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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, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: THERMOELECTRIC MODULE WITH THERMAL ISOLATION FEATURES FOR VEHICLE BATTERY

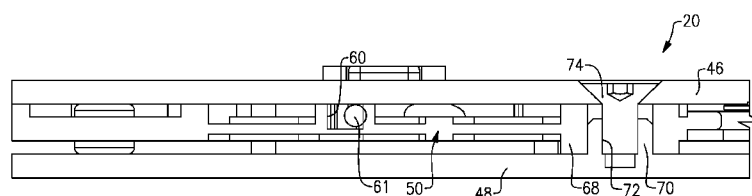


FIG. 5C

(57) Abstract: A thermoelectric module assembly for thermally conditioning a component includes first and second heat spreaders that are spaced apart from one another and configured to respectively provide cold and hot sides. An insulator plate is arranged between the first and second heat spreaders. The insulator plate has a compression limiter. A thermoelectric device is arranged within the insulator plate and operatively engaged with the first and second heat spreaders. A fastening element secures the first and second heat spreaders to one another about the insulator plate in an assembled condition. The compression limiters are configured to maintain a predetermined spacing between the first and second heat spreaders in the assembled condition.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. H01L23/40 H01L35/32 H01M10/6572 F28F13/00 H01L23/38
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)

H01L H01M F28F F28D F25B

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/028562 A1 (GREVE THOMAS [DE] ET AL) 12 February 2004 (2004-02-12)	1-7,9-14
Y	paragraphs [0025] - [0028]; figures 1-3	17,18
X	US 4 823 554 A (TRACHTENBERG LEONARD [US] ET AL) 25 April 1989 (1989-04-25)	15,16
Y	column 5, line 9 - column 6, line 29;	17,18
A	figure 5	1-14
	column 12, lines 50-63	
X	US 5 809 785 A (POLKINGHORNE JOHN D [CA]) 22 September 1998 (1998-09-22)	15-18
A	column 3, line 33 - column 4, line 3;	1-14
	figures 1,2,3,5,9	
A	DE 10 2012 206127 A1 (BEHR GMBH & CO KG [DE]) 17 October 2013 (2013-10-17)	1-8
	paragraphs [0075] - [0088]	
	-/--	



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

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"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

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Date of the actual completion of the international search

4 January 2017

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INTERNATIONAL SEARCH REPORT

International application No
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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.
A	JP H10 30856 A (SANYO ELECTRIC CO) 3 February 1998 (1998-02-03) abstract; figures 1,2 -----	1-8
A	US 2015/116943 A1 (OLSSON MATTIAS K-O [US] ET AL) 30 April 2015 (2015-04-30) paragraphs [0025] - [0043]; figures 2A-3C -----	1-8
A	US 2008/041067 A1 (MATSUOKA AKIO [JP] ET AL) 21 February 2008 (2008-02-21) paragraphs [0028] - [0050], [0073]; figures 1-4 -----	1-8
A	US 2005/280140 A1 (CORBIN JOHN S JR [US] ET AL) 22 December 2005 (2005-12-22) paragraphs [0027], [0034], [0039]; figures 4A-4C -----	1-8
A	EP 1 220 313 A1 (GATEWAY INC [US]) 3 July 2002 (2002-07-03) paragraph [0021]; figures 4A-4C,5 -----	1-8
A	EP 0 368 741 A1 (BULL SA [FR]) 16 May 1990 (1990-05-16) column 5, lines 4-54; figure 2 -----	1-8
A	US 6 151 214 A (YEH CHIH-CHIANG [TW]) 21 November 2000 (2000-11-21) column 1, line 65 - column 2, line 55; figure 4 -----	1-8
A	US 4 744 009 A (GRABBE DIMITRY G [US] ET AL) 10 May 1988 (1988-05-10) column 2, line 48 - column 3, line 33; figure 1 -----	1-8
A	EP 0 678 917 A1 (NEC CORP [JP]) 25 October 1995 (1995-10-25) column 6, line 11 - column 8, line 14; figures 1-3 -----	1-8
A	US 4 465 894 A (REYES JAIME M [US]) 14 August 1984 (1984-08-14) column 7, line 16 - column 8, line 10; figures 1-6 -----	18-20
A	EP 2 362 457 A2 (BOEING CO [US]) 31 August 2011 (2011-08-31) abstract; figures 1-4 -----	18-20
A	US 5 585 204 A (OSHIDA KEI [JP] ET AL) 17 December 1996 (1996-12-17) column 5, line 49 - column 6, line 44; figure 5 -----	18
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/036390

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP H10 266378 A (NIPPON STEEL CORP) 6 October 1998 (1998-10-06) abstract; figures 1,2 -----	18
A	JP H04 360955 A (SEKISUI CHEMICAL CO LTD) 14 December 1992 (1992-12-14) abstract; figures 1,2 -----	18,20

INTERNATIONAL SEARCH REPORT

International application No.
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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.:
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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-17

A thermoelectric module assembly for thermally conditioning a component, the assembly comprising:
 first and second heat spreaders spaced apart from one another and configured to respectively provide cold and hot sides;
 an insulator plate arranged between the first and second heat spreaders;
 a thermoelectric device arranged within the insulator plate and operatively engaged with the first and second heat spreaders; and
 the assembly further comprises :
 a fastening element securing the first and second heat spreaders to one another about the insulator plate in an assembled condition, and the insulator plate comprising a compression limiter,
 or
 the thermoelectric device includes a wire; and channels are provided in the insulator plate that receive the wire.

1.1. claims: 1-8

fastening element securing the first and second heat spreaders to one another about the insulator plate in an assembled condition, and the insulator plate comprising a compression limiter

1.2. claims: 9-14

no compression limiter, no channels, but
 a retainer is provided between the insulator plate and the thermoelectric device, the retainers configured to carry the thermoelectric device with the insulator plate during an assembly procedure.

1.3. claims: 15-17

the thermoelectric device includes a wire; and channels are provided in the insulator plate that receive the wire

2. claims: 18-20

no compression limiter, no channels, no retainer, but
 a matrix of voids provided in the insulator plate configured to reduce a thermal mass of the assembly

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/036390

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2004028562	A1	12-02-2004	AU 2794202 A EP 1337326 A1 JP 4316877 B2 JP 2004525746 A TW 574065 B US 2004028562 A1 WO 0243853 A1	11-06-2002 27-08-2003 19-08-2009 26-08-2004 01-02-2004 12-02-2004 06-06-2002
US 4823554	A	25-04-1989	AU 3538889 A EP 0413729 A1 US 4823554 A WO 9000708 A1	05-02-1990 27-02-1991 25-04-1989 25-01-1990
US 5809785	A	22-09-1998	CA 2206745 A1 US 5784890 A US 5809785 A	03-12-1997 28-07-1998 22-09-1998
DE 102012206127	A1	17-10-2013	NONE	
JP H1030856	A	03-02-1998	NONE	
US 2015116943	A1	30-04-2015	CN 105874623 A EP 3063798 A1 KR 20160077078 A US 2015116943 A1 WO 2015066049 A1	17-08-2016 07-09-2016 01-07-2016 30-04-2015 07-05-2015
US 2008041067	A1	21-02-2008	JP 2008034792 A US 2008041067 A1	14-02-2008 21-02-2008
US 2005280140	A1	22-12-2005	NONE	
EP 1220313	A1	03-07-2002	EP 1220313 A1 JP 2002290073 A KR 20020055431 A TW 507518 B US 2002105785 A1	03-07-2002 04-10-2002 08-07-2002 21-10-2002 08-08-2002
EP 0368741	A1	16-05-1990	EP 0368741 A1 FR 2638895 A1 JP H0354839 A	16-05-1990 11-05-1990 08-03-1991
US 6151214	A	21-11-2000	AU 713440 B3 DE 29909262 U1 GB 2350480 A US 6151214 A	02-12-1999 12-08-1999 29-11-2000 21-11-2000
US 4744009	A	10-05-1988	NONE	
EP 0678917	A1	25-10-1995	CA 2147396 A1 DE 69531126 D1 DE 69531126 T2 EP 0678917 A1 US 5814535 A US 5838064 A	23-10-1995 31-07-2003 06-05-2004 25-10-1995 29-09-1998 17-11-1998
US 4465894	A	14-08-1984	AU 2640884 A CA 1200612 A	11-10-1984 11-02-1986

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/036390

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 0122121 A2	17-10-1984
		JP S59198784 A	10-11-1984
		US 4465894 A	14-08-1984

EP 2362457	A2	31-08-2011	EP 2362457 A2
			31-08-2011
			US 2011209739 A1
			01-09-2011
			US 2013269742 A1
			17-10-2013

US 5585204	A	17-12-1996	NONE

JP H10266378	A	06-10-1998	NONE

JP H04360955	A	14-12-1992	NONE
