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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) **Title**: SYSTEMS AND METHODS FOR CONTROLLING A HYBRID HEATING SYSTEM

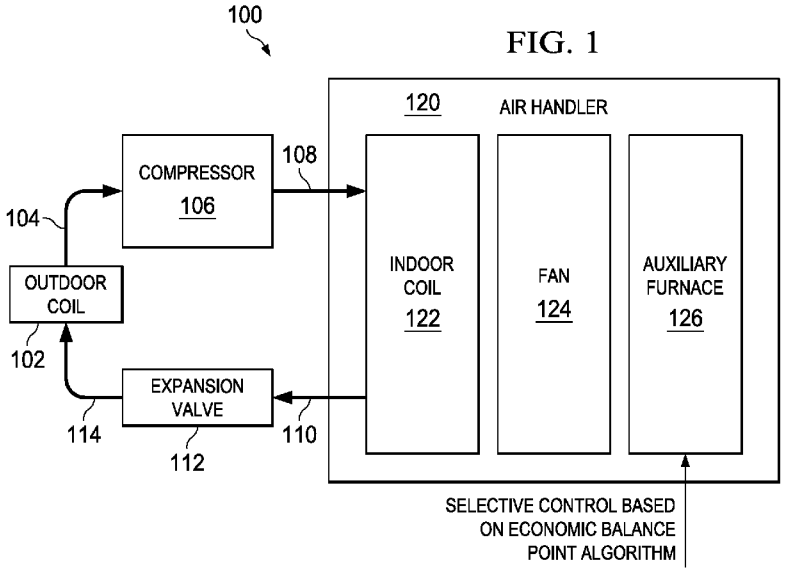

FIG. 1

(57) **Abstract**: In at least some embodiments, a hybrid heating system includes a heat pump and an auxiliary furnace. The system also includes a controller coupled to the heat pump and the auxiliary furnace. The controller, in response to receiving a heat request, selects either the heat pump or the auxiliary furnace based on an economic balance point algorithm.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/046792 A1 (CARRIER CORP [US]; LIFSON ALEXANDER [US]; TARAS MICHAEL F [US]) 26 April 2007 (2007-04-26) page 3, line 15 - page 8, line 16; figure 1	1-20
X	US 4 971 136 A (MATHUR ANOOP [US] ET AL) 20 November 1990 (1990-11-20) column 2, line 30 - column 5, line 13	1-6, 10-14, 16,17
X	US 4 716 957 A (THOMPSON PETER [JP] ET AL) 5 January 1988 (1988-01-05) column 1, line 45 - column 3, line 9 column 6, line 34 - line 56 column 17, line 53 - column 18, line 44 figure 1	1-6, 11-13, 16,17

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 159 495 A1 (HONEYWELL TECHNOLOGIES SARL [CH]) 3 March 2010 (2010-03-03) paragraph [0007] - paragraph [0015]; figure 1 -----	1,16

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007046792 A1	26-04-2007	CN 101326414 A	17-12-2008
		EP 1946020 A1	23-07-2008
		ES 2388067 T3	08-10-2012
		HK 1127517 A1	06-08-2010
		US 2009125150 A1	14-05-2009
		WO 2007046792 A1	26-04-2007
US 4971136 A	20-11-1990	NONE	
US 4716957 A	05-01-1988	AU 567005 B2	05-11-1987
		AU 5530186 A	02-10-1986
		US 4716957 A	05-01-1988
EP 2159495 A1	03-03-2010	NONE	