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(71) Applicants:
- **Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO**
  2628 VK Delft (NL)

(72) Inventors:
- **van der Sluis, Sietse Marlom**
  7327 LK Apeldoorn (NL)
- **van Druten, Alexander Cornelis**
  3011 HC Rotterdam (NL)

(74) Representative: **van Loon, C.J.J. et al**
c/o VEREENIGDE
Johan de Wittlaan 7
2517 JR Den Haag (NL)

(54) Method and device for cooling products

(57) Method and device for cooling products like e.g. beverage cans etc. below the ambient temperature by means of a flow of cold air. The device comprises or cooperates with restricted rooms, called cocoons (5,11).Each cocoon is able to be or to become loaded with one or a number of the products (6) to be cooled. Detection means (7) are arranged for detecting the presence and/or load of each cocoon. Air flow control means (8,10) are arranged to restrict the flow of cold air only to cocoons which are loaded with at least one product to be cooled. A detection part (7) protudes in the cocoon (5) or in an area (13) in which the cocoon (11) and/or product (6) may reside, and is connected with air flow control means (8,10) which are arranged to control the air flow per cocoon (5) or per area (13) in which the cocoon (11) and/or product (6) may reside.

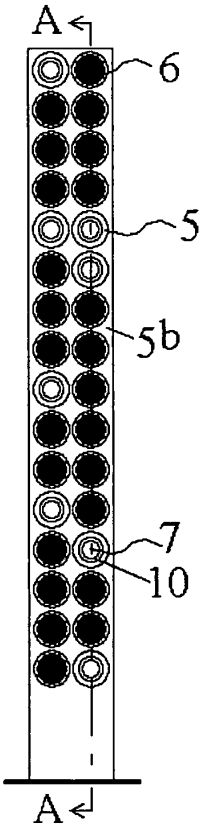

FIG. 1[a]

EP 1 930 674 A1

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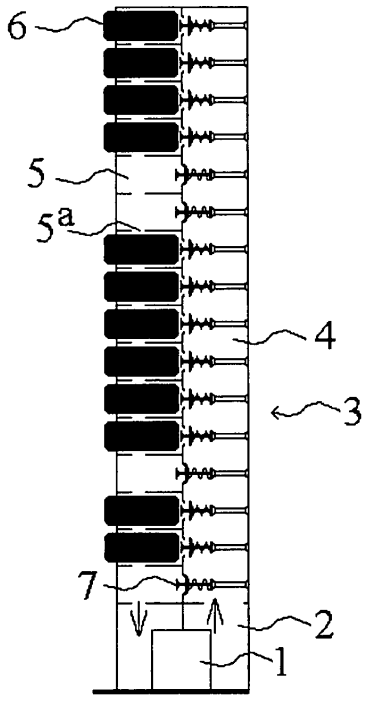

FIG. 1b

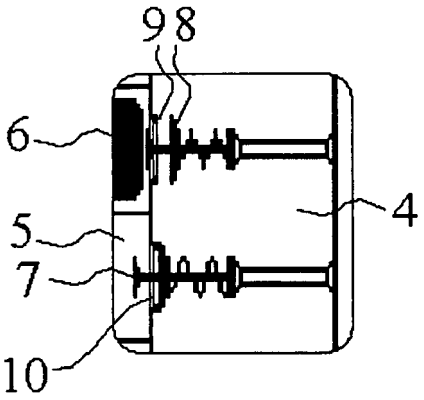

FIG. 1c

Description

FIELD OF THE INVENTION

[0001] The invention refers to a method and apparatus for cooling products, e.g. beverage cans, bottles or other products below the ambient temperature by means of cold air.

BACKGROUND OF THE INVENTION

[0002] A Refrigerated Display Cabinet(RDC)is an apparatus for the display of refrigerated foodstuffs, with the purpose of selling these products to the public. RDCs are used in supermarkets, food stores, convenience stores and other places where refrigerated or deep frozen foodstuffs are sold.

[0003] In an RDC the products are cooled by means of cold air flowing along the product, where the cold air has a temperature below the desired product temperature. Alternatively the product may be cooled by means of contact cooling through the shelf or surface on which the product is placed, where this shelf or surface has a lower temperature than the desired product temperature. A combination of air cooling and contact cooling is also possible.

[0004] The air that cools the products is cooled inside the RDC and discharged into the area where the products are located through an air discharge opening. After the air has passed over the products, it may be collected again through a suction opening, and cooled again inside the RDC. The movement of the air may be produced by natural phenomena (silent cooling) or may be supported by means of fans.

[0005] The cooling of the air inside the RDC may be performed with a heat exchanger, along the outside of which the air is led and which on the inner side is fed with a refrigerant or a cooling medium, with a temperature lower than that of the air. The refrigerant or cooling medium can be circulated to the heat exchanger from an external cooling machine (in which case the cabinet is a so called remote cabinet) or can be circulated to the heat exchanger from a cooling machine that is integrated into the RDC (a so called integral cabinet).

[0006] The part of the RDCs where the refrigerated products are located may be visible to the public, either wholly exposed or by means of a glass door or sliding glass pane. In European RDCs, glass doors are common for RDCs that hold frozen foods and for RDCs that hold refrigerated drinks. These RDCs or usually called "glass door cabinets".

[0007] The control system of RDCs is dedicated to keep the air temperature inside the cabinet at a desired level. A secondary control is available to provide defrost cycles to the heat exchanger coil, as ice is formed on the coil during operation and the ice needs to be removed at regular intervals. The flow of air in the RDC is constant throughout the whole duration of the cooling period, and is not controlled by the amount of products available in the RDC. During the period of defrosting of the evaporator coil, and shortly thereafter, the airflow in the RDC may be reduced by means of a control system on the basis of air or coil temperature or on the basis of time or on the basis of air or coil temperature and time.

[0008] At night - when no public is present - open refrigerated cabinets (without glass doors or glass sliding panels) can be covered with so called night covers, to prevent spilling of cold air out of the cabinet. Some cabinet control systems reduce the flow of air in the RDC during the period that the night covers are applied.

[0009] RDCs are used for a variety of cooled products, including dairy products, meat products, seafood products, vegetables, ready meals, flowers and drinks, as well as for frozen products such as vegetables, fish, meat, ready meals and ice cream.

[0010] Beverage cans or crates filled with bottles of beer or other beverages are products sold in food retail stores and other shops. Unlike dairy and meat products, these products do not need to be cooled for preservation purposes and extension of shelve life. Beverage cans or crates filled with bottles of beer or other beverages can be stored, displayed and sold at ambient temperature. Before actual consumption, beer and other beverages are cooled, to improve the drinking experience. Beer and other beverages are cooled in bottles or cans in a household refrigerator or in a cellar or in a cold water basin of some kind, large enough to hold one can or one bottle or larger. Other beverages alternatively are cooled by means of ice cubes, at the time of drinking. These ice cubes are produced in a household or commercial refrigerator with freezing compartment, refrigerator - freezer combination, or freezer. In retail cooled bottles or cans of beer or other beverages are displayed in glass door refrigerators, called bottle coolers. In these bottle coolers the bottles or cans are placed standing side - by - side or alternatively lying in rows, stacked on top of each other.

[0011] In bottle coolers beverage cans are not cooled individually, but the whole interior of the bottle cooler, in which the beverage cans are situated, is cooled.

[0012] Bottle coolers are not intended for the sale of a crate or crates of beer or other beverages, but for the sale of loose cooled bottles of beer or other beverages. Crates are not placed in glass door bottle coolers, as the horizontal access mode does not comply with the access to the bottles in the crates, where access is from above.

[0013] In prior art RDCs the interior of the cabinet is cooled as a whole, and the airflow in the cabinet is independent of the number of products stored in the cabinet. In Prior-art RDCs bottled or canned beer and beverages are not stored and displayed in cocoons or in a crate or in crates.

SUMMARY OF THE INVENTION

[0014] One aim of the invention is to display and cool products like e.g. beverage cans or bottles etc. by means

of an amount of cold air that is adjusted to the amount and/or location of the products to be cooled by the apparatus.

[0015] According to the invention, it is preferred that the relevant products to be cooled are placed in a restricted room, containing one or a number of the products to be cooled. The restricted room will be called "cocoon" hereinafter. It is preferred to detect, e.g. by detection means, which cocoons are empty or even absent and/or which cocoons are not empty or absent, and to direct, e.g. by air flow control means, the flow of cold air only to cocoons which contain at least one product to be cooled. In that way the need for cold air is variable, viz. adjusted to only the amount of not empty (or not absent) cocoons. The cold air may flow around or through the (not empty) cocoons. Each cocoon may be arranged to contain one product or one set of products, e.g. a box or crate or "six-pack" (six cans or bottles held together by means of transparent shrink-foil) of beverage. The cocoon may be part of the product, e.g. a crate or shrink-foil, containing a number of products (bottles, cans), which might be sold together with the actual products; in that case it will be detected wether the cocoons are or are not present in a certain area, or may be part of the apparatus, each cocoon e.g containing one product, e.g. a single beverage can.

[0016] The detection means, arranged to detect which cocoons are empty/absent and/or which cocoons are not empty/absent, and the air flow control means may be arranged electronically, electro-mechanically or pure mechanically. The detection means and the air flow control means may preferrably be integrated, and may e.g. comprise a mechanical part which protudes in the area in which the cocoon or product resides (not empty/not absent cocoon state) or not resides (empty/absent cocoon state). Control means, e.g. having the shape of an air flap or slide, may be communicatively connected with the detection means, thus providing direct and simple control of the cold air flow to or through the product cocoon.

[0017] The apparatus using the inventive cold air distribution is very well suited for retail situations, where the products are on display to the public and easily accessible without barriers between the products and the public. Every time a consumer picks a product or a set of products out of the RDC, thus emptying the cocoon in which the product or set of products was placed, that action is detected and the cold air suplly automatically is stopped. When the RDC, by the shop staff, is refilled again, that action is detected too and the cold air supply to the concoon will be restored again.

[0018] Besides beverages etc., the invention is also applicable for dairy products, meat products, ice cream etc.

[0019] The use of an air flow which is controlled by the amount of non-empty/non-absent cocoons increases the performance of the apparatus by reducing the amount of cold air that is spilt to the environment. This reduction of spilt cold air reduces the amount of refrigeration energy needed by the apparatus. This reduction of spilt cold air also reduces the amount of cold introduced by the apparatus into the comfort zone around the apparatus. In this comfort zone public may be present, that experiences discomfort arising from the introduction of cold air into the comfort zone.

[0020] Sensing/detecting the amount of empty/absent cocoons may be based on the weight or the physical boundaries of the products.

[0021] Control of the air flow may be extended to sensing the amount of e.g. crates partly filled with beverages bottles and adapting the cold air output to those partly filled product cocoons.

[0022] The extraction of heat from the cold air flow through the apparatus and through the cocoons or crates may be done by means of an evaporator coil of a refrigerating machine, where the refrigerating machine is integrated in the apparatus or where the refrigerating machine is located outside the apparatus. It is also possible that cold air is supplied to the apparatus from an external source, where the cold air supplied from the external cold air source makes up for the cold air spilt into the comfort zone and other losses of cold from the apparatus and the cocoons or crates.

EXEMPLARY EMBODIMENT

[0023]

Figure 1 shows a first preferred embodiment of the invention; figure 1a is a front view of the first preferred embodiment; figure 1b is a cross-section over the line AB in figure 1a; figure 1c is a magnified detail of figure 1a and figure 1b.

Figure 2 shows a second preferrede embodiment of the invention; figure 2a is a front view of the first preferred embodiment; figure 2b is a cross-section over the line AB in figure 2a.

[0024] In the device of figure 1 for cooling products below the ambient temperature a flow of cold air is generated by a cold air generator 1, mounted in the bottom chamber 2 of a housing 3. Moreover, the housing 3 comprises a vertically extending distribution chamber 4, which may be communicatively connected with a number of restricted rooms, called cocoons 5. Each cocoon 5 may be loaded with one - in figure 1- or a number - in figure 2 - of the products to be cooled. In this example the product may be cans 6 containing soft drink or beverage.

[0025] The device, moreover, comprises detection means which are arranged for detecting - in the embodiment of this figure 1 - the load (viz. empty of occupied by a can 6) of each cocoon, as well as air flow control means which are arranged to restrict the flow of cold air only to cocoons which are loaded with at least one product to be cooled.

[0026] The device of figure 1 is arranged that the cold air flows through the cocoons 5 and mainly around the cans 6. Each cocoon 5 of which it is detected that it is empty, thus not loaded with a can 6, is not flown by cold air, due to the fact that those empty cocoons are cut off from the cold air source, distributed by the distribution chamber 4.

[0027] The detection means comprise a mechanical detection part in the form of a detection shaft 7, including having a flat end and spring-loaded protuding in the cocoon 5 in which the can 6 may or may not reside. The detection shaft 7 is mechanically communicatively connected with mechanical air flow control means, in the form of a disk-shaped valve 8, cooperating with a valve seat 9 which surrounds an aperture 10 in the wall between the distribution chamber 4 and the series of cocoons 5.

[0028] When no can 6 is inside a cocoon 5, the spring-loaded detection shaft 7 extends inside the cocoon 5, allowing the valve 8 to rest upon the valve seat 9 and thus closing the aperture 10 and preventing the cold air to enter in the empty cocoon 5. When, however, a can 6 is inserted into the cocoon 5, the spring-loaded detection shaft 7 will be pushed backwards, forcing the valve 8 to leave the valve seat 9 and thus opening the aperture 10 and allowing the cold air to enter in the empty cocoon 5. In this way the mechanical air flow control means are arranged to control the air flow per cocoon, viz. to exclusively flow through the loaded cocoons 5 with cold air while excluding the empty cocoons 5.

[0029] Each cocoon 5 may be provided with apertures 5a in their sides, enabling the cold air to return, e.g. via a common return chamber 5b, surrounding all individual cocoons 5, to the cold air generator 1.

[0030] Not shown in the figures is an alternative configuration wherein the detection means comprise electrical or electronic detection parts extending to the cocoon 5 or the area in which the cocoon 5 or product 6 may reside, and which are electrically or electronically connected with electric or electromechanical air flow control means arranged to control the air flow per cocoon or per area in which the cocoon or product may reside. Embodiments of such an alternative configuration may be within the capabilities of any person skilled in the art.

[0031] Figure 2 shows another embodiment of a device for cooling products below the ambient temperature by means of a flow of cold air, according to the invention. In Figure 2 the rooms of restricted dimensions, called cocoons, are formed by crates or boxes 11 loaded with a number, e.g. ten or fifteen of the products to be cooled, e.g. cans 6 or bottles of beer, which can be piled up on a floor 12.

[0032] As in the embodiment of figure 1 a flow of cold air is generated by a cold air generator 1, mounted in the bottom chamber 2 of a housing 3. Moreover, the housing 3 comprises a vertically extending distribution chamber 4, which may be communicatively connected with a number of cocoons, having the form here of the boxes 11. As useually each box 11 will be sold as a whole, viz. entirely filled with bottles or cans 6, each cocoon, shaped as a box 11 is loaded with a fixed number of the products to be cooled. However, it may be possible to sell the content of the box 11 piece-by-piece, which does not influence the operation of the embodiment, although the content of the (upper) box 11 should be inspected regularly by e.g. the supermarket's staff.

[0033] As in the embodiment of figure 1, the device comprises detection means which are arranged for detecting - in the embodiment of this figure 2 - the presence of each cocoon, as well as air flow control means which are arranged to restrict the flow of cold air only to areas which are occupied by a cocoon, in this case a box (which may be entirely or partly - see note - be filled with bottles or cans 6).

[0034] The device of figure 2 is arranged that the cold air flows through the boxes and mainly around the cans 6. Each box 11 is connected to the cold air distribution chamber 4 via controllable cold air outlets which may have the same configuration as the previous embodiment, shown in detail in figure 1c.

[0035] The detection means comprise a mechanical detection part in the form of a detection shaft 7, including having a flat end and spring-loaded protuding in an (open) area 13 which may or may not be occupied by a box 11. The detection shaft 7 is mechanically communicatively connected with mechanical air flow control means, in the form of a disk-shaped valve 8, cooperating with a valve seat 9 which surrounds an aperture 10 in the wall between the distribution chamber 4 and the area 13.

[0036] When no box 11 is within area 13 at the level of a certain detection shaft 7, that spring-loaded detection shaft 7 extends inside the area 13, allowing the valve 8 to rest upon the valve seat 9 and thus closing the aperture 10 and preventing the cold air to enter in the area 13. When, however, the spring-loaded detection shaft 7 has been pushed backwards by one of the piled up boxes 11, that box will thus force the valve 8 to open the aperture 10 and to allow the cold air to enter in the box 11. In this way the mechanical air flow control means are arranged to restrict the cold air flow to boxes 11 and to close the cold air outlets which mouth into the area 13 which is not occupied by any box 11.

[0037] Each box may be provided with apertures 14 in their side walls which match with the locations of the cold air outlet apertures 10 in the distribution chamber 4. Moreover, the boxes may be provided with matching apertures 15 in their upper and lower sides, enabling the cold air to flow through the entire pile of boxes, towards the floor 12, which comprise sucking apertures 16, enabling the (main part of the) air flow to return to the cold air generator 1.

Claims

1. Method for cooling products below the ambient tem-

perature by means of a flow of cold air, comprising that

- the products to be cooled are loaded in a restricted room, called cocoon hereinafter, containing one or a number of the products to be cooled;
- detecting the presence and/or the load of each cocoon;
- restricting the flow of cold air only to cocoons which are loaded with at least one product to be cooled.

2. Device for cooling products below the ambient temperature by means of a flow of cold air, the device comprising or being arranged to cooperate with restricted rooms, called cocoons (5,11) hereinafter, each cocoon being able to be or to become loaded with one or a number of the products (6) to be cooled; the device, moreover, comprising detection means (7) which are arranged for detecting the presence and/or the load of each cocoon, as well as air flow control means (8,10) which are arranged to restrict the flow of cold air only to cocoons which are loaded with at least one product to be cooled.

3. Device according to claim 2, the device being arranged that the cold air flows around or through the loaded cocoons.

4. Device according to claim 2, the detection means comprising a mechanical detection part (7) which protudes in the cocoon (5) or in an area (13) in which the cocoon (11) and/or product (6) may reside, and which is mechanically communicatively connected with mechanical air flow control means (8,10) which are arranged to control the air flow per cocoon (5) or per area (13) in which the cocoon (11) and/or product (6) may reside.

5. Device according to claim 2, the detection means comprising electrical or electronic detection parts extending to the cocoon or the area in which the cocoon and/or product may reside, and which are electrically or electronically connected with electric or electromechanical air flow control means which are arranged to control the air flow per cocoon or per area in which the cocoon and/or product may reside.

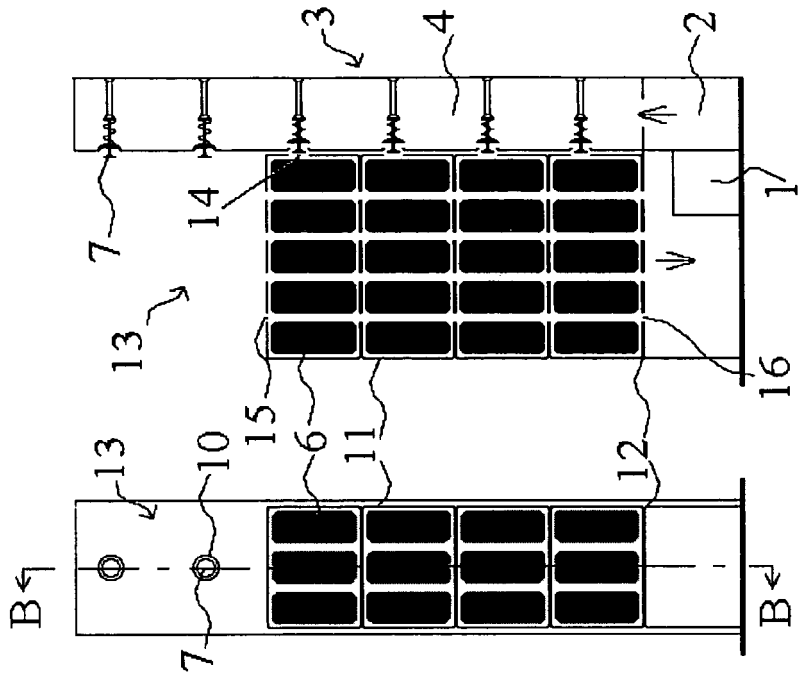

FIG. 2a

FIG. 2b

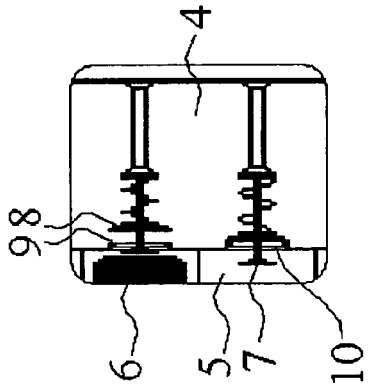

FIG. 1c

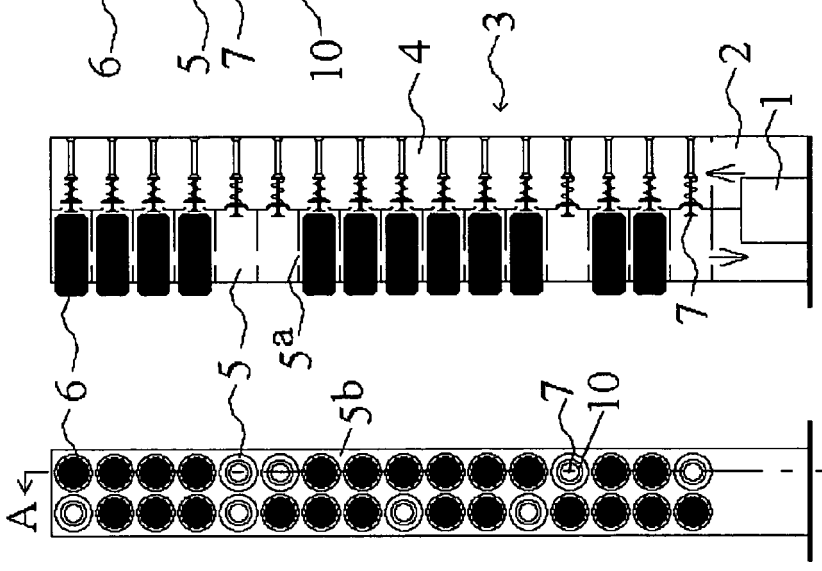

FIG. 1a

FIG. 1b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 07 5047

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 May 2007	de Graaf, Jan Douwe

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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