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SYO-9605

SPECIFICATION

TITLE OF THE INVENTION

CRYOGENIC SHOWCASE

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to a cryogenic showcase comprising an adiabatic box having an outer case and an inner case in which a heat insulator is filled between said outer case and said inner case both opened upward.

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2. Background Art

The conventional type of cryogenic showcase is constituted by an inner case shown in, for example Fig. 9. That is, in Fig. 9, a reference numeral 101 designates an
15 inner case made of a steel sheet, opened upward and constituting a storeroom 102 thereinside, and a cooler 103 comprising a pipe including a refrigerant therewithin is attached snakily on the outer face (on the side of a heat insulator) of this inner case 101. A horizontal rolled
20 auxiliary cooler 104 is attached at the upper rear end of the inner case 101.

The inner case 101 constituted as described above is built in an outer case not shown in Fig.9 with space between this outer case and the inner case 101 and a heat
25 insulator is filled with the space between them. The



storeroom 102 is cooled at predetermined coldly storing or freezing temperature by the cooler 103 and the auxiliary cooler 104 attached on the inner case 101.

However, in the above-described cryogenic showcase, since the storeroom 102 is kept only at either coldly storing or freezing temperature, a beverage (food to be stored coldly) such as a juice, a milk or the like and a cold confectionery such as an ice cream, frozen foods or the like cannot be concurrently kept in the same storeroom. Therefore, heretofore, as in, for example Japanese patent publication No. 1-41911 (F25D23/06), inner cases for freezing and cold storage are arranged side by side within the outer case, a cooler and an auxiliary cooler are respectively attached to each inner case, and thereby complication of structure and a rise of costs are caused.

The present invention is made to solve such a conventional technical problem and the object of the present invention is to provide a simply constituted and low-priced cryogenic showcase provided with storerooms at different temperature for freezing and cold storage.

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SUMMARY OF THE INVENTION

The inventors of the present invention found that the above-mentioned problems can be solved by a novel and improved cryogenic showcase.

An object of the present invention is to provide a cryogenic showcase comprising an adiabatic box comprising an outer case and an inner case both opened upward, wherein a heat insulator is filled with a space between said outer case and said inner case; a partition member for partitioning said inner case into first and second storerooms; a cooler attached on the outer face of said inner case at the side of said first storeroom for heat exchange; and an auxiliary cooler provided across the upper part of said both storerooms.

Further, preferably a refrigerant flown through said coolers is let into said auxiliary cooler earlier than into said cooler.

Another object of the present invention is to provide a cryogenic showcase comprising an adiabatic box comprising an outer case and an inner case both opened upward, wherein a heat insulator is filled with a space between said outer case and said inner case; a partition member for partitioning said inner case into first and second storerooms; a cooler attached on the outer face of said inner case at the side of said first storeroom for heat exchange; and an auxiliary cooler provided across the upper part of said both storerooms, wherein area provided with said cooler located at the side of said second storeroom is smaller than that at the side of said first storeroom.



Furthermore, a refrigerant flown through said coolers is let first into an auxiliary cooler, second into the cooler at the side of the first storeroom, and last into the cooler at the side of the second storeroom.

5 In addition, in a cryogenic showcase according to the present invention, the partition member is preferably constituted by a heat conducting plate and an adiabatic plate, and said heat conducting plate is located on the side of the first storeroom and said adiabatic plate is located on
10 the side of the second storeroom.

 In a cryogenic showcase according to the present invention, since an inner case is partitioned into first and second storerooms by a partition member, a cooler is attached on the outer face of the inner case only at the side of the
15 first storeroom for heat exchange and an auxiliary cooler is provided across the upper part of both storerooms, the second storeroom is cooled only by the auxiliary cooler and the first storeroom is cooled by the cooler via the inner case in addition to the auxiliary cooler.

20 Since both storerooms are certainly partitioned by the partition member, the first storeroom can be cooled at lower temperature than the second storeroom. Therefore, according to the present invention, storerooms at different temperature for freezing and cold storage can be constituted
25 at a low price with such simple structure.



Since a cryogenic showcase is constructed such that a refrigerant flown through said coolers is let into the auxiliary cooler earlier than into the cooler, the temperature of the auxiliary cooler can be lowered in comparison with that of the cooler and thereby defrosting work can be simplified by generating frost only on the auxiliary cooler.

In a cryogenic showcase according to the present invention, since a cooler is attached on the outer face of the inner case at the both sides of both storerooms for heat exchange wherein area provided with said cooler located at the side of said second storeroom is smaller than that at the side of said first storeroom, the second storeroom is cooled by the auxiliary cooler and the cooler arranged, e.g. at far intervals via the inner case and the first storeroom is cooled by the auxiliary cooler and the cooler arranged e.g. closely via the inner case. Further, since both storerooms are partitioned by the partition member, the first storeroom can be cooled up to the lower temperature more powerfully than the second storeroom. Therefore, according to the present invention, storerooms at different temperature for freezing and cold storage can be constituted at a low price with such simple structure.

When a refrigerant is let into the auxiliary cooler earlier than into the cooler in a cryogenic showcase, the



temperature of the auxiliary cooler can be lowered in comparison with that of the cooler and thereby defrosting work can be simplified by generating frost only on the auxiliary cooler. Further, since a refrigerant is let from the cooler on the side of the first storeroom into the cooler on the side of the second storeroom, the cooling capacity of the cooler on the side of the first storeroom can be secured and a failure in cooling in the first storeroom can be avoided beforehand.

10 Furthermore, since the partition member is constituted by a heat conducting plate and an adiabatic plate, the heat conducting plate is located on the side of the first storeroom and the adiabatic plate is located on the side of the second storeroom in a cryogenic showcase in addition to the above construction, both storerooms can be prevented or controlled from being influenced thermally each other and the difference of both storerooms in temperature can be maintained satisfactorily because a cooling action from the inner case is conducted to the heat conducting plate of the partition member, the first storeroom can be also cooled by the partition member and the second storeroom is insulated thermally from the first storeroom by the adiabatic plate.

25 BRIEF DESCRIPTION OF THE DRAWINGS

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Fig. 1 is a perspective drawing showing a cryogenic showcase according to the present invention;

Fig. 2 is a sectional view viewed along a line A-A in Fig. 1;

5 Fig. 3 is a plane cross section showing a cryogenic showcase shown in Fig. 1;

Fig. 4 is a perspective drawing showing an inner case in a cryogenic showcase shown in Fig. 1;

Fig. 5 is a circuit diagram showing a refrigerant
10 in a cryogenic showcase shown in Fig. 1;

Fig. 6 is a perspective drawing showing an inner case in another cryogenic showcase;

Fig. 7 is a plane cross section showing another cryogenic showcase shown in Fig. 6;

15 Fig. 8 is a circuit diagram showing a refrigerant in another cryogenic showcase shown in Fig. 6; and

Fig. 9 is a perspective drawing showing an inner case in the conventional cryogenic showcase.

20 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, embodiments according to the present invention will be described in detail below.

Figs. 1 to 5 show an embodiment of a cryogenic showcase S according to the present invention. A cryogenic showcase S
25 is for selling, e.g. an ice cream or a beverage such as a



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juice or a milk at a store and comprises an adiabatic box 1 with an opening at the front half of the top face. Said adiabatic box 1 is constituted by a window 2 to see through in the upper part of the front face, an adiabatic wall 5 provided with two right and left transparent doors 3 and 4 at said opening, a machine room 6 located in the lower part thereof and a housing 7 located at the rear half of the top face thereof.

Said adiabatic wall 5 is constituted by a metallic inner case 11 open upward, a metallic outer case 12 opened upward and housing this inner case 11 so as to form space between the outer case and this inner case 11 and a foamed heat insulator 13 such as rigid polyurethane foamed and filled with said space between the inner case 11 and the outer case 12. A partition member 10 is riveted between the center of the front wall 11A and that of the back wall 11B of the inner case 11 so as to partition the inner case 11 into a first storeroom 8 on the left side and a second storeroom 9 on the right side. Said transparent door 3 corresponds to the first storeroom 8 and the transparent door 4 corresponds to the second storeroom 9.

Said inner case 11 comprises front, back, left, right and bottom walls 11A to 11E as shown in Figs. 2 to 4. A cooler 14 comprising a snaking pipe including a cryogenic refrigerant is attached on the peripheral face of a part



corresponding to the first storeroom 8 at the left side of the partition member 10 for heat exchange. In addition to this, a sheet of auxiliary cooler 16 formed by rolled-bonding is attached at the rear half of the top face across the upper
5 part of both storerooms 8 and 9.

Said outer case 12 comprises a front wall 12A, a back wall 12B the upper end of which is extended upper than this front wall 12A, right and left side walls 12C and 12D, a bottom wall 12E gently tilted so that the rear part is higher
10 and a top wall 20 located over the above-described auxiliary cooler 16, opposite to this auxiliary cooler 16 via the above-described space and gently tilted so that the rear part is lower. A snaking high temperature refrigerant pipe 21 extended to the center from both the right and the left is
15 attached with an aluminum tape or the like on the inner face of the front wall 12A, that is, on the face thereof at the side of the heat insulator 13.

Said heat insulator 13 is foamed and filled in space between the inner case 11 and the outer case 12. The
20 auxiliary cooler 16 and the top face 20 are coupled by a coupling 49 for the back part. The foamed heat insulator 13 is also filled in space enclosed by the auxiliary cooler 16, the top wall 20 and this coupling 49 for the back part. In the above-described machine room 6 as shown in Fig. 2, a
25 compressor 29 is installed on a base 28 and further, a



condenser 31 made of a wire tube is supported by supporters
38, 38.

The discharge port of the above-described
compressor 29 is connected to the condenser 31 via the high
5 temperature refrigerant pipe 21 as shown in Fig. 5 and is
connected to the auxiliary cooler 16 via a dryer 25 and a
capillary tube 26 as a decompression device. The auxiliary
cooler 16 is connected to the cooler 14 and the cooler 14 is
connected to the suction port of the compressor 29.

10 The above-described housing 7 is formed by a shade
plate 33 made of resin and located on the front face, the
upper part of the back wall 12B of the above-described outer
case 12, a pair of right and left side coupling members 34
and 35 made of resin, a metallic head wall 36 and the top
15 wall 20 which forms a part of the above-described case 12.
In addition, a fluorescent lamp 37 for illuminating the
inside and outside of the showcase is attached in the
housing. The housing also houses the above-described doors 3
and 4 when these doors are opened. A beam 39 for preventing
20 the head wall 36 from being bent horizontally is put between
the above-described both side coupling members 34 and 35 and
the fluorescent lamp 37 is attached along the front face of
this beam 39.

The above-described side coupling member 34, 35
25 mainly couples the opposite left and right side walls 11C and

12C of the inner case 11 and the outer case 12. A groove 40 for fitting the above-described beam 39, a rail 41 for putting one side of the transparent door 3 or 4 so that it can be moved forward or backward, receiving sections 43 for receiving both ends of the above-described auxiliary cooler 16 and gutters for receiving drops of dew from the both transparent doors 3 and 4 are integrated with the both side coupling members 34 and 35. A reference numeral 47 designates a central rail for putting the adjacent other side of both transparent doors 3 and 4 so that they can be moved freely. A reference numeral 48 designates a front coupling made of resin for coupling the front wall 11A of the inner case 11 and the front wall 12A of the outer case 12.

The above-described partition member 10 is constituted by a heat conducting plate 51 comprising a heat conducting metallic plate made of aluminum or the like and an adiabatic plate 52 made of rigid synthetic resin or the like which is stuck on the rear face of said heat conducting plate. The heat conducting plate 51 is riveted on the inner case 11 on the side of the first storeroom 8 and the adiabatic plate 52 is positioned on the inner case on the side of the second storeroom 9.

In the above-described constitution, when the compressor 29 is operated, a high temperature refrigerant discharged from the compressor 29 is decompressed in the



capillary tube 26 after the heat of the high temperature
refrigerant discharged from the compressor is radiated and
the high temperature refrigerant is liquefied in the high
temperature refrigerant pipe 21 and the condenser 31, flows
5 first into the auxiliary cooler 16 and starts to evaporate.
Next, high temperature refrigerant is returned into the
compressor 29 after it flows into the cooler 14 and is
evaporated. Thereby, the auxiliary cooler 16 and the cooler
14 execute a cooling action. Since the heat conducting plate
10 51 of the partition member 10 is also cooled directly from
the inner case 11 and the temperature thereof is lowered, the
first storeroom 8 is cooled by the left half of the auxiliary
cooler 16, the inner case 11 (the cooler 14) and the heat
conducting plate 51, and thereby the temperature thereof is
15 lowered up to predetermined freezing temperature.

In the meantime, since the second storeroom 9 is
cooled by only the right half of the auxiliary cooler 16 and
is insulated thermally from the first storeroom 8 by the
adiabatic plate 52 of the partition member 10, the
20 temperature thereof is maintained at predetermined cooling
temperature. Thereby, the first storeroom 8 functions as a
refrigeration room, the second storeroom 9 functions as a
cold room, an ice cream and so on can be preserved in the
first storeroom 8, and a juice, a milk and so on can be
25 preserved in the second storeroom 9.



Since a refrigerant first flows into the auxiliary cooler 16 and is evaporated, the temperature of the auxiliary cooler 16 is lower than that of the cooler 14. Therefore, since frost is generated only on the auxiliary cooler 16 instead of the inner case 11, only frost generated on this auxiliary cooler 16 has only to be removed in defrosting and the operability of defrosting is enhanced.

Further, since complicated constitution such as two inner cases are provided is not required to be adopted, the structure can be simplified and a rise of costs can be prevented.

Next, Figs. 6 to 8 show another structure of a cryogenic showcase S according to the present invention. In Figs. 6 to 8, the same reference numeral is assigned to the same section and function in Figs. 1 to 5. In this case, a cooler 14 attached on the peripheral face of an inner case 11 for heat exchange comprises a first cooler 14A at the side of a first storeroom 8 and a second cooler 14B at the side of a second storeroom 9. Each cooler 14A and 14B comprises a snaking cryogenic refrigerant pipe as described above, the first cooler 14A is arranged closely and the second cooler 14B is arranged at far intervals as shown in Fig. 6 so as that area provided with said cooler located at the side of said second storeroom is smaller than that at the side of said first storeroom. An auxiliary cooler 16 is attached



across both storerooms 8 and 9 as described above.

Further, the first cooler 14A is connected to the auxiliary cooler 16, the second cooler 14B is connected to the rear of the first cooler 14A and the second cooler 14B is
5 connected to the suction side of a compressor 29.

In the above-described constitution, when the compressor 29 is operated, a high temperature refrigerant discharged from the compressor 29 is decompressed in a capillary tube 26 after the heat of the high temperature
10 refrigerant is radiated in the a high temperature refrigerant pipe 21 and a condenser 31 and it is liquefied, first flows into the auxiliary cooler 16 and starts to evaporate. Next, after the high temperature refrigerant flows into the first cooler 14A and is evaporated, it flows into the second cooler
15 14B, is evaporated and then is returned to the compressor 29. Thereby, the auxiliary cooler 16 and the cooler 14 (the first cooler 14A and the second cooler 14B) execute a cooling action.

Since a heat conducting plate 51 of a partition
20 member 10 is also cooled directly from the inner case 11 as described above and the temperature thereof is lowered, the first storeroom 8 is cooled by the left half of the auxiliary cooler 16, the first cooler 14A arranged closely via the inner case 11 and the heat conducting plate 51 and the
25 temperature is lowered up to predetermined freezing



temperature.

In the meantime, the second storeroom 9 is cooled by the right half of the auxiliary cooler 16 and the second cooler 14B arranged at far intervals via the inner case 11.

5 In addition, since a refrigerant flows into the first cooler 14A earlier than the second cooler 14B, the temperature of the first cooler 14A itself is much lower than that of the second cooler 14B. Since the second storeroom 9 is insulated thermally from the first storeroom 8 by an adiabatic plate 52
10 of the partition member 10 as described above, the first storeroom 8 is kept at the above-described freezing temperature and the second storeroom 9 is kept at predetermined cooling temperature.

Thereby, the first storeroom 8 functions as a
15 refrigeration room, the second storeroom 9 functions as a cold room, an ice cream and so on can be preserved in the first storeroom 8 and a juice, a milk and so on can be preserved in the second storeroom 9.

Since a refrigerant first flows into the auxiliary
20 cooler 16 as described above and is evaporated, the temperature of the auxiliary cooler 16 is lower than that of the cooler 14. Therefore, since frost is generated only on the auxiliary cooler 16 instead of the inner case 11, frost generated on the auxiliary cooler 16 has only to be removed
25 in defrosting and the operability of defrosting is enhanced.



In the above-described embodiments, the first storeroom 8 functions as a refrigeration room and the second storeroom 9 functions as a cold room, however, it need hardly be said that each combination of a refrigeration room and a chilled room or a chilled room and a cold room is also effective.

As described in detail above, according to the present invention, since a cooler is attached on the inner case on the side of the first storeroom, the second storeroom is cooled only by the auxiliary cooler and the first storeroom is cooled by the cooler via the inner case in addition to the auxiliary cooler. Thereby, the first storeroom can be cooled at lower temperature than the second storeroom and therefore, storerooms at different temperature for freezing and cold storage can be constituted at a low price with such simple structure.

In addition to this, since a refrigerant flows into the auxiliary cooler earlier than the cooler, the temperature of the auxiliary cooler can be lower than that of the cooler and defrosting work can be simplified by generating frost only on the auxiliary cooler.

In another embodiment, since a cooler located at the side of the second storeroom is arranged at far intervals and a cooler located at the side of the first storeroom is arranged closely, the second storeroom is cooled by the



auxiliary cooler and the cooler arranged at far intervals via the inner case and the first storeroom is cooled by the auxiliary cooler and the cooler arranged closely via the inner case. Since both storerooms are partitioned by the partition member, the first storeroom can be cooled up to lower temperature more powerfully than the second storeroom. Therefore, according to the present invention, storerooms at different temperature for freezing and cold storage can be constituted at a low price with such simple structure.

10 In addition, since a refrigerant is let into the auxiliary cooler earlier than into the cooler in addition to the above-described, the temperature of the auxiliary cooler can be lower than that of the cooler and defrosting work can be simplified by generating frost only on the auxiliary cooler. Further, since a refrigerant is let from the cooler on the side of the first storeroom into the cooler on the side of the second storeroom, the cooling capacity of the cooler on the side of the first storeroom can be secured and a failure in cooling in the first storeroom can be avoided beforehand.

Furthermore, since the partition member is constituted by a heat conducting plate and an adiabatic plate, the heat conducting plate is arranged on the side of the first storeroom and the adiabatic plate is arranged on the side of the second storeroom in addition to the above-



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described each invention, a cooling action from the inner case is conducted to the heat conducting plate of the partition member, both storerooms can be prevented or controlled from being influenced by heat each other and the
5 difference of both storerooms in temperature can be maintained satisfactorily because the first storeroom can be also cooled by the partition member and the second storeroom is insulated thermally from the first storeroom by the adiabatic plate.

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WHAT IS CLAIMED IS:

1. A cryogenic showcase comprising

an adiabatic box comprising an outer case and an inner case both opened upward, wherein a heat insulator is filled

5 with a space between said outer case and said inner case;

a partition member for partitioning said inner case into first and second storerooms;

a cooler attached on the outer face of said inner case at the side of said first storeroom for heat exchange; and

10 an auxiliary cooler provided across the upper part of said both storerooms.

2. A cryogenic showcase according to Claim 1, wherein a refrigerant flown through said coolers is let into said

15 auxiliary cooler earlier than into said cooler.

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3. A cryogenic showcase comprising

an adiabatic box comprising an outer case and an inner case both opened upward, wherein a heat insulator is filled

20 with a space between said outer case and said inner case;

a partition member for partitioning said inner case into first and second storerooms;

a cooler attached on the outer face of said inner case at the side of said first storeroom for heat exchange; and

25 an auxiliary cooler provided across the upper part of



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said both storerooms, wherein:

area provided with said cooler located at the side of
said second storeroom is smaller than that at the side of
said first storeroom.

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4. A cryogenic showcase according to Claim 3, wherein a
refrigerant flown through said coolers is let first into an
auxiliary cooler, second into the cooler at the side of the
first storeroom, and last into the cooler at the side of the
10 second storeroom.

5. A cryogenic showcase according to Claim 1, 2, 3 or 4,
wherein the partition member is constituted by a heat
conducting plate and an adiabatic plate, and said heat
15 conducting plate is located on the side of the first
storeroom and said adiabatic plate is located on the side of
the second storeroom.

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