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(54) Title: SYSTEM, METHOD, AND APPARATUS FOR HEATING

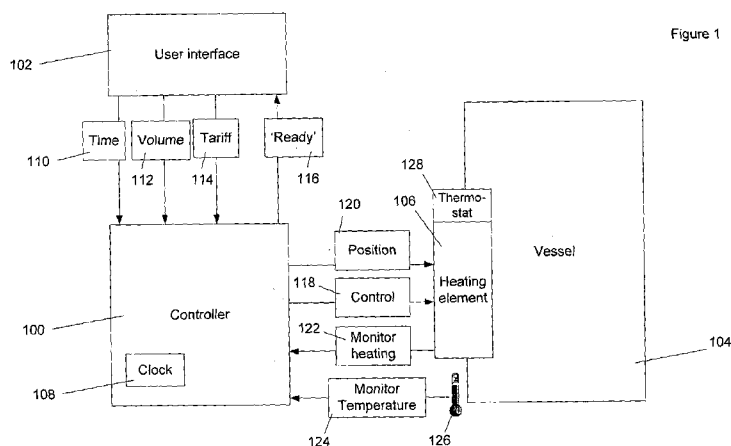


Figure 1

(57) Abstract: The present invention relates to a heating element controller (100) for a liquid heating system arranged to determine the duty cycle of a heating element (106) and modulate the timepoint of heating initiation by the heating element (106) in dependence upon an expected duration of completing the heating process and upon a required time at which the heating process is to be completed, wherein said expected duration is determined in dependence on said duty cycle. The invention extends to a heating element controller comprising means for computing a fouling parameter and means for controlling the operation of the heating element in dependence upon the fouling parameter. The invention extends to a system for heating liquids comprising at least one heating element associated with a liquid vessel, and preferably the heating element is moveable in the vessel, or alternatively the system for heating liquids may comprise a plurality of heating elements.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. F24H9/00 F24H9/18 F24H9/20 F24D19/00 G05D23/19 ADD.		
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) F24H F24D G05D H05B H02J		
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 94/10620 A1 (MEC SYSTEMS CORP [CA]; MUNROE ROBERT D [CA]; DEMALLINE JOHN T [CA]; FI) 11 May 1994 (1994-05-11)	1-4, 6-10, 12-15, 71-73
Y	page 4, line 19 - page 8, line 9; claim 5; figure 1	5
Y	----- US 6 293 471 B1 (STETTIN DANIEL R [US] ET AL) 25 September 2001 (2001-09-25) column 5, line 29 - column 6, line 12; figure 1 -----	5
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 7 May 2013		Date of mailing of the international search report 01/08/2013
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Ast, Gabor

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2012/000614

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 77, 78
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-16, 71-73

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-16, 71-73

A heating element controller for a liquid heating system specifying features of the controller.

2. claims: 1, 17-40, 68, 74-76

A heating element controller for a liquid heating system specifying features of the controller comprising means for computing a fouling parameter, and means for controlling the operation of the heating element in dependence upon the fouling parameter.

3. claims: 41-67, 69, 70

A system for heating liquids, comprising at least one heating element associated with a liquid vessel

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 77, 78

The vague statement "substantially as herein described with reference to the accompanying figures" used in claims 77 and 78 renders the subject matter of the aforementioned claims unclear to such an extent that a comparison with prior art is not possible.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2012/000614

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 9410620	A1	11-05-1994	AU	5367594 A		24-05-1994
			CA	2147974 A1		11-05-1994
			WO	9410620 A1		11-05-1994

US 6293471	B1	25-09-2001	NONE			
