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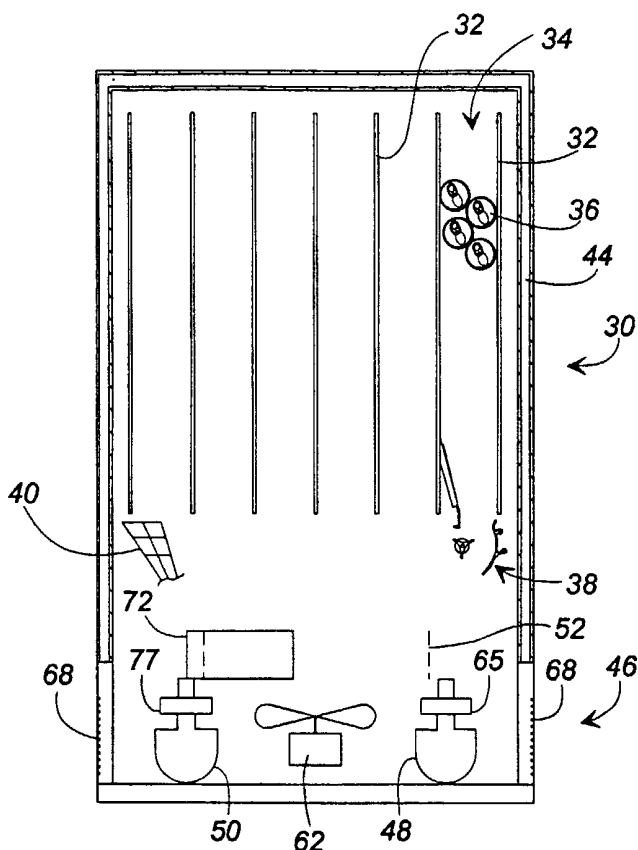
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[Continued on next page]

(54) Title: APPARATUS USING STIRLING COOLER SYSTEM AND METHODS OF USE



(57) **Abstract:** There is disclosed an apparatus for use as beverage container vending machines (30, 102), beverage dispensers (378, 472, 496), transportable beverage container dispensers (352) and glass door merchandizers (210, 450), all cooled by Stirling coolers (10, 48, 50, 128, 218, 220, 272, 324, 370, 432, 468, 474, 498). The apparatus includes an insulated enclosure (214) and a Stirling cooler (10, 48, 50, 128, 218, 220, 272, 324, 370, 432, 468, 474, 498) having a cold portion (26). A plate (52, 104-116, 142-151, 244, 248, 356, 358, 460, 462) or coil made of a heat-conducting material disposed within the insulated enclosure (214) is connected in heat exchange relationship with the cold portion (26) of the Stirling cooler (10, 48, 50, 128, 218, 220, 272, 324, 370, 432, 468, 474, 498). Heat transfer fluids, heat pipes (78, 196-206, 238, 550) and direct contact are different methods used to transfer heat from the plate (52, 104-116, 142-151, 244, 248, 356, 460, 462) to the cold portion (26) of the Stirling cooler (10, 48, 50, 128, 218, 220, 272, 324, 370, 432, 468, 474, 498). The cooled plate (52, 104-116, 142-151, 244, 248, 358, 460, 462) or coil is used to cool a container (36, 120, 246, 322, 362, 464) or a fluid that is, in turn, used to cool either a container or a fluid. Methods of chilling containers and fluids are also disclosed.

WO 01/20967 A3



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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 F25D11/00 F25B9/14 F28F3/02 B67D1/08

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)

IPC 7 F25B F25D B67D

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 10, 30 November 1995 (1995-11-30) -& JP 07 180921 A (TOSHIBA CORP), 18 July 1995 (1995-07-18) abstract; figures 3-5 ---	1-3,17, 23,25, 27,28, 31,49, 52-55, 61,63
A	US 3 004 408 A (DROS ALBERT A ET AL) 17 October 1961 (1961-10-17) column 1, line 37-39 column 1, line 72 -column 2, line 11; figures 1,2 --- -/--	1

Further documents are listed in the continuation of box C. Patent family members are listed in annex.

° Special categories of cited documents :

<p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*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)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>	<p>*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</p> <p>*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</p> <p>*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.</p> <p>* & * document member of the same patent family</p>
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Date of the actual completion of the international search 21 June 2001	Date of mailing of the international search report 26. 06. 2001
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center; font-weight: bold;">Boets, A</p>
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/25766

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>KIM S -Y ET AL: "THE APPLICATION OF STIRLING COOLER TO REFRIGERATION" INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE,US,NEW-YORK, NY: IEEE, 27 July 1997 (1997-07-27), pages 1023-1026, XP000800398 ISBN: 0-7803-4515-0 page 1024, left-hand column, last paragraph -page 1025, right-hand column, paragraph 1</p>	1
X	---	
A	<p>US 5 142 872 A (TIPTON RUSSELL C) 1 September 1992 (1992-09-01) column 4, line 62 -column 16, line 49; figures 1-11</p>	17,23 19,20, 22,25, 27,28,31
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A	---	
A	<p>US 5 927 079 A (FUKUDA EIJI ET AL) 27 July 1999 (1999-07-27) column 2, line 35 -column 6, line 51; figures 1-6</p>	49, 52-55, 61,63
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 00/25766

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 065 995 A (FUJI ELECTRIC CO LTD) 8 December 1982 (1982-12-08) page 2, line 6 -page 14, line 3; figures 1-10 ---	49, 52-55, 61-64
A	US 2 342 299 A (PEET GERALD D) 22 February 1944 (1944-02-22) page 1, right-hand column, line 17 -page 4, left-hand column, line 32; figures 1-9 ---	49, 52-55, 61,63
A	US 5 642 622 A (BERCHOWITZ DAVID M ET AL) 1 July 1997 (1997-07-01) ---	
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A	CH 233 266 A (HERMES PATENTVERWERTUNGS GMBH) 15 July 1944 (1944-07-15) -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/25766

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.:

1-3, 17-29, 31, 49, 52-55, 61-64

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.
- 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: 1-3

Apparatus having an insulated enclosure cooled by two Stirling coolers disposed outside the enclosure

2. Claims: 4-16,41,42,57,58

Apparatus having an insulated enclosure with a intermediate heat conducting member passing through the wall and connected to one Stirling cooler disposed outside the enclosure

3. Claims: 17-27

Apparatus having an insulated enclosure with a Stirling cooler extending partially through a wall of said enclosure

4. Claims: 28,29,31

Transportable apparatus having insulated enclosure cooled by one Stirling cooler driven by an electric system of a vehicle

5. Claims: 30,32-40,43,56

Stirling cooled container dispensing apparatus

6. Claims: 44-48,50,51

Stirling cooler for one container

7. Claims: 49,52-55,61-64

Stirling cooler for fluid on demand

8. Claims: 59,60

Construction of a heat exchanger

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/25766

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