation of a cooling system for said cooled zone and a mains power supply voltage, means for measuring said mains power supply voltage, and means for using said relationship to control said pattern of operation.

5. claim: 15

Refrigerator with a cooled zone, a door, a cooling system, a control unit, and a user control, wherein the control unit is configured to control a cyclical pattern of on/off operation of the cooling system and is responsive to said user control to adjust a duty cycle of said on/off operation.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 15 0133

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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26-06-2012

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