(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 September 2004 (02.09.2004)

PCT

(10) International Publication Number
WO 2004/073413 A1

(51) International Patent Classification[7]: A23G 9/04, 9/08, 9/22, A23L 3/36

(21) International Application Number: PCT/GB2004/000719

(22) International Filing Date: 23 February 2004 (23.02.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0304195.1 22 February 2003 (22.02.2003) GB

(71) Applicant and
(72) Inventor: **PETERS, Mark** [GB/GB]; Slush Puppie Ltd, Unit 12/13 Lyon Way, Greenford, Middlesex UB6 0BN (GB).

(74) Agent: **JOHNSTONE, Helen**; Eric Potter Clarkson, Park View House, 58 The Ropewalk, Nottingham NG1 5DD (GB).

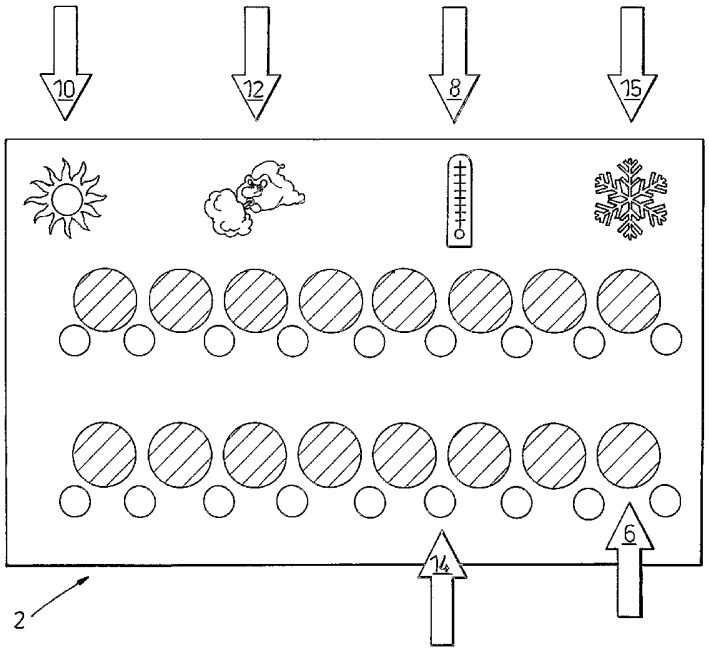
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, 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, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FROZEN POURABLE PRODUCT



(57) Abstract: A method of forming a partially frozen pourable mixture, the method comprising the steps of: mixing a liquid containing a base liquid and a flavouring; pouring the liquid into one or more containers each having a predetermined volume and representing an individual portion of the mixture; placing the one or more containers within a temperature controlled chamber; causing the temperature to vary in a controlled manner to produce frozen pourable product in the one or more containers.

WO 2004/073413 A1

FROZEN POURABLE PRODUCT

This invention relates to a method of forming a partially frozen pourable product, particularly such a product for human consumption, and to an apparatus for forming such a product. Such products are particularly popular with children, and are often referred to as slushes.

A frozen pourable product typically comprises a base liquid such as water into which has been added a flavouring in the form of a solid which can dissolve within the base liquid. Suitable flavourings are, for example, sugar and Isosweet solids. Isosweet is the trade name of Amylum UK for isomerose syrup. This is a glucose syrup treated with enzymes to make it sweeter. The flavouring is mixed into the base liquid and the mixture is frozen. During the freezing process, the soluble solids in the non-frozen liquor increase in concentration.

The semi frozen pourable product is then consumed by drinking the non-frozen liquor containing the soluble solids "through" the ice. The ice may also be consumed.

It is known to manufacture partially pourable frozen product by mixing a suitable flavouring with a base liquid such as water at appropriate levels of dilution. The mixture is then poured into a freezer in the form of a container incorporating an agitator. The mixture is frozen to about -3°C until it forms a pourable semi frozen mixture, and is held at this temperature by a viscosity switch that controls a freezer element in the freezer. As is the case with most freezers, the temperature of the mixture is controlled to within a predetermined temperature range by causing the freezer unit to be switched on and off as appropriate. Conveniently, the freezer will comprise a sensor which senses the viscosity of the freezing mixture. As the viscosity

increases to a certain level, the freezer unit will be triggered to switch off in order to raise the temperature and hence reduce viscosity of the mixture. Similarly once the mixture falls below a certain viscosity, the freezer unit will be triggered to switch on again to reduce the temperature and hence increase the viscosity of the mixture.

Such freezer units are often found in retail units such as newsagents, in which a range of products such as sweets and drinks are also sold. When a customer wants to purchase some of the partially frozen pourable product, an appropriate amount of the mixture is dispensed from the freezer by means of a tap into a smaller receptacle such as a paper cup.

A problem with this known method of forming and dispensing a partially frozen pourable mixture is that the mixture tends to freeze in the freezer from the surface of the mixture downwards leaving mixture towards the bottom of the freezer in the form of an unfrozen liquor containing the solid flavouring. This means that it is not possible to dispense all of the product from within the freezer since the tap must be positioned a predetermined distance from the bottom of the freezer. This in turn means that from time to time it is necessary to shut down the freezer, empty the freezer of mixture which is not dispensable, and then refill the freezer with a fresh mixture. This results in substantial waste.

In addition, because the freezer has a relatively large capacity, of the order of 10 litres to 30 litres depending on the type of freezer, some of the mixture will remain in the freezer for several days. During this time ice crystals will grow, sometimes becoming unacceptably large.

Further, it is necessary to have a supply of individual containers such as paper cups, into which the mixture is poured, at the point of sale of the product. This results in potentially further waste.

Also, the known method of forming the mixture cannot be used with milk-based products for legal and hygiene reasons. Milk products suffer microbiological spoilage, and food poisoning organisms may grow from within the milk products. Preservatives may not be added. Machine dispensed milk products would require pasteurising daily, resulting in unacceptably high wastage spoilage due to over heating.

According to a first aspect of the present invention there is provided a method of forming a partially frozen pourable mixture, the method comprising the steps of:

mixing a liquid containing a base liquid and a flavouring;

pouring the liquid into one or more containers each having a predetermined volume, and representing an individual portion of the mixture;

placing the one or more containers within a temperature controlled chamber;

causing the temperature to vary in a controlled manner to produce frozen pourable product in the one or more containers.

An advantage of the present invention is that a retailer wishing to sell the product may buy the product in pre-packed containers. Each container holds an individual portion size of the mixture. It is then necessary merely to store the containers in a temperature controlled chamber forming part of the invention. When a customer wishes to purchase the product, it is necessary only for the retailer to remove a container from the chamber and

present it to the customer. This results in a more convenient process and obviates the need to have separate individual containers for dispensing the mixture.

Preferably, the temperature is caused to fall to about -20°C for a first predetermined period of time and then caused to increase to about -3°C for a second predetermined period of time.

During the first predetermined period of time when the temperature drops to -20°C, ice crystal growth is initiated by lowering the temperature of the mixture to below freezing temperature of the mixture.

The presence of the dissolved solids which provide the flavour to the liquid will depress the freezing point of water which is usually used as a base liquid, from 0°C to typically -3°C, in a situation where 50% ice formation is required.

As the product freezes ice is formed and soluble solids in the non-frozen liquor increase in concentration. This causes the freezing temperature to be lowered further.

During the second predetermined period of time where the temperature within the chamber is increased to -3°C, the mixture is held at a temperature which maintains the liquid in a partially frozen pourable state in which it is suitable for selling to consumers.

For any given mixture within a temperature range of approximately –1°C to -10°C, an equilibrium ice to liquor ratio will be established. Thus, in order to ensure a particular ratio of ice to liquor, it is necessary to control the temperature within the chamber during the period within which consumers

may buy the product. This period is usually within the hours of 0900 to 1800 depending on the hours within which the retail unit selling the product trades.

Preferably the method comprises the further steps of thawing the mixture to a temperature of about +2°C for a third predetermined period of time.

During this third predetermined period of time, the chamber may be restocked to replace products which have been sold during the day, and products not sold are thawed before being refrozen during the first step of the cycle during which the temperature in the chamber is reduced to about -20°C for the first predetermined period of time. This prevents growth of large ice crystals in product remaining in the chamber for more than one temperature cycle.

The resulting product will typically contain approximately 25% ice although a ratio of between 10% and 50% of ice is also feasible. The consistency of the product is preferably similar to that of slush from melted snow. If it is too thick, it cannot be consumed via a straw. If it is too thin it becomes mobile like water.

Conveniently, the method comprises a further step of rotating the one or more containers about a longitudinal axis for at least some of the time that the one or more containers are positioned within the chamber.

This has the effect of ensuring substantially uniform freezing of the product within the one or more container.

According to the second aspect of the present invention there is provided an apparatus for forming a partially frozen pourable mixture comprising:

a chamber;

receiving means for receiving one or more containers containing a mixture to be frozen;

a temperature sensor for sensing the temperature within the chamber;

temperature means for cooling and heating the chamber;

control means for controlling operation of the temperature means such that the temperature within the chamber cycles through at least two predetermined temperatures for predetermined periods of time.

Preferably, the control means controls operation of the temperature means such that the temperature within the chamber is caused to fall to about -20°C for a first predetermined period of time and then caused to increase to about -3°C for a second predetermined period of time.

Preferably, the control means controls the operation of the temperature means such that the temperature is raised to +2°C for a third predetermined period of time.

Conveniently, the temperature means comprises refrigerator coils, and a fan, and optionally a heater.

Advantageously, the apparatus further comprises rotating means for causing rotation of one or more container.

Conveniently, the rotation means comprise one or more rollers.

The invention will now be further described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a schematic representation of a first embodiment of the invention, in the form of a temperature control chamber forming part of the apparatus according to the second aspect of the present invention used to carry out the method of the first aspect of the present invention;

Under certain circumstances it has been found advantageous to be able to rotate one or more of the one or more containers containing the mixture to be frozen. However in other circumstances, for example, if a large number of containers is being processed simultaneously, it is preferable for the containers to remain stationary throughout the processing.

It has been found that, if a large number of containers is processed, for example, 80 or more containers, then the product within the containers cools more slowly. This may create a larger depression of the freezing point than occurs when a smaller number of containers are processed simultaneously.

It has, therefore, been found advantageous that when a large number of containers are processed simultaneously, that they should remain stationary through the process. In other words, the container should be processed statically. This means that when seeding occurs, the ice crystals tend to form a matrix which occupies all the original liquid space.

The mixture to be frozen can be held as a pseudo solid for several days of the temperature cycle. This eliminates the need for a thawing cycle.

A product processed in this way will become a slush, i.e., a frozen pourable product, upon shaking the container prior to consumption of the mixture.

According to a third aspect of the present invention, there is provided a product formed using the method according to the first aspect of the present invention, or the apparatus according to the second aspect of the present invention.

Figure 2 is a schematic plan view of the chamber of Figure 1 showing the rollers on which containers may be supported;

Figure 3 is a schematic representation of the chamber of Figure 1 with no containers present showing spindles on which rollers are supported;

Figure 4 is a detail of Figure 3; and

Figure 5 is a schematic representation of a second embodiment of the present invention.

Referring to the Figures 1 to 4, a temperature controlled chamber is designated generally by the reference numeral 2. The chamber can take any form in which it is possible to control temperature within the chamber, and may for example be in the form of an incubator.

The chamber is shaped and sized so that it can contain 16 individual containers 4. It is to be understood however that a chamber 2 according to the present invention may be proportioned to hold any number of containers 4 as appropriate.

Each of the containers 4 contains a mixture which will be sold as a semi frozen pourable product.

In this example each container 4 is positioned on rollers 6, although in other examples, the chamber 2 may not include rollers.

The chamber 2 further comprises a thermometer 8 which in this example comprises a platinum resistance thermometer, a heater 10 and a fan 12. The chamber also contains a source of refrigeration 15. This may be in the form of cooling coils or chilled air. In this example the source of refrigeration is coiling coils 15.

The product contained within the containers 4 comprises a base liquid such as water, and a predetermined proportion of a flavouring in the form of a solid. In this example the flavouring is a glucose syrup solid which is added to the base liquid water in a proportion of 10% glucose syrup solid to 90% water.

Each container 4 comprises a substantially cylindrical clear plastic bottle having a neck and a cap. The maximum capacity of each container 4 in this example is 390ml. Each container is filled with a mixture of water and glucose syrup solid to a capacity of 350ml to allow 40ml of head space which is used to stir the product. The rollers 6 on which each of the containers 4 are supported, allows each container to be rotated along its axis. In this example the speed of rotation is 2.5 bottle revolutions per minute.

The temperature within the chamber 4 is controlled so that it varies to produce a frozen pourable product within each of the containers. A temperature cycle within the chamber will now be described in more detail.

First Period, Period A

This period takes place between the hours of midnight and 2am. The temperature within the chamber is raised to +2°C and product within containers which has not been sold during the temperature cycle is thawed and remixed.

Second Period, Period B

This period takes place between the hours of 2am and 4am. During this period the temperature within the chamber is lowered to -15°C. Old and newly supplied products are lowered to a temperature well below the initial freezing temperature. Initially, the product will cool to a temperature of, say -6°C which is significantly below the initial freezing temperature of the product. Small ice crystals will then quickly form throughout the containers and the temperature of the product will rise.

Third Period, Period C

This period takes place between the hours of 4am and midnight. During this period the temperature is controlled within a range of approximately –1.5°C +/- 0.5°C. During this period, the product is maintained at a temperature that produces a suitable ratio of ice to liquor for the proportion of glucose solids within the base liquid.

In this example, as mentioned above, the mixture comprises 10% of glucose solids. This means at a temperature of -1°C there will be a minimal amount of ice. At a temperature of –1.5°C there will be 25% ice and at a temperature of -2°C there will be 50% ice.

It is during period C that retailers will have the opportunity to sell the product to customers. As the day progresses, ice crystals become fewer and

larger and would continue to enlarge if the product was not completely thawed during period A when the incubator is also restocked.

The temperature may be controlled in such a way to produce the product having any proportion of ice from 10% to 50% as appropriate.

The invention further comprises a controller which controls the operation of the heater 10 and the fan 12 as appropriate in order to produce the required temperature at the appropriate time.

The temperature is controlled by an electronic control unit connected to the thermometer 8. If the freezer temperature is above the set point then the control unit admits refrigeration to the freezer to cool it down. When the temperature is sensed to be below the set point then the refrigeration is withdrawn.

The invention is adapted to cover temperature rise and falls of 0.1 to 2°C. The time between set points (the hunt) is typically 20 minutes although the hunt time may be anything from 1 minute to 2 hours.

The thermometer 8 monitors the temperature at all times, and the controller causes adjustment of the temperature through operation of the refrigeration source 15, heater 10 or fan 12 as appropriate during the temperature cycle of the chamber.

Referring now to Figures 2 to 4, the chamber 2 is shown in more detail. The chamber 2 comprises rollers 6 which are adapted to support the containers 4 and also to cause the containers to rotate. One of the rollers, in this case roller 14, is a drive roller and is driven by any means such as a

motor to rotate at a predetermined speed. Adjacent rollers are drivingly connected to one another by means of drive belts 16.

Figures 3 and 4 show details of the chamber 2. As can be seen, the drive portion of roller 14 and the drive belts are hidden behind a false back 18 to the chamber 2. This ensures that the drive mechanism does not interfere with the containers 6.

The chamber comprises, in this embodiment, two shelves, or layers of rollers as can been seen in Figure 1.

Turning now to Figure 5, a second embodiment of the invention is illustrated. In this embodiment, the invention comprises a temperature controlled chamber designated generally by the reference numeral 200. Parts of the chamber 200 which correspond to parts of the chamber 2 illustrated in Figures 1 to 4 have been given corresponding reference numerals for ease of reference.

The chamber 200 is very similar to chamber 2, but there are no rollers 6 for causing rotation of the containers 4 (not shown in Figure 5). It has been found that chamber 200 is particularly useful for processing large numbers of containers 4 simultaneously. In particular, chamber 200 is useful for processing eighty to one hundred and sixty containers at a time.

On processing a large number of containers 4 at the same time, the product held within the containers will cool more slowly. This will create a larger depression of the freezing point compared to the depression of the freezing point created when a smaller number of packs of containers are processed at the same time.

Because there are no rollers 6 in the chamber 200, the containers will be processed statically. This means that ice crystals tend to form a matrix that occupies all of the original liquid space in each of the containers.

This means that the product can be held at as a pseudo solid for several days of the daily temperature cycle. This in turn means that there is no need for a thawing cycle.

In other words, the first period, period A as described hereinabove with reference to Figures 1 to 4 is not necessary when using the chamber 200 for processing a large number of containers 4 at the same time.

It is to be understood that the chamber illustrated in Figures 1 to 4 could be used to statically process containers by similarly not operating the rollers.

Example

Product Details

A raspberry flavoured syrup was prepared with 15% glucose solids, 0.3% citric acid, preservatives, colouring and flavouring.

This was filled into 120 P.E.T. bottles to 330ml. The brim full capacity of the bottles was 390ml. The bottles were placed on 4 shelves, 30 bottles to a shelf and with air space around each bottle i.e., the bottles were not touching one another.

The Daily Cycle

Seeding

The temperature within the chamber 200 was set at minus 15° centigrade and kept at this temperature for 14 hours. After approximately 3 hours the air temperature in the display unit was about minus 6 degrees centigrade. The first bottles developed ice crystals which very quickly occupied most of the volume of the bottle. The temperature in the seeded bottles rose to minus two degrees centigrade. This rise in temperature means that the refrigeration cooling rate reduces, and the number of bottles seeding per hour falls. Also, in general, the longer a bottle takes to seed the greater the freezing point depression. However, after 14 hours all bottles had seeded and grown sufficient ice.

Holding

The temperature in the chamber 200 was then set at minus 3 degrees centigrade for 10 hours. If the temperature detected was above minus 3 degrees, the refrigeration would cut in. If the temperature dropped to below minus 2.8 degrees centigrade, the refrigeration would cut out. If refrigeration dropped below minus 5 degrees centigrade the heater would cut in. As the temperature rose, more ice thawed. After 2 hours holding, the bottles were saleable as slush. On removing the bottles from the chamber, the product was found to imitate a solid with an ice crystal structure. On shaking the bottle the product assumed a typical slush pourable structure.

Restacking

Sold product can be replaced by fresh product, typically stored at ambient, at any stage during the holding cycle.

5

CLAIMS

1. A method of forming a partially frozen pourable mixture, the method comprising the steps of:

mixing a liquid containing a base liquid and a flavouring;

pouring the liquid into one or more containers each having a predetermined volume and representing an individual portion of the mixture;

placing the one or more containers within a temperature controlled chamber;

causing the temperature to vary in a controlled manner to produce frozen pourable product in the one or more containers.

2. A method according to Claim 1 wherein the temperature is caused to fall to about -20°C for a first predetermined period of time, and then caused to increased to -3°C for a second predetermined period of time.

3. A method according to Claim 2 comprising the further step of raising the temperature within the chamber to a temperature of +2°C for third predetermined period of time.

4. A method according to any one of the preceding claims further comprising the step of rotating the one or more containers about a longitudinal axis.

5. An apparatus for forming a partially frozen pourable mixture comprising:

a chamber;

receiving means for receiving one or more containers containing a mixture to be frozen;

a temperature sensor for sensing the temperature within the chamber;

temperature means for cooling and heating the chamber;

control means for controlling operation of the temperature means such that the temperature within the chamber cycles through at least two predetermined temperatures for predetermined periods of time.

6. An apparatus according to Claim 5 wherein the control means controls operation of the temperature means, such that the temperature within the chamber is caused to fall to about minus 20 degrees centigrade for a first predetermined period of time, and then caused to increase to about minus 3 degrees centigrade for a second predetermined period of time.

7. An apparatus according to Claim 5 or Claim 6 wherein the control means controls the operation of the temperature means such that the temperature is raised to plus 2 degrees centigrade for a third predetermined period of time.

8. An apparatus according to any one of Claims 5, 6 or 7 wherein the temperature means comprises one or more of:

refrigerator coil, fan, heater.

9. An apparatus according to any one of Claims 5 to 8 further comprising rotating means for causing rotation of one or more of the containers.

10. An apparatus according to Claim 9 wherein the rotating means comprises one or more rollers.

11. A partially frozen pourable mixture formed by a method according to any one of Claims 1 to 4.

12. A partially frozen pourable mixture formed using an apparatus according to any one of Claims 5 to 10.

13. A method substantially as hereinbefore described with reference to the accompanying drawings.

14. An apparatus substantially as hereinbefore described with reference to the accompanying drawings.

15. A partially frozen pourable mixture substantially as hereinbefore described with reference to the accompanying drawings.

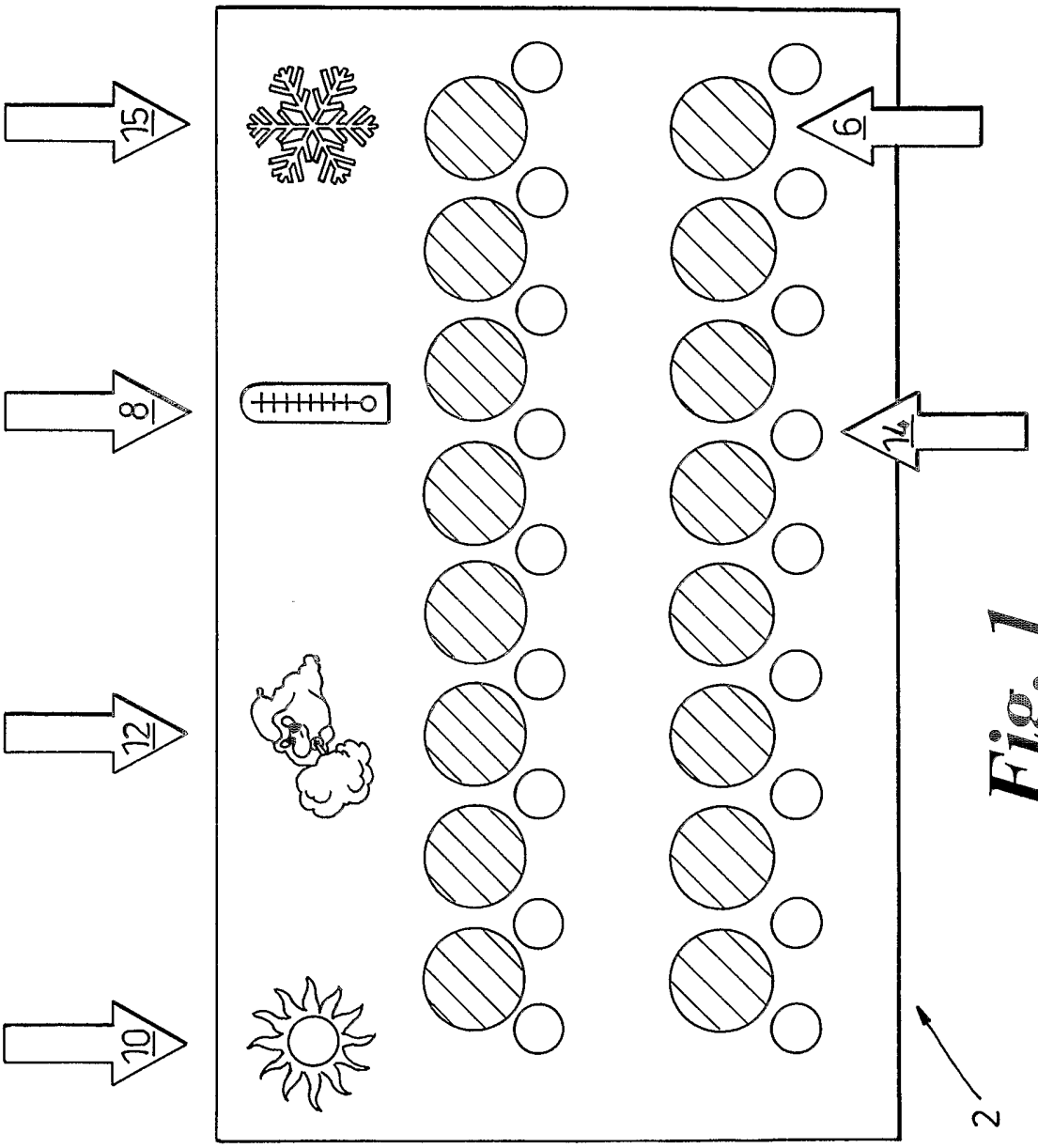


Fig. 1

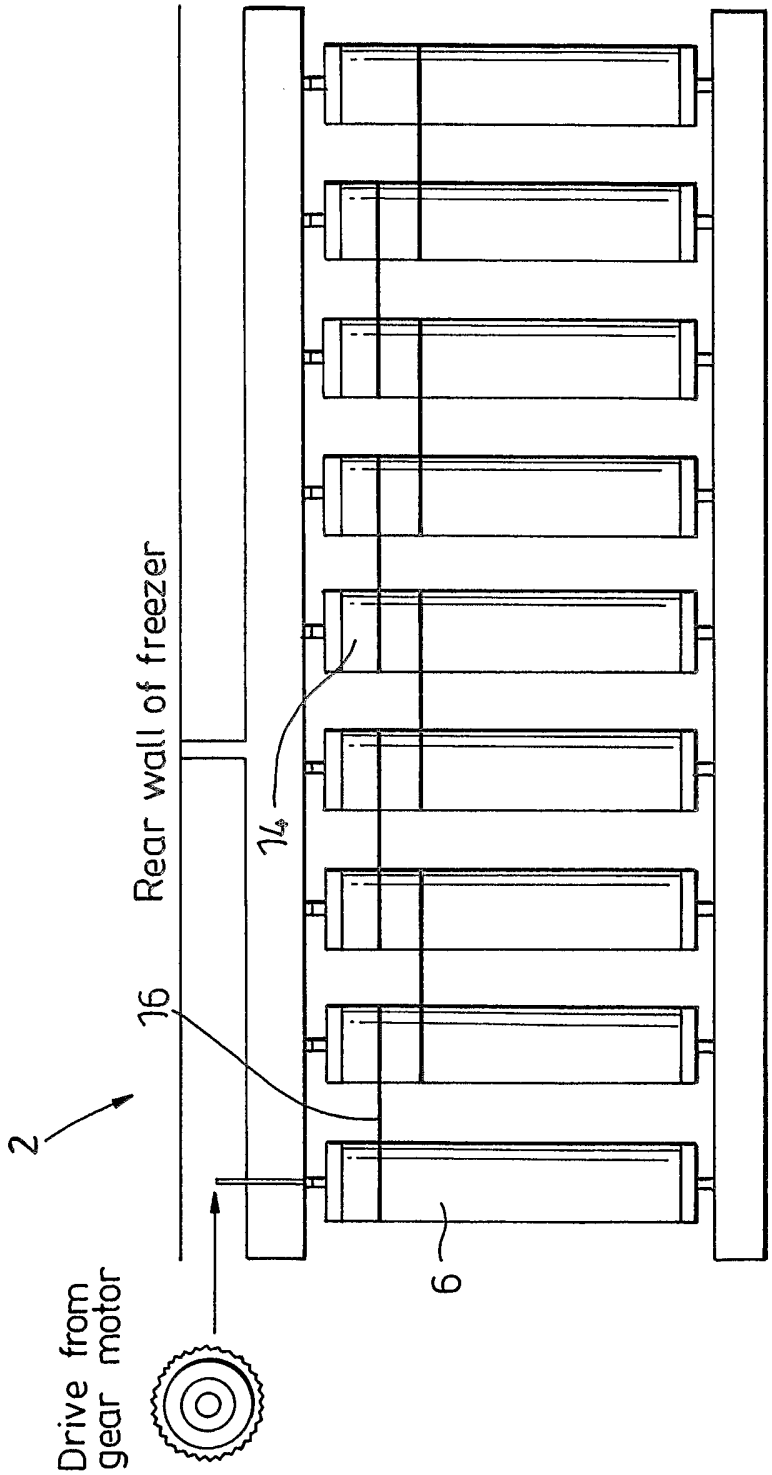


Fig. 2

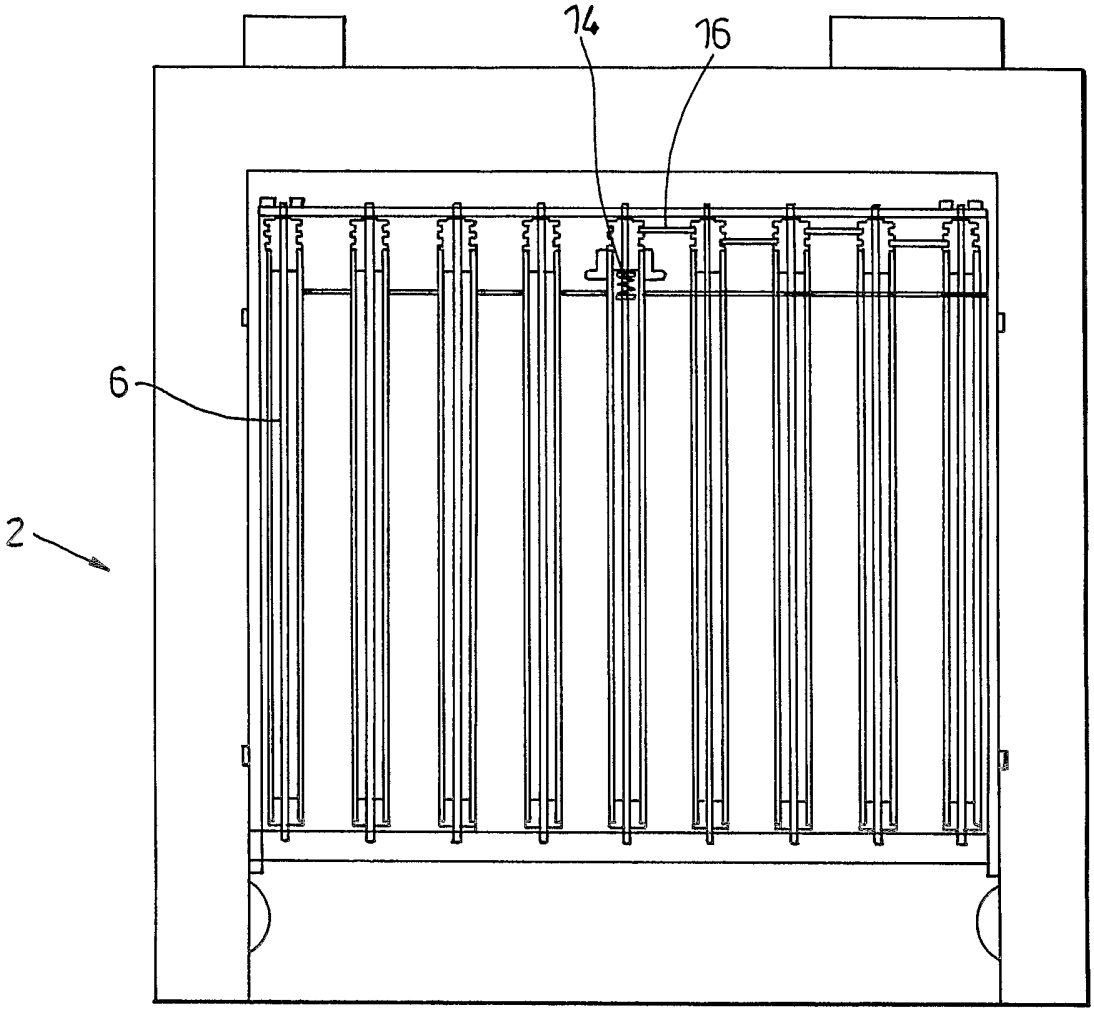


Fig. 3

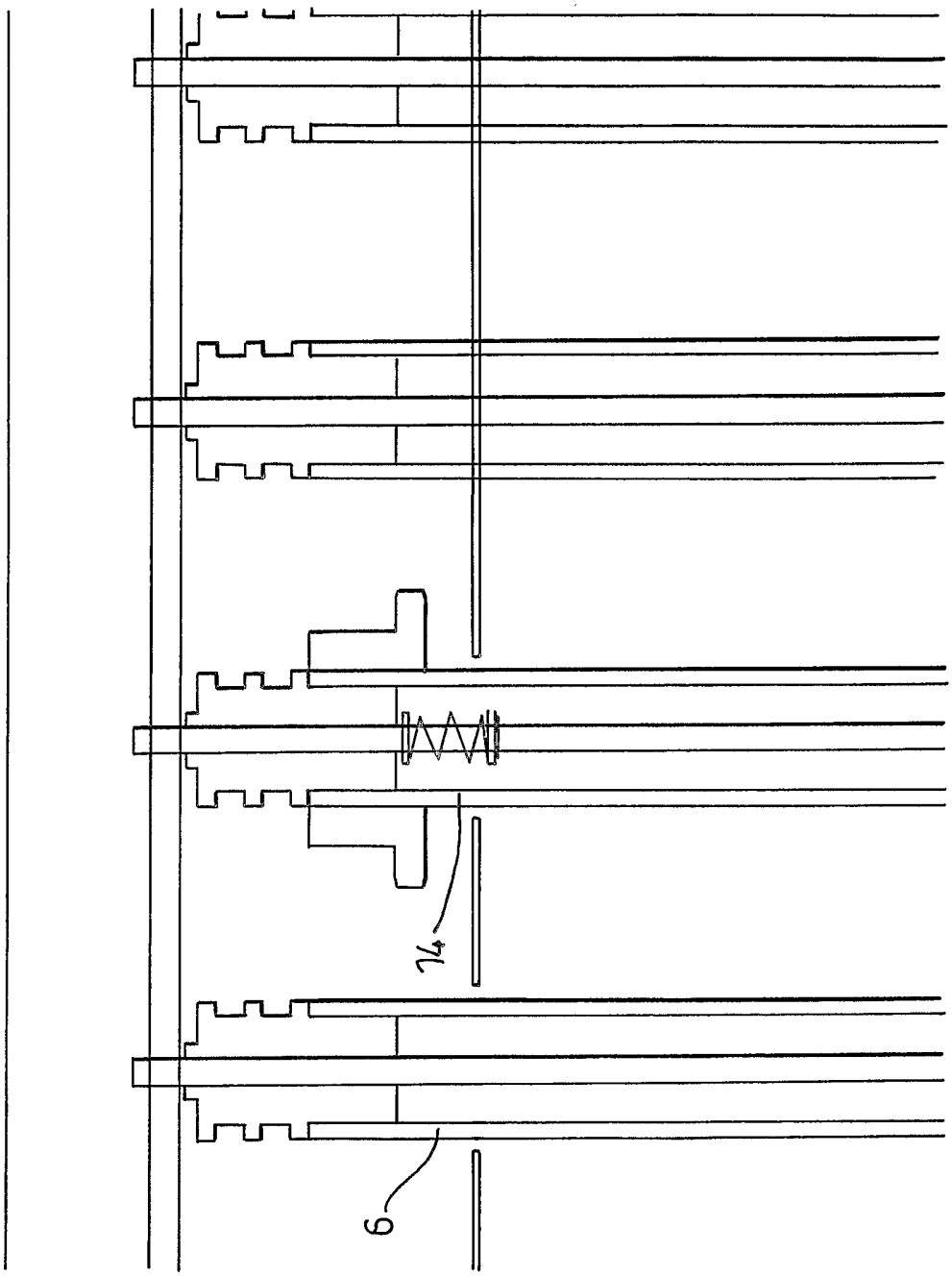


Fig. 4

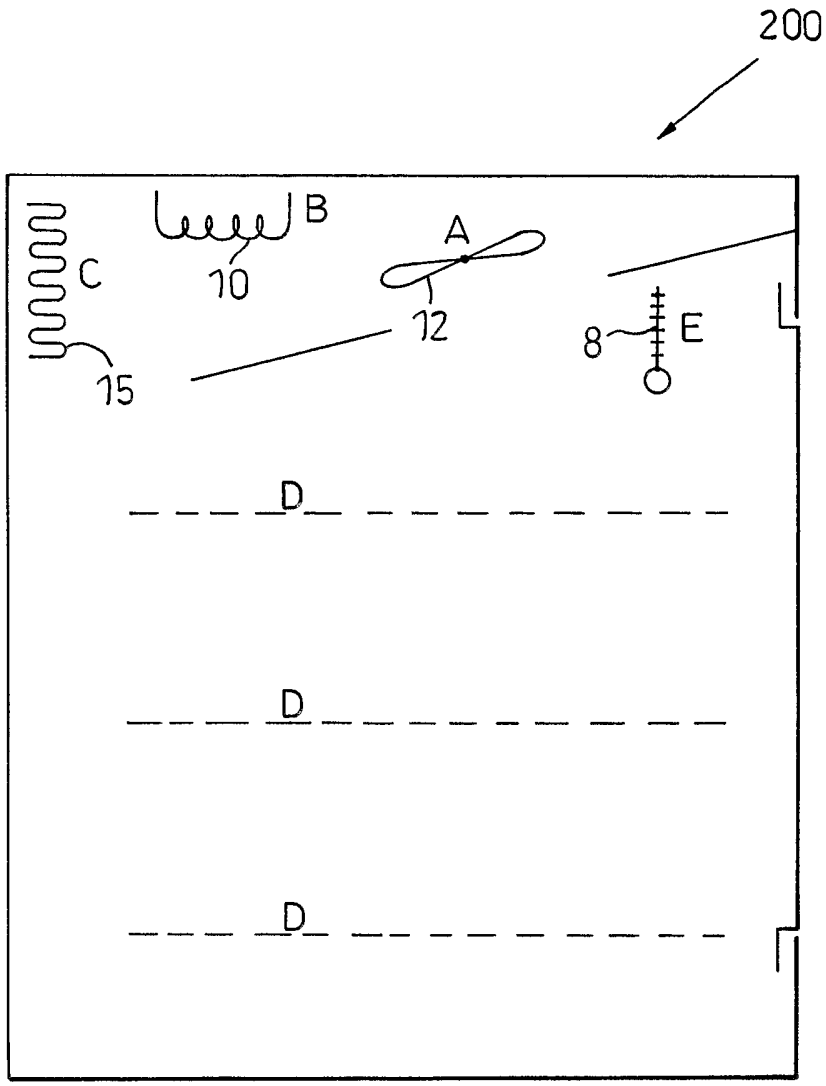


Fig. 5

INTERNATIONAL SEARCH REPORT

rnational Application No
T/GB2004/000719

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23G9/04 A23G9/08 A23G9/22 A23L3/36

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 A23G A23L

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

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 068 875 A (BROWN WILLIAM ET AL) 30 May 2000 (2000-05-30)	1-4
X		11,12
A	US 2002/150664 A1 (BROWN WILLIAM ET AL) 17 October 2002 (2002-10-17)	1-4
X		11,12
A	US 5 363 746 A (GORDON ELLIS D) 15 November 1994 (1994-11-15) abstract; claim 1	1-12
A	GB 282 951 A (WATFORD ENGINEERING WORKS LTD; JOHN PARAMOR) 5 January 1928 (1928-01-05) the whole document	5-10

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in 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	Date of mailing of the international search report
24 June 2004	12/07/2004

Name and mailing address of the ISA	Authorized officer
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	Gaiser, M

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

rnational Application No
T/GB2004/000719

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/033021 A1 (FRANK JIMMY I) 21 March 2002 (2002-03-21) paragraph '0008! - paragraph '0012!; claims 1,11; figure 3	5-10
A	WO 01/60184 A (SOFTPAC IND) 23 August 2001 (2001-08-23) abstract; claim 14	1-4,11, 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2004/000719

Box 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.: 13-15
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 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:

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.:

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

Continuation of Box II.2

Claims Nos.: 13-15

Claims 13-15 do not comprise any technical features, but only references to the description. Therefore, no meaningful search can be conducted on the subject-mater of these claims.

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 Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

rnational Application No
T/GB2004/000719

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6068875 A	30-05-2000	US 5948461 A	07-09-1999
		US 5766665 A	16-06-1998
		US 2002048626 A1	25-04-2002
US 2002150664 A1	17-10-2002	NONE	
US 5363746 A	15-11-1994	NONE	
GB 282951 A	05-01-1928	NONE	
US 2002033021 A1	21-03-2002	US 2003145607 A1	07-08-2003
WO 0160184 A	23-08-2001	AU 4797701 A	27-08-2001
		WO 0160184 A1	23-08-2001
		US 2001046545 A1	29-11-2001