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F24D 17/00 (2006.01) *F24J 2/32* (2006.01)
F24H 1/06 (2006.01) *F24J 2/34* (2006.01)
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,

[Continued on next page]

(54) Title: A SOLAR WATER HEATER

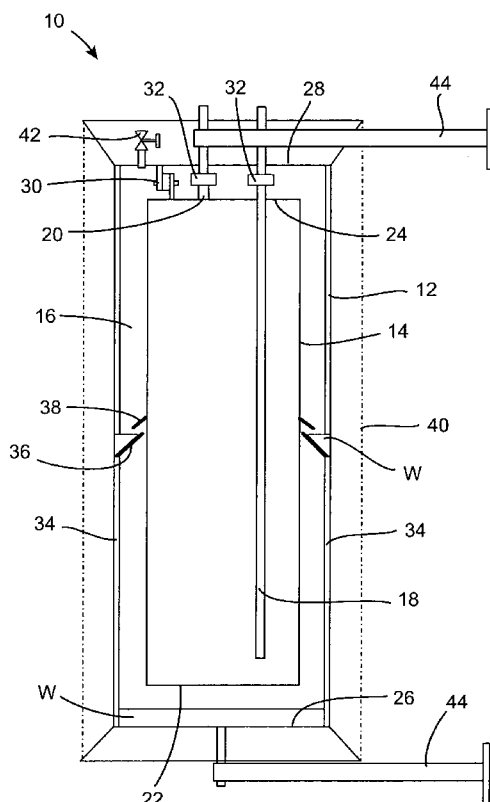


Fig. 1

(57) Abstract: The present invention provides a solar water heating apparatus which includes concentric inner and outer vessels defining an annular cavity therebetween, within which cavity a phase change material is located, and which is vaporised when solar radiation is incident on the outer vessel, in order to transfer heat to a water store contained in the inner vessel, this water store being fed fresh unheated water while the heated water is extracted therefrom for domestic or other purposes.



NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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24 November 2011

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2009/007961

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.:
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:
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.:

1-18, 24
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.:

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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/007961

A. CLASSIFICATION OF SUBJECT MATTER INV. F24D11/00 F24D17/00 F24H1/06 F24H7/04 F24J2/05 F24J2/32 F24J2/34 F28D20/00 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) F28D F24J F24D F24H 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 practical, search terms used) EPO-Internal																							
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td style="vertical-align: top;">DE 100 43 533 A1 (SAILER ROLAND [DE]; SAILER WOLFGANG [DE]) 28 March 2002 (2002-03-28) the whole document</td> <td style="text-align: center; vertical-align: top;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">the whole document</td> <td style="text-align: center; vertical-align: top;">3-5, 12-18,24 2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="text-align: center; vertical-align: top;">-----</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US 4 164 253 A (SKALA STEPHEN F [US]) 14 August 1979 (1979-08-14) column 3, line 20 - column 4, line 56; figures 1,2</td> <td style="text-align: center; vertical-align: top;">2</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">DE 20 2007 005965 U1 (FUCHS MICHAEL [DE]) 12 July 2007 (2007-07-12) the whole document</td> <td style="text-align: center; vertical-align: top;">3-5</td> </tr> <tr> <td></td> <td style="text-align: center; vertical-align: top;">----- -/-</td> <td></td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	DE 100 43 533 A1 (SAILER ROLAND [DE]; SAILER WOLFGANG [DE]) 28 March 2002 (2002-03-28) the whole document	1	Y	the whole document	3-5, 12-18,24 2	A	-----		A	US 4 164 253 A (SKALA STEPHEN F [US]) 14 August 1979 (1979-08-14) column 3, line 20 - column 4, line 56; figures 1,2	2	Y	DE 20 2007 005965 U1 (FUCHS MICHAEL [DE]) 12 July 2007 (2007-07-12) the whole document	3-5		----- -/-	
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Y	DE 20 2007 005965 U1 (FUCHS MICHAEL [DE]) 12 July 2007 (2007-07-12) the whole document	3-5																					
	----- -/-																						
☒ 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 document 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 28 September 2011	Date of mailing of the international search report 06/10/2011																						
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 Leclaire, Thomas																						

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2009/007961

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	DE 203 17 011 U1 (LEIBFRIED ULRICH [DE]) 15 April 2004 (2004-04-15) paragraphs [0001], [0037]; figure 1	12-14
Y	EP 0 663 569 A1 (BERGMAYR MARTIN MAG ING [AT]) 19 July 1995 (1995-07-19) page 2, line 53 - page 4, line 46; claims 1,3,8; figures 1,4	15-18
A	DE 103 13 403 A1 (TRIESCH FRANK [DE]) 7 October 2004 (2004-10-07) reference sign 7; paragraph [0021]; figures 1,3	18
A	DE 201 13 189 U1 (TSAI MING KUN [TW]) 25 October 2001 (2001-10-25) abstract; figure 3	1-5
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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DE 102006037760	A1	14-02-2008	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-5, 12-18, 24

Solar water heating apparatus with inner and outer concentrically arranged vessels and PCM in the cavity between the vessels, inlet/outlet for unheated/heated water to inner vessel

1.1. claims: 2-5

cavity partially evacuated, cavity comprising wicking material

1.2. claims: 12-14

position of inlet and outlet

1.3. claims: 15-18

heat exchanger connected between inlet and outlet, details of the heat exchanger

1.4. claim: 24

insulation of vessel, respective end spaces

2. claims: 6-11

reservoir where phase change material may be retained, details thereof

3. claim: 19

solar radiation absorbing coating

4. claim: 20

divider within the outer vessel

5. claims: 21-23

transparent cover vessel
