



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 621 831 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.02.2006 Bulletin 2006/05

(51) Int Cl.:
F25D 11/02 (2006.01) **F25D 17/06 (2006.01)**
F25D 25/02 (2006.01)

(21) Application number: **04425583.4**

(22) Date of filing: **29.07.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(72) Inventor: **Fumagalli, Silvano**
20052 Monza (MI) (IT)

(74) Representative: **Mittler, Enrico**
Mittler & C. s.r.l.,
Viale Lombardia, 20
20131 Milano (IT)

(71) Applicant: **CANDY S.p.A.**
I-20052 Monza (Milano) (IT)

(54) **Freezer suitable to quickly cool food and refrigerator comprising said freezer**

(57) A freezer comprising a cabinet (4), a compartment (1) and refrigeration circuit with condenser (12), compressor (9), evaporator (7) and ventilator (14) is described. The ventilator (14) is suitable to forcedly circulate air through the evaporator (7) and inside said compartment by means of at least one opening (101,130,140,141). The freezer comprises at least one container (21) and the at least one opening (101,130,140,141), for the inlet of the air forced by the ventilator (15) inside said compartment (1), is arranged in proximity of the ventilator (15); the latter conveying the air cooled by the evaporator (7) on the at least one container (21).

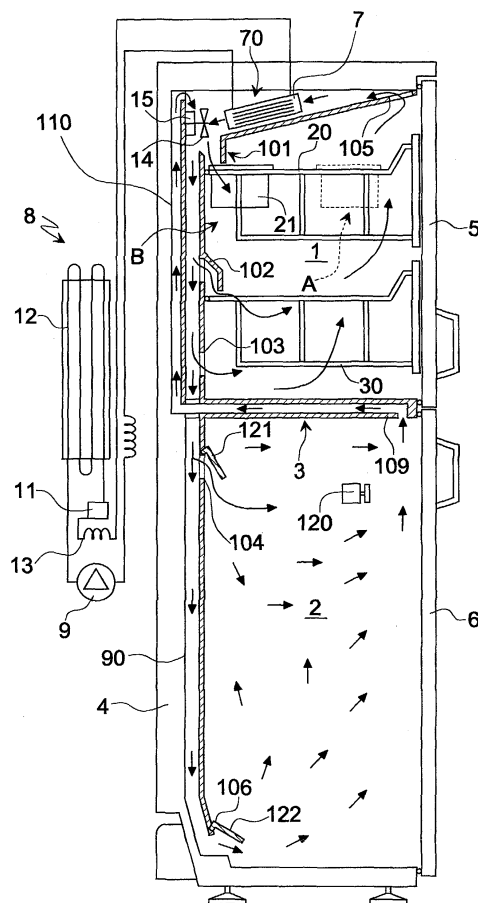


Fig.1

EP 1 621 831 A1

Description

[0001] The present invention refers to a freezer suitable to quickly cool food and to a refrigerator comprising said freezer.

[0002] Current household refrigerators normally comprise at least two compartments at different temperature, one with a higher temperature (typically between +3°C and +6°C) for fresh food and the other one at a lower temperature and (typically -18°C) for frozen and shock frozen food. Each one of the two compartments is provided with a respective evaporator, or with a respective portion of a same evaporator, which is part of an unusual refrigeration circuit with compressor and condenser.

[0003] These refrigerators are generally "no frost", which means they are provided with means suitable to prevent the formation of frost on the wall of the evaporator. For such reason in the compartment at lower temperature a so called "ventilated" evaporator is provided, which is subjected to forced circulation of air.

[0004] In the stage of refrigeration of the food each food, which has previously been cooked at a temperature greater or equal to 90°C, starts to irreversibly deteriorate due to the very quick proliferation of bacteria present in the air and of the spores which survived to the cooking. The temperature range within which there is the highest development of bacteria is comprised between +70°C and +3°C. The longer is the permanence in this zone, the greater is the alteration of the product and this occurs when a food is let cool at room temperature and/or in a normal refrigerator. In order to prevent this, blast chillers are utilised which allow to bring the core temperature of food from +70°C to +3°C in 90 minutes. In this way the ageing process of the product, which can be stored in the refrigerator for 5/7 days, is slowed.

[0005] In the same way, in order to ensure to the food to be frozen that the initial quality is not compromised in any way during the freezing stage, it is necessary that the latter takes place quickly. In fact with the quick freezing the food liquids turn into micro-crystals which do not damage in any way the tissue structure of the product. To this purpose quick freezers are utilised which allow to bring the core temperature of food from +90°C to -18°C in 240 minutes.

[0006] Both blast chillers as well as quick freezers are usually part of a single household appliance, and such household appliance is made in a way separate from household refrigerators.

[0007] In the application for European patent EP 1074802 a refrigerator with compartment for the quick cooling of food is described. Said compartment has small dimensions and it quickly cools by means of a circulation of air forced by the ventilator through the evaporator by means of openings for the inlet of air whose opening and closing is regulated by thermostatically controlled valve means.

[0008] In view of the state of the art herein described, the object of the present invention is to provide a freezer

suitable to quickly cool food that is different from the known freezers.

[0009] According to the present invention, said object is attained by means of a freezer comprising a cabinet, a compartment and refrigeration circuit with relative condenser, compressor, evaporator and ventilator, said ventilator being suitable to forcedly circulate air through said evaporator and inside said compartment by means of at least one opening, characterised in that it comprises at least one container and in that said at least one opening for the inlet of air forced by the ventilator inside said compartment is arranged in proximity of the ventilator, the latter conveying the cooled air from the evaporator on said at least one container.

[0010] Always according to the present invention it is possible to provide a refrigerator as defined in claim 8.

[0011] The characteristics and the advantages of the present invention will become evident in the following detailed description of an embodiment thereof, which is illustrated as non-limiting example in the enclosed drawings, in which:

Figure 1 is a vertical schematic section of a refrigerator provided with a freezer suitable to quickly cool food according to an embodiment of the present invention;

Figure 2 is a vertical schematic section of a single freezer according to a variation of the embodiment of the present invention;

Figure 3 is a vertical schematic section of the single freezer according to an other variation of the embodiment of the present invention.

[0012] In Figure 1 a refrigerator having two compartments, respectively 1 and 2, respectively at lower (freezer) and at higher temperature separated by a horizontal separation wall 3 inside a common cabinet 4 is shown. Such compartments are closed by respective independent doors 5 and 6.

[0013] On the top of the freezer 1 an evaporator 7 is present which is part of a refrigeration circuit 8 which comprises a compressor 9, a filter 11, a condenser 12 and flow laminators 13. The evaporator 7 is arranged in a housing or interspace 70 obtained inside the cabinet 4 and on top of the compartment 1.

[0014] A ventilator 14, cyclically set in action by an appropriate electric motor 15 and placed on top of the refrigerator, facing the evaporator 7, allows the circulation of air inside the refrigerator. Said ventilator 14 is suitable to intake the air which passes through the evaporator 7 and it is suitable to convey the cooled air into the compartments 1 and 2.

[0015] Inside the freezer 1 two racks are arranged, a top rack 20 and a bottom rack 30; the top rack 20 bears a container 21 movable along the rack 20, more precisely slidable on the rack 20.

[0016] The freezer 1 is provided with mouths 101-103 for the access of the cool air forcedly circulated by the

ventilator 14 and with an opening 105 for the outflow of air from the compartment 1 toward the evaporator 7.

[0017] The mouth 101 directly communicates with the ventilator 14 and the evaporator 7 in such a way that the cooler air is conveyed by said mouth 101 on the rack 20. If the container 21 is moved from a position of rest A, in proximity of the door 5 and far from the mouth 101, to a working position B, below the mouth 101, the food arranged in said container is influenced by the cooler air coming from the ventilator 14 and from the evaporator 7; in such way a quick cooling of the food arranged in the container 21 is provided and more particularly a quick freezing of the food present in the container 21 since said food reaches the temperature of about -18°C in a more rapid way than other food arranged in the same compartment 1.

[0018] The cool air which circulates in the compartment 1 exits through the opening 105, passes through the evaporator 7 while cooling and it is conveyed by the ventilator 14 toward the compartments 1 and 2.

[0019] The air which circulates in the compartment 2 enters through the duct 90, the mouths 104 and 106 and it outflows through the opening 107, it runs through the duct 109 and the duct 110 so as to go back to the ventilator 14. The openings 104 and 106 are provided with suitable valves 121, 122 controlled by a thermostat 120. The forced circulation of air prevents the formation of frost.

[0020] In a variation of the embodiment of the freezer according to the present invention, which is shown in Figure 2, the same freezer compartment 1 has instead three mouths for the inlet of cool air, a larger opening 130 to convey all the cooler air coming from the ventilator 14 toward the container 21 arranged on the lower rack 30.

[0021] Another variation of the second embodiment of the invention, which is shown in Figure 3, provides the presence of two containers 21 arranged one on the rack 20 and the other one on the rack 30 in such a way so as to have two zones for the quick cooling of food. The two containers 21 are arranged in proximity of the mouths 140 and 141 for the inlet of cool air. The mouth 140 is also provided with a valve 142 to close it in the case of absence of the container 21 or in the case one wants to utilise only the container 21 of the rack 30 for the quick cooling of food.

[0022] The freezers shown in Figures 1- 3 can be considered to be as single or part of a refrigerator.

Claims

1. Freezer comprising a cabinet (4), a compartment (1) and refrigeration circuit with relative condensator (12), compressor (9), evaporator (7) and ventilator (14), said ventilator (14) being suitable to forcedly circulate air through said evaporator (7) and inside said compartment by means of at least one opening (101, 130, 140, 141), **characterised in that** it comprises at least one container (21) and **in that** said at

least one opening (101, 130, 140, 141) for the inlet of the forced air by the ventilator (14) inside said compartment (1) is arranged in proximity of the ventilator (14), the latter conveying the air cooled by the evaporator (7) on said at least one container (21).

2. Freezer according to claim 1, **characterised in that** it comprises at least one rack (20, 30) and said at least one container (21) is movable on said rack (20, 30) from a first position (A) in which said container (21) is arranged far from said at least one opening (101, 130, 140, 141) to a second position (B) in which said container (21) is arranged in proximity of said at least one opening (101, 130, 140, 141) and it is influenced by the cool air conveyed by the ventilator (14) though it and vice-versa.

3. Freezer according to claim 2, **characterised in that** it comprises two openings (140, 141) for the inlet of cool air, two racks (20, 30) arranged inside compartment freezer (1) and two containers (21), one for each rack, and movable between said first (A) and said second (B) position.

4. Freezer according to claim 2, **characterised in that** it comprises a top rack (20) and a bottom rack (30), said container (21) being slidable along the top rack (20).

5. Freezer according to claim 2, **characterised in that** it comprises a top rack (20) and a lower rack (30), said container (21) being slidable along said lower rack (30).

6. Freezer according to claim 1, **characterised in that** it comprises an interstice (70) formed by said cabinet (4) and said freezer compartment (1) on top of the freezer, said evaporator (7) being arranged in said interstice (70).

7. Freezer according to claim 3, **characterised in that** it comprises a valve (142) for the closing of one (140) of said two openings.

8. Household refrigerator comprising a cabinet (4), at least one freezer compartment (1) and at least one compartment (2) at a temperature greater than said freezer compartment (1), comprising a refrigeration circuit (8) with relative condensator (12), compressor (9), evaporator (7) and ventilator (14), said ventilator (14) being suitable to forcedly circulate air through said evaporator (7) and inside said compartment (2) at a temperature greater than freezer compartment (1) and inside said freezer compartment by means of at least one opening (101, 130, 140, 141), **characterised in that** said compartment freezer (1) comprises at least one container (21) and **in that** said at least one opening (101, 130, 140, 141) for the inlet

of air forced by the ventilator (14) inside said freezer compartment (1) is arranged in proximity of the ventilator (14), the latter conveying the air cooled by the evaporator (7) on said at least one container (21).

5

9. Refrigerator according to claim 8, **characterised in that** said freezer compartment (1) comprises at least one rack (20, 30) and said at least one container (21) is movable on said rack (20, 30) from a first position (A) in which said container (21) is arranged far from said at least one opening (101, 130, 140, 141) to a second position (B) in cui said container (21) is arranged in proximity of said at least one opening (101, 130, 140, 141) and is influenced by the cool air conveyed by the ventilator (14) through it and vice-versa. 10 15
10. Refrigerator according to claim 9, **characterised in that** said freezer compartment (1) comprises two openings (140, 141) for the inlet of cool air, two racks (20, 30) arranged inside said freezer compartment (1) and two containers (21), for each rack, and movable between said first (A) and said second (B) position. 20
11. Refrigerator according to claim 9, **characterised in that** said freezer compartment (1) comprises a top rack (20) and a bottom rack (30), said container (21) being slidable along the top rack (20). 25
12. Refrigerator according to claim 9, **characterised in that** said freezer compartment (1) comprises a top rack (20) and a bottom rack (30), said container (21) being slidable along the bottom rack (30). 30
13. Refrigerator according to claim 8, **characterised in that** it comprises an interstice (70) formed by said cabinet (4) and said freezer compartment (1) on top of the refrigerator, said evaporator (7) being arranged in said interspace (70). 35 40
14. Refrigerator according to claim 10, **characterised in that** said freezer compartment (1) comprises a valve (142) for the closing of one (140) of said two openings (140, 141). 45

45

50

55

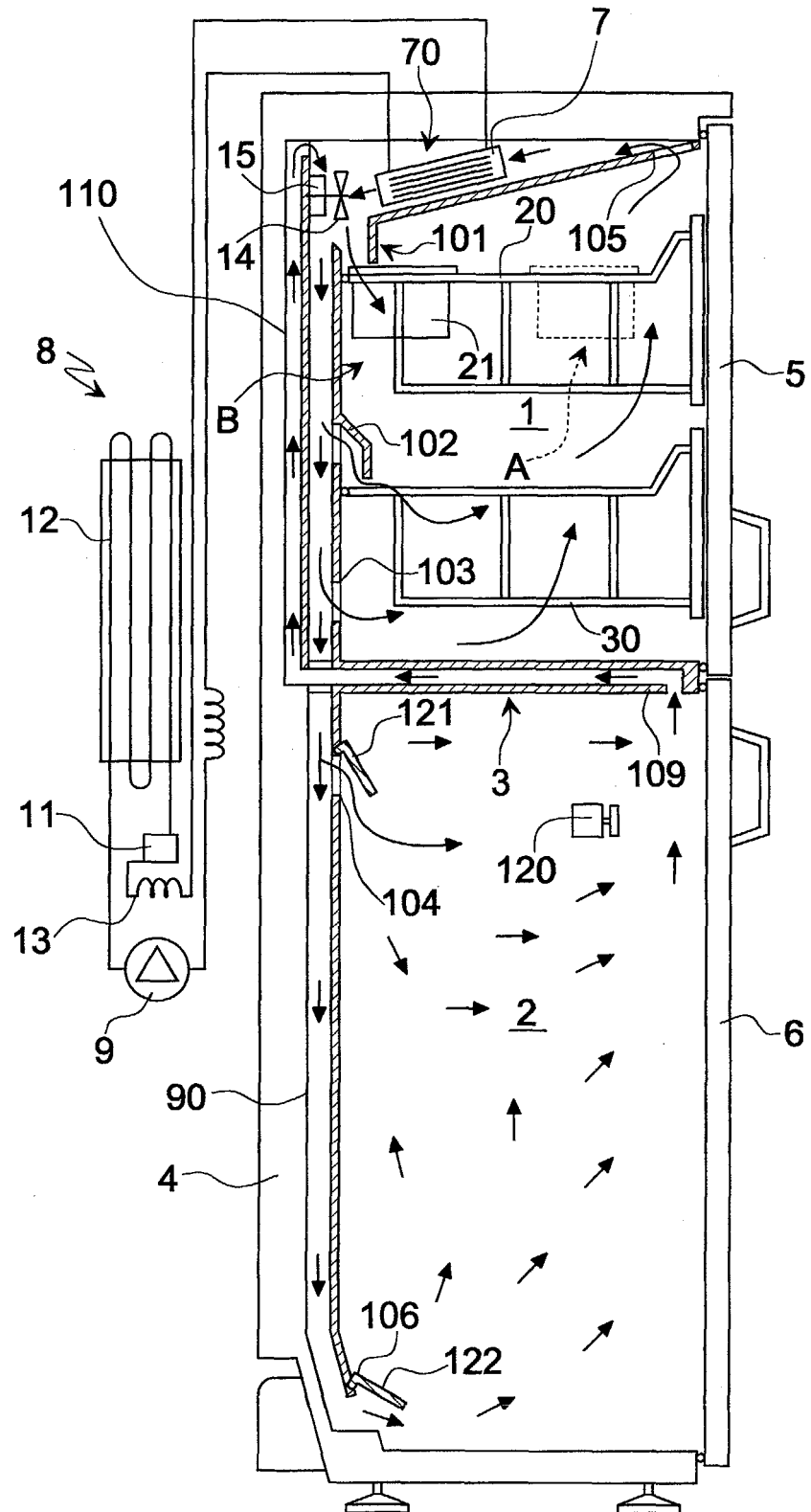


Fig.1

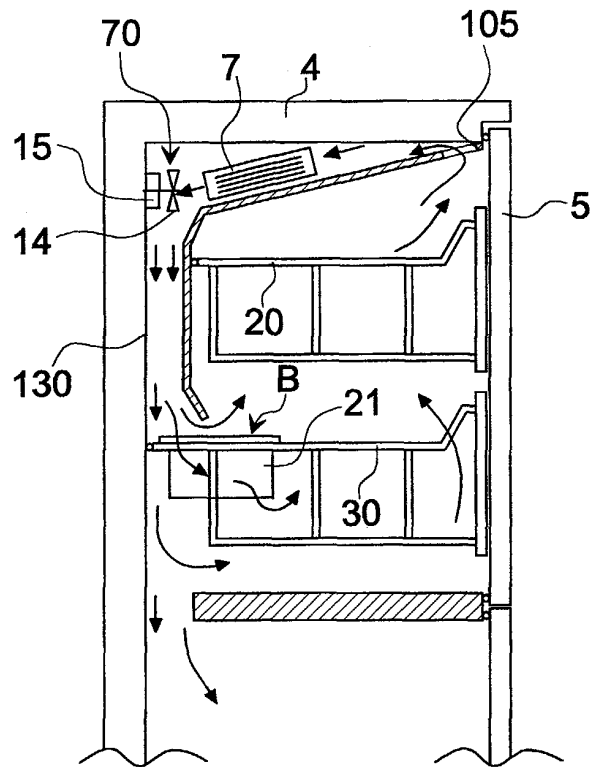


Fig.2

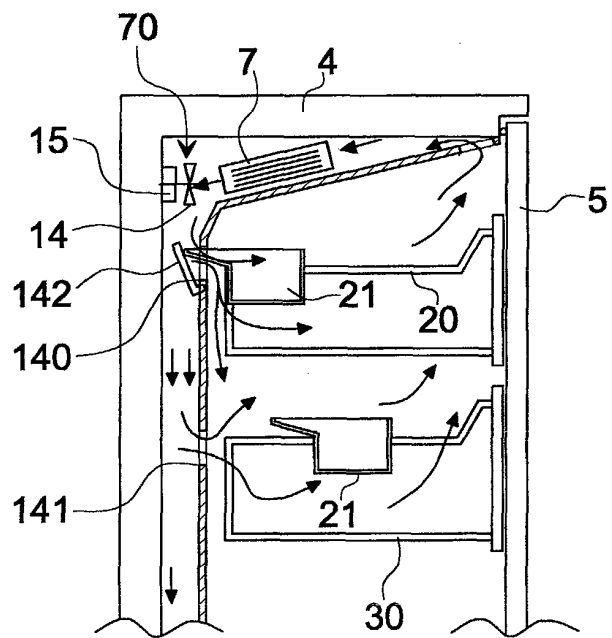


Fig.3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5583

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 04, 31 August 2000 (2000-08-31) -& JP 2000 002476 A (HITACHI LTD), 7 January 2000 (2000-01-07) * abstract * * figure 4 *	1-5,8-12	F25D11/02 F25D17/06 F25D25/02
A	-----	6,7,13, 14	
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 503 (M-1478), 10 September 1993 (1993-09-10) -& JP 05 126452 A (MATSUSHITA REFRIG CO LTD), 21 May 1993 (1993-05-21) * abstract * * figure 1 *	1-4,8-11	
A	-----	5-7, 12-14	
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 18, 5 June 2001 (2001-06-05) -& JP 01 111181 A (MATSUSHITA REFRIG CO LTD), 27 April 1989 (1989-04-27) * abstract * * figures 1-6 *	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F25D
A	-----	6,7	
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 517 (M-1481), 17 September 1993 (1993-09-17) -& JP 05 133680 A (SANYO ELECTRIC CO LTD), 28 May 1993 (1993-05-28) * abstract * * figure 1 *	1	
	----- -/-		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 December 2004	Examiner CORREIA DOS REIS, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

3
EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5583

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 879 881 A (MADIGAN STEPHEN M) 14 November 1989 (1989-11-14) * column 8, line 55 - column 8, line 62 * * column 10, line 46 - column 10, line 54 * * figures 5,9 *	1,6,8,13	
A	----- PATENT ABSTRACTS OF JAPAN vol. 014, no. 287 (M-0988), 21 June 1990 (1990-06-21) -& JP 02 089979 A (MITSUBISHI ELECTRIC CORP), 29 March 1990 (1990-03-29) * abstract * * figures 1-6 * -----	1-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search		Date of completion of the search	Examiner
The Hague		14 December 2004	CORREIA DOS REIS, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

3
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 42 5583

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-12-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000002476 A	07-01-2000	CN 1245283 A	23-02-2000
		KR 2000006235 A	25-01-2000
		TW 528847 B	21-04-2003
		US 6244061 B1	12-06-2001
		US 2001035018 A1	01-11-2001

JP 05126452 A	21-05-1993	NONE	

JP 01111181 A	27-04-1989	NONE	

JP 05133680 A	28-05-1993	JP 3048713 B2	05-06-2000

US 4879881 A	14-11-1989	AU 4228289 A	18-04-1990
		WO 9003542 A1	05-04-1990

JP 02089979 A	29-03-1990	NONE	
