

RAPID COOLING SHAVED ICE MANUFACTURING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 [0001]

The present invention relates to a rapid cooling shaved ice manufacturing device in which an ice layer forming rotary drum is used.

2. Description of the Related Art

10 [0002]

Patent Literature 1 describes a basic principle of the present invention. The basic principle includes: a water supplying means that supplies water to a water receptacle; a rapid cooling means that has concentric, elongated, double
15 cylinders; a refrigerant that is supplied from the rapid cooling means; an ice layer forming rotary drum that, as a result of the refrigerant, forms a film-like ice layer on an outer circumferential surface, while rotating the water that is supplied from the water supplying means in a manner similar to
20 a "waterwheel;" and a cutting blade that is provided such as to intersect the outer circumferential surface of the ice layer forming rotary drum and continuously shaves off the film-like ice layer.

[0003]

25 However, an issue of the invention described in Patent

Literature 1 is to provide a rapid cooling shaved ice manufacturing device that is capable of forming the film-like ice layer by water being supplied to the outer circumferential surface of the cooling drum from above, through a water supply pipe 28b and a water supply receptacle 28a, and has an efficient and simple configuration.

[0004]

In addition, a means for solving the issue of the invention is characterized by including: a cooling drum 21 that forms an ice layer of a predetermined thickness on an outer circumferential surface thereof while rotating with the outer circumferential surface being maintained at a temperature that is equal to or below a freezing point; an ice shaving blade 29 that is set such as to substantially be in contact with the outer circumferential surface of the cooling drum and formed on the outer circumferential surface of the cooling drum; and a water supplying means 28 that includes a water supply suit (receptacle) 28a in which edge portions of both side surface portions and an edge portion of a front surface portion are substantially in contact with the outer circumferential surface of the cooling drum, and a water supply pipe 28b that supplies water to a space that is formed by the water supply suit 28b and the outer circumferential surface of the cooling drum 21 (see Fig. 3). Here, reference numbers are those given in Patent Literature 1.

[0005]

The above-described invention in Patent Literature 1 has an advantage in that the film-like ice layer can be instantaneously and substantially uniformly formed. However,
5 the invention also has issues such as those below.

(a) For reasons such as bearing members being attached to left and right side walls of a vertically elongated casing, the cooling drum 21 being provided inside the casing with the bearing members therebetween, the ice shaving blade 29 being provided
10 in a tilted state inside the casing, the water supplying means 28 that has a complex configuration being arranged near an area above the cooling drum 21 to supply water from above the outer circumferential surface of the cooling drum 21, the cooling drum
21, the ice shaving blade 29, the water supplying means 28, and
15 the like cannot easily be attached to the casing. Therefore, manufacturing is troublesome. In addition, a space portion of a front wall of the casing cannot be effectively used.

(b) For example, a storage container that receives "snow-like shaved ice" that is shaved off by the ice shaving
20 blade 29 is provided inside the casing. Therefore, in addition to insertion and removal of the storage container 30 being troublesome, the overall device increases in size.

(c) Because the "snow-like shaved ice" directly falls into the storage container, the shaved ice is accumulated in a
25 specific section of the storage container. In addition, the

storage container 30 cannot be manually or electrically moved to a desired position during rotation of the cooling drum 21.

(d) A structure for preventing gas that has been rapidly vaporized in an internal space of the cooling drum 21 from leaking outside is not described. In addition, because a packing for maintaining airtightness is not present, a compressor cannot be made powerful.

(e) Furthermore, issues and configurations such as control to prevent water from overflowing from the water supply suit 28a being difficult, and soft and safe water for shaved ice being used are not present.

[0006]

[Patent Literature 1] Japanese Patent Laid-open Publication No. Heisei 10-68564

[0007]

A first issue of the present invention is to enable an attachment space portion that is present between left and right protruding support portions that are provided on a front surface of a casing to be effectively used, and components such as an ice layer forming rotary drum, a shaving blade, and a shaved ice guidance plate to be easily assembled, while taking advantage of the advantages of the invention in Patent Literature 1. The first issue is to, as a result, actualize improved efficiency in manufacturing operations and size reduction of the device. In addition, at the same time, the first issue is to enable a

container for receiving snow-like shaved ice that slides and falls from the shaved ice guidance plate to be arbitrarily placed in a space below the shaved ice guidance plate on the front surface of the casing, and for example, the container to be freely
5 positionally displaced either manually or through use of a turntable. Furthermore, the first issue is to prevent vaporized gas that has been sprayed into an internal space of the ice layer forming rotary drum and lost cooling temperature from leaking outside.

10 [0008]

A second issue is to enable "airtightness" to be sufficiently maintained so that gas that flows to the internal space of the ice layer forming rotary drum does not easily leak outside, even when pressure of a compressor that configures a
15 cooling means is increased. In addition, depending on an embodiment, the second issue is to enable a sealing member to have excellent durability.

A third issue is to prevent, as much as possible, water W for shaved ice that flows out from an introduction path that
20 has an open/close valve from "overflowing" or splashing from a water storage tray.

A fourth issue is to enable "non-sticky (not immediately melted), fluffy" snow-like shaved ice to be manufactured using soft and safe water for shaved ice.

25 [0009]

Moreover, objects such as preventing cooling heat of the ice layer forming rotary drum from escaping through bearings, enabling an arc-shaped lower side of the ice layer forming rotary drum to be immersed in the water for shaved ice at all times, even when the water storage tray is made thinner, preventing debris from attaching to the ice layer forming rotary drum, and enabling a water storage tray that has a shallow bottom to be freely inserted and removed are specified by dependent claims.

SUMMARY OF THE INVENTION

[0010]

A rapid cooling shaved ice manufacturing machine of the present invention is characterized by including: a casing that has left and right protruding support portions; an ice layer forming rotary drum that is provided in a horizontal state in an attachment space portion between the protruding support portions with left and right bearing members therebetween, and rotates as a result of driving force from a driving motor; an open-upper-end water storage tray that is arranged in a horizontal state below the ice layer forming rotary drum and temporarily receives "water for shaved ice" from a water supplying portion that is provided in the casing, through a water introduction path; a shaving blade that is supported in a horizontal state by the left and right protruding support portions such as to substantially be in contact with a front side of the ice layer forming rotary drum, and shaves off a

film-like ice layer that is formed on an outer circumferential surface of the ice layer forming rotary drum; and a guidance plate that is provided in a fixed state in the left and right protruding support portions such as to be capable of guiding
5 "snow-like shaved ice" that is shaved off by the shaving blade in a predetermined direction, in which a cylindrical protruding portion that is supported such as to freely rotate by one bearing member is provided in either of the left and right bearing members on one side wall of the ice layer forming rotary drum, inner
10 and outer narrow elongated circular cylindrical pipes that configure a rapid cooling means are concentrically fitted into the cylindrical protruding portion, and further at least a first sealing member is provided between an outer circumferential surface of the outer narrow elongated circular cylindrical pipe
15 and an inner circumferential surface of an annular recess formed in the cylindrical protruding portion (claim 1). Effects of the invention are as described hereafter.

[0011]

In the above-described configuration, the rapid cooling
20 shaved ice manufacturing machine is characterized by a second sealing member being arranged such as to be provided together with the first sealing member in an axial direction of the narrow elongated circular cylindrical pipes, and one side surface of the second sealing member being crimped such as to be in close
25 contact to another side surface of the first sealing member

(claim 2). As a result of this configuration, "airtightness" can be sufficiently maintained so that gas that flows to an internal space of the ice layer forming rotary drum does not easily leak outside, even when pressure of a compressor that
5 configures a cooling means is increased.

[0012]

In addition, the rapid cooling shaved ice manufacturing machine is characterized by at least the first sealing member and the second sealing member being constituent components of
10 a gland packing, and pressed such that respective opposing side walls are crimped together by a packing retainer that has a plurality of fasteners that are screwed into the cylindrical protruding portion (claim 3). As a result of the configuration, closeness to the outer narrow elongated circular cylindrical
15 pipe in an inner radial direction can be increased. In addition, because the sealing members are not easily damaged, durability of the device can be maintained.

[0013]

In addition, the rapid cooling shaved ice manufacturing
20 machine is characterized by an open/close valve that is either of an automatic or manual type being provided on the water introduction path; a flow amount control member being connected to the open/close valve towards the water storage tray; and an opening on an upper end portion of the flow amount control member
25 having a large diameter, and meanwhile, a control opening on

a lower end portion having a smaller diameter than the opening so that the water for shaved ice can be sent into the water storage tray a little at a time (claim 4).

[0014]

5 As a result of the configuration, the amount of "water for shaved ice" that flows out from the flow amount control member can be set to substantially correspond to a thickness and an amount of a film-like ice layer that is formed on the outer circumferential surface of the ice layer forming rotary drum.

10 In addition, the water for shaved ice that flows out from the introduction path that has the open/close valve can be prevented, as much as possible, from "overflowing" or splashing from the water storage tray.

[0015]

15 In addition, the rapid cooling shaved ice manufacturing machine is characterized by the water supplying portion of the casing temporarily storing the "water for shaved ice" that is softened by an ion exchange resin portion and from which germs are removed by a filtration processing portion; and further,

20 the water introduction path that has the open/close valve being connected to the water supplying portion (claim 5). As a result of the configuration, snow-like shaved ice that is "delicious and safe," and in addition, does not immediately melt and is fluffy can be manufactured.

25 [0016]

In addition, the rapid cooling shaved ice manufacturing machine is characterized by the water storage tray that has an open upper end having a flat portion that receives the "water for shaved ice" and a shallow recess that is continuous with the flat portion (claim 6). As a result of the configuration, a bottom of the ice layer forming rotary drum can be placed in contact with the "water for shaved ice" that flows into the shallow recess at all times, in a manner similar to a waterwheel. In addition, an arc-shaped lower side of the ice layer forming rotary drum can be immersed in the water for shaved ice at all times even when the storage tray is made thinner.

[0017]

In addition, the rapid cooling shaved ice manufacturing machine is characterized by the left and right bearing members being formed into a cylindrical body that has a flange portion using a synthetic resin material (claim 7). As a result of the configuration, heat from the ice layer forming rotary drum can be prevented from escaping through the bearings.

[0018]

In addition, the rapid cooling shaved ice manufacturing machine is characterized by a cover that covers the exposed outer circumferential surface of the ice layer forming rotary drum and the shaving blade being provided in the attachment space portion of the protruding support portions (claim 8). As a result of the configuration, debris can be prevented from

attaching to the ice layer forming rotary drum.

[0019]

Furthermore, the rapid cooling shaved ice manufacturing machine is characterized by the outer narrow elongated circular cylindrical pipe spraying, in a vaporized state, a refrigerant that is sent by pressure from a compressor that is housed inside the casing, into an internal space of the ice layer forming rotary drum through a small spray hole, and meanwhile, the inner narrow elongated circular cylindrical pipe receiving the vaporized gas that has been sprayed into the internal space and lost cooling temperature through a suction opening, and returning the vaporized gas to the compressor that is housed in the casing (claim 9). As a result of the configuration, the refrigerant can be effectively used.

15

EFFECTS OF THE INVENTION

[0020]

The present invention is capable of taking advantage of the basic principle and advantages of the invention described in Patent Literature 1. In addition, the attachment space portion that is present between the left and right protruding support portions that are provided on the front surface of the casing can be effectively used, and components such as the ice layer forming rotary drum, the shaving blade, and the shaved ice guidance plate can be easily attached to the left and right

25

protruding support portions. As a result, improved efficiency in manufacturing operations, size reduction of the device, and the like can be actualized. Furthermore, at the same time, the container for receiving the snow-like shaved ice that slides
5 and falls from the shaved ice guidance plate can be arbitrarily placed in the space below the shaved ice guidance plate on the front surface of the casing, and for example, can be freely positionally displaced either manually or through use of a turn table. Moreover, the vaporized gas that has been sprayed into
10 the internal space of the ice layer forming rotary drum and lost cooling temperature can be prevented from leaking outside. Depending on the embodiment, because the water W for shaved ice is used, snow-like shaved ice that is "delicious and safe," and in addition, does not immediately melt and is fluffy can be
15 manufactured.

BRIEF DESCRIPTION OF THE DRAWING

[0021]

FIG. 1 to FIG. 15 are explanatory diagrams according to
20 an embodiment of the present invention.

FIG. 1 is a front view of an overall shaved ice device including a casing;

Fig. 2 is a right-side view of Fig. 1;

Fig. 3 is a perspective view of main sections;

25 Fig. 4 is an explanatory diagram showing arrangement

locations of main components that are visible when a right side wall of the casing is removed (other components are omitted);

Fig. 5 is an explanatory diagram schematically showing main sections (heat exchanging means and compressor are
5 omitted);

Fig. 6 is an explanatory diagram showing an enlarged view of the main sections in Fig. 5, and in particular, schematically showing a shaft sealing device (gland packing) that includes a first sealing member, a second sealing member, and the like;

10 Fig. 7 is an explanatory diagram of a state in which a packing retainer is tightened;

Fig. 8 is an explanatory diagram of main sections (flow amount control member and water storage tray);

15 Fig. 9 is a cross-sectional view taken along line 9-9 in Fig. 8;

Fig. 10 is an overall explanatory diagram of main sections (water source, ion exchange resin portion, and water supplying portion of filtration processing portion casing);

20 Fig. 11 is an explanatory diagram of the ion exchange resin portion;

Fig. 12 is an explanatory diagram of a state in which an arc-shaped lower side of an ice layer forming rotary drum is immersed in water for shaved ice in a shallow recess of the water storage tray;

25 Fig. 13 is an explanatory diagram of main sections (cover);

Fig. 14 is an overall cross-sectional explanatory diagram of inner and outer narrow, elongated, circular cylindrical pipes configuring a rapid cooling means; and

Fig. 15 is a schematic explanatory diagram of the rapid
5 cooling means that is connected in a circulating manner to the ice layer forming rotary drum.

EXPLANATION OF REFERENCE NUMBERS

[0022]

- 1: casing
- 10 2: first housing portion
- 3: second housing portion
- 3a: rear housing portion
- 3b: protruding support portion
- 4: attachment space portion
- 15 5: ice layer forming rotary drum
- 6: water supplying portion
- 7: bearing member
- 11: rapid cooling means
- 28: inner narrow, elongated, circular cylindrical pipe
- 20 29: outer narrow, elongated, circular cylindrical pipe
- 28a: suction opening
- 29a: spray hole
- 30: cylindrical protruding portion
- 21: driving motor
- 25 23: water introduction path

24: flow amount control member
 25: water storage tray
 47: shaving blade
 48: guidance plate
 5 31: gland packing
 37: first sealing member
 38: second sealing member
 39: third sealing member
 40: fourth sealing member
 10 41: fastener
 42: packing retainer
 50: ice layer
 50a: snow-like shaved ice
 60: water source
 15 61: ion exchange resin portion
 62: filtration processing portion
 W: water for shaved ice

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 [0023]

First, a configuration of a casing 1 of a rapid cooling
 shaved ice manufacturing device (referred to, hereafter, as a
 "device X") will briefly be described with reference to Fig.
 1 to Fig. 4. With reference to Fig. 1 that is a front view and
 25 Fig. 2 that is a right side view, the casing 1 is configured

by a case-like first housing portion 2 that corresponds to a lower portion and a case-like second housing portion 3 that is integrally provided above the first housing portion 2.

[0024]

5 In addition, the second housing portion 3 is configured by a rear housing portion 3a in which a water supplying portion 6 can be set on an upper surface thereof, and a pair of left and right protruding support portions 3b that extend in a horizontal state from both left and right end portions of the rear housing portion 3a. The left and right protruding support portions 3b protrude by a predetermined amount in a box-like shape from a front wall 2a of the first housing portion 2. In addition, an attachment space portion 4 of which a top, a bottom, and a front is open in a communicating manner is present between 10 the left and right protruding support portions 3b. For example, this attachment space portion 4 is a rectangular component attachment space.

[0025]

Fig. 3 shows each of a hollow, circular cylindrical ice layer forming rotary drum 5 that is provided in a horizontal state in the attachment space portion 4 between the left and right protruding support portions 3 with left and right bearing members 7 therebetween, and rotates as a result of driving force from a driving motor 21, and a water supplying portion (such 20 as a storage water tank that has a lid body or a tank) 6 that 25

is freely arranged on the upper surface of the rear housing portion 3a and receives water from a water source 60, described hereafter.

[0026]

5 Here, a first switch for rotating a driving motor in a forward direction and a second switch for rotating the driving motor in a reverse direction are provided on a front surface of either of the left and right protruding support portions 3b (not shown). In addition, a control unit that provides forward
10 rotation and reverse rotation control signals to the driving motor, a storage unit that records therein a program for driving motor control, a timer that counts shaving time, a water level sensing means, an electromagnetic valve, a compressor, and the like are arranged as appropriate inside the casing 1 (not shown).

15 [0027]

Furthermore, as shown in Fig. 2, 8 is a support base for the first housing portion 2 that is formed such as to be larger than the casing 1. 9 is a movable auxiliary base that is set on an upper surface of the support base 8. 10 is a cup-like
20 receptacle container.

[0028]

Next, Fig. 4 shows main components that are visible on the outside in a state in which a right side wall of the casing 1 is removed. A compressor (virtual line) 12 and a heat exchanging
25 means (solid line) 13 that configure a rapid cooling means 11

are housed in the case-like first housing portion 2 of the lower portion. Here, a refrigerant supply pipe, a vaporized gas return pipe, a control unit, and the like are omitted. According to the embodiment, vaporized gas that has lost cooling temperature in an internal space of the ice layer forming rotary drum 5 is returned to the compressor 12 that is housed in the casing 1.

[0029]

Meanwhile, in the case-like second housing portion 3 of an upper portion, the rear housing portion 3a and at least either of the protruding support portions 3b communicate in a front/rear direction, and a power transmission means 19 is provided in an internal space thereof with front and back sprockets therebetween. That is, 15 is an output shaft of the driving motor 21. 16 is an input shaft of the ice layer forming rotary drum 5. 17 is a driving sprocket. 18 is a driven sprocket. 19 is a power transmission means such as a chain or a timing belt. Here, the driving motor 21 described hereafter is preferably arranged in a lateral state in the rear housing portion 3a. Meanwhile, the ice layer forming rotary drum 5 is arranged in the attachment space portion 4 as shown in Fig. 3.

[0030]

Next, the left and right bearing members 7 and the ice layer forming rotary drum 5 will be described together with other members, with reference to Fig. 5. To enable main sections of

the present invention to be understood, Fig. 5 schematically shows, for convenience, the driving motor 21, the power transmission means 19, a water introduction path 23 that is connected to the water supplying portion 6 that houses water
5 W for shaved ice and has an open/close valve 22 that is either of an automatic and manual type, a pipe-like flow amount control member (virtual line) 24 that is removably connected to the water introduction path, a water storage tray (virtual line) 25 that is arranged below the ice layer forming rotary drum 5, and the
10 like.

[0031]

In Fig. 5, 27 is a pair of vertical support plates that are composed of metal and provided in a fixed state on inner wall surfaces of the left and right protruding support portions
15 3b. 7 is a left and right pair of bearing members that are provided in a fixed state on the vertical support plates 27 and include a ball bearing 7a on an inner circumferential surface thereof. 5 is the hollow circular cylindrical ice layer forming rotary drum that is supported by the bearing members 7 such as
20 to freely rotate. 28 and 29 are inner and outer narrow elongated circular cylindrical pipes that configure the rapid cooling means 11. 30 is a cylindrical protruding portion that is provided on one side wall (left side wall in Fig. 5) of the ice layer forming rotary drum 5. 31 is a gland packing that is
25 provided in a fixed state in the cylindrical protruding portion.

In addition, one end portion of another refrigerant supply pipe 33 and one end portion of a discharge pipe 34 for returning vaporized gas are respectively connected to protruding outer end portions (left side in Fig. 5) of the inner and outer narrow
5 elongated circular cylindrical pipes 28 and 29, with a two-way joint 32 therebetween.

[0032]

Here, according to the embodiment, a metal material that is excellent for rapid cooling is used in the ice layer forming
10 rotary drum. The bearing member 7 is formed into a cylindrical body that has a flange portion using a synthetic resin material (preferably Teflon) so that cooling heat from the metal material is not, to the greatest extent possible, transmitted to the left and right vertical support plates 27 that are composed of metal
15 through the left and right pair of bearing members 7 (that is, such that cooling heat does not escape).

[0033]

Next, a configuration of the gland packing 21 of the device X will be described with reference to Fig. 6 and Fig. 7.
20 According to the embodiment, on one side wall of the ice layer forming rotary drum 5, the cylindrical protruding portion 30 that is supported such as to freely rotate by one bearing member 7 is provided in either of the left and right bearing members 7. The inner and outer narrow elongated circular cylindrical
25 pipes 28 and 29 that configure the rapid cooling means 11 are

concentrically fitted into the cylindrical protruding portion 30. Furthermore, at least a first sealing member 37 is provided between an outer circumferential surface of the outer narrow elongated circular cylindrical pipe 29 and an inner
5 circumferential surface of an annular recess 36 that is formed in the cylindrical protruding portion 30.

[0034]

Here, there are various aspects of the gland packing 31. Here, the gland packing 31 according to the embodiment is
10 configured by: the first sealing member 37 that has a rectangular cross-sectional shape and has a notched portion 37a that has a laterally collapsed chevron shape on one side surface (left in Fig. 6) on a receiving side; a second sealing member 38 that similarly has a notched portion 38a that has a laterally
15 collapsed chevron shape on one side surface on the receiving side, and also has a chevron-shaped protruding portion 38b on another side surface (right in Fig. 6) on a side opposite the one side surface that is crimped such as to be wedged into the notched portion 37; a third sealing member 39 that has an aspect
20 that is substantially similar to that of the second sealing member; a final fourth sealing member 40 that has a chevron-shaped protruding portion 40b that is crimped such as to be wedged into a chevron-shaped notched portion 39a of the third sealing member 39; and a packing retainer 42 that
25 has a plurality of fasteners 41 that are screwed into the

cylindrical protruding portion 30.

[0035]

In this manner, in the preferred gland packing 31, a thick second sealing member 38 is arranged such as to be provided together with the thick first sealing member 37 in an axial center direction of the outer narrow elongated circular cylindrical pipe 29, and the third sealing member 39 and the like that follow the thick second sealing member 38 are crimped such as to be close together.

[0036]

Next, the flow amount control member 24 and the water storage tray 25 will be described with reference to Fig. 8 and Fig. 9. As described above, the open/close valve 22 that is either of the automatic and manual type is provided in the water introduction path 23. The pipe-like flow amount control member 24 is connected to the open/close valve 23 towards the water storage tray 25. An opening 24a on an upper end portion of the flow amount control member 24 has a large diameter, and meanwhile, a control opening 24b on a lower end portion has a smaller diameter than the opening so that the water for shaved ice can be sent into the water storage tray a little at a time.

[0037]

In addition, the open-upper-end water storage tray 25 includes a flat portion 25a that receives the "water W for shaved ice" and a shallow recess 25b that is continuous with the flat

portion. A bottom wall inner surface of the recess is formed such as to curve inward so that an arc-shaped lower side of the ice layer forming rotary drum 5 is immersed in the water W for shaved ice at all times.

5 Next, the water source 60, an ion exchange resin portion 61, and a filtration processing portion 62 will be described with reference to Fig. 10 and Fig. 11. For example, the water source 60 is preferably tap water. However, the water source 60 may be lake water or well water. An example of the ion exchange
10 resin portion 61 is as shown in Fig. 11. In addition, the filtration processing portion 62 may be a single filtration processing portion 62 or a plurality thereof. However, a hollow fiber membrane that is capable of removing germs is preferably used. In this manner, the water supplying portion 6 of the casing
15 1 according to the embodiment temporarily stores the "water W for shaved ice" that is softened by the ion exchange resin portion 61 and from which germs have been removed by the filtration processing portion 62. Here, the ion exchange resin portion 61 that serves as a soft water generating portion includes a
20 generating tank 61a that has an inflow portion and an outflow portion in an upper end portion, an ion exchange resin 61b that is in a granular state and provided inside the generating tank 61a, and a pipe-like delivery pipe 61c that is provided inside the generating tank 61a.

25 [0038]

Next, Fig. 12 shows a positional relationship between the ice layer forming rotary drum 5 and the water storage tray 25. Unlike the complex water supplying means in Patent Literature 1, the water storage tray 25 according to the embodiment is arranged in a horizontal state below the ice layer forming rotary drum 5, and when the open/close valve 22 is set to an "open state" simultaneously with or with a slight delay from the driving motor 21 being started by the control signal from the control unit, the water storage tray 25 temporarily receives the "water W for shaved ice" that flows from the opening 24a in the upper end portion of the flow amount control member 24. At this time, the amount of "water W for shaved ice" that flows from the flow amount control member 24 is preferably set to substantially correspond to a thickness and an amount of a film-like ice layer that is formed on the outer circumferential surface of the ice layer forming rotary drum 5.

[0039]

Next, Fig. 13 is an explanatory diagram of a cover 45. The cover 45 is transparent or translucent. The cover 45 is such that left and right end surfaces are formed into a substantially L-like shape, and is capable of covering the exposed outer circumferential surface of the ice layer forming rotary drum 5 and the shaving blade 47. Here, when the cover 45 is provided in the attachment space portion 4, a base end portion of the horizontal portion may be axially supported to upper portions

of inner ends of the left and right protruding support portions 3b, and the cover 45 may be such that a vertical or tilted portion is lifted upward from a front side.

[0040]

5 Next, Fig. 14 is an overall cross-sectional explanatory diagram of the inner and outer narrow elongated circular cylindrical pipes 28 and 29 that configure the rapid cooling means 11. The outer narrow elongated circular cylindrical pipe 29 sprays, in a vaporized state, a refrigerant that is sent by
10 pressure from the compressor 12 that is housed inside the casing through the heat exchanging means 13, into the internal space of the ice layer forming rotary drum 5, through a single or a plurality of small spray holes 29a, and meanwhile, the inner narrow elongated circular cylindrical pipe 28 receives the
15 vaporized gas that has been sprayed into the internal space and lost cooling temperature, through a single or a plurality of suction openings 28a.

[0041]

 Next, Fig. 15 is a schematic explanatory diagram of the
20 rapid cooling means 11 that is connected in a circulating manner to the ice layer forming rotary drum 5. In Fig. 15, 12 is the compressor that is provided inside the first housing portion 2 of the casing and compresses a refrigerant. For example, the compressor 12 includes a tank main body, a condenser that
25 condenses the compressed refrigerant, a condenser fan for

releasing heat that is generated in the condenser during condensation outside the system, an expansion valve, and the like.

[0042]

5 13 is a heat exchanging means that is arranged in the first housing portion 2 such as to be adjacent to the compressor 12 and is connected to the compressor 12 by one refrigerant supply pipe 33. The refrigerant that is heat exchanged by the heat exchanging means 13 is sent to the outer narrow elongated
10 circular cylindrical pipe 29 through the other refrigerant supply pipe and the two-way joint 32. The refrigerant that is sent to the outer narrow elongated circular cylindrical pipe 29 is forcefully sprayed into the internal space of the ice layer forming rotary drum 5 through the small spray hole 29a, and as
15 a result, for example, the outer circumferential surface of the ice layer forming rotary drum 5 is cooled to about minus 14 degrees. The vaporized gas that has been forcefully sprayed into the internal space of the ice layer forming rotary drum 5 and lost generated heat enters the inner narrow elongated
20 circular cylindrical pipe 28 from the suction opening 28a, and is returned to the compressor 12 in a circulating manner through the two-way joint 32 and the return pipe 34.

[0043]

Here, a type of refrigerant and the like are not
25 particularly limited. For example, the refrigerant can be used

by being selected as appropriate from hydrocarbon refrigerants, carbon dioxide refrigerants, and the like that are commonly used.

In addition, according to the embodiment, because the gland packing 31 is used in one of the bearings 7, a large (powerful)

5 compressor 12 can be used.

[0044]

Finally, the shaving blade 47 and the guidance plate 48 will briefly be described. The shaving blade 47 is supported in a horizontal state by the left and right protruding supporting

10 portions 3b of the casing 1 such as to substantially be in contact with a front side of the ice layer forming rotary drum 5, and shaves off a film-like ice layer 50 that is rapidly formed during rotation on the outer circumferential surface of the ice layer forming rotary drum 5. Here, "substantially be in contact" is

15 meant to also include a case of slight physical separation.

According to the embodiment, the shaving blade 47 is positioned orthogonal to the outer circumferential surface such as to be

positioned below a center axial line of the ice layer forming rotary drum 5. An angle of a tip end portion of the shaving blade

20 47 is preferably set as appropriate to be oriented slightly upward and/or slightly downward and the like, in correspondence to a rotation direction of the ice layer forming rotary drum 5.

[0045]

25 Here, according to the embodiment, the shaving blade 47

is positioned below a center line in an axial direction of the ice layer forming rotary drum 5, and on the front side of the outer circumferential surface of the ice layer forming rotary drum 5. In addition, the ice layer forming rotary drum 5 rotates
5 in an arrow direction as shown in Fig. 3 when the "snow-like shaved ice 50a" is shaved off, but rotates in a direction opposite the arrow direction when the film-like ice layer 50 is completely shaved off. Therefore, the control unit can also control not only a rotation frequency but also the rotation direction based
10 on a signal received from an input unit.

[0046]

As shown in Fig. 13, the guidance plate 48 is preferably provided integrally with a surface of the shaving blade 47. In addition, the guidance plate 48 has a laterally elongated
15 rectangular opening 49 through which the water storage tray 25 that has a shallow bottom can be inserted and removed.

[0047]

Therefore, 48a is a tilted base plate that has the opening 49 and is formed such as to be slightly tapered towards a lower
20 end. The tilted base plate 48a is fixed as appropriate to the inner wall surfaces of the left and right protruding end portions 3a of the casing 1. 48b is a left and right pair of surrounding plates that are fixed to left and right end portions of the tilted base plate 48a, and the surrounding plates 48b are bent such
25 as to be closer to each other from a center portion towards the

lower end.

[0048]

Therefore, for example, the guidance plate 48 can enable the water storage tray 25 with a shallow bottom to be freely
5 inserted and removed during cleaning, and guide the "snow-like shaved ice 50a" that has been shaved off by the shaving blade 47 to an opening in a predetermined direction (receptacle container 10).

10

INDUSTRIAL APPLICABILITY

[0049]

For example, the present invention is used in industrial manufacturing of "non-sticky (not immediately melted), fluffy" snow-like shaved ice.

15

CLAIMS

What is claimed is:

1. A rapid cooling shaved ice manufacturing device characterized by comprising:

5 a casing that has left and right protruding support portions;

an ice layer forming rotary drum that is provided in a horizontal state in an attachment space portion between the protruding support portions with left and right bearing members
10 therebetween, and rotates as a result of driving force from a driving motor;

an open-upper-end water storage tray that is arranged in a horizontal state below the ice layer forming rotary drum and temporarily receives "water for shaved ice" from a water
15 supplying portion that is provided in the casing, through a water introduction path;

a shaving blade that is supported in a horizontal state by the left and right protruding support portions such as to substantially be in contact with a front side of the ice layer
20 forming rotary drum, and shaves off a film-like ice layer that is formed on an outer circumferential surface of the ice layer forming rotary drum; and

a guidance plate that is provided in a fixed state in the left and right protruding support portions such as to be capable
25 of guiding "snow-like shaved ice" that is shaved off by the

shaving blade in a predetermined direction, wherein

a cylindrical protruding portion that is supported such as to freely rotate by one bearing member is provided in either of the left and right bearing members on one side wall of the ice layer forming rotary drum,

inner and outer narrow elongated circular cylindrical pipes that configure a rapid cooling means are concentrically fitted into the cylindrical protruding portion, and further

at least a first sealing member is provided between an outer circumferential surface of the outer narrow elongated circular cylindrical pipe and an inner circumferential surface of an annular recess formed in the cylindrical protruding portion.

2. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

a second sealing member is arranged such as to be provided together with the first sealing member in an axial direction of the narrow elongated circular cylindrical pipes, and one side surface of the second sealing member is crimped such as to be in close contact to another side surface of the first sealing member.

3. The rapid cooling shaved ice manufacturing device according to claim 2, characterized in that:

at least the first sealing member and the second sealing member are constituent components of a gland packing, and are pressed such that respective opposing side walls are crimped together by a packing retainer that has a plurality of fasteners
5 that are screwed into the cylindrical protruding portion.

4. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

an open/close valve that is either of an automatic and
10 manual type is provided on the water introduction path;

a flow amount control member is connected to the open/close valve towards the water storage tray; and

an opening on an upper end portion of the flow amount control member has a large diameter, and meanwhile, a control
15 opening on a lower end portion has a smaller diameter than the opening so that the water for shaved ice can be sent into the water storage tray a little at a time.

5. The rapid cooling shaved ice manufacturing device
20 according to claim 1, characterized in that:

the water supplying portion of the casing temporarily stores the "water for shaved ice" that is softened by an ion exchange resin portion and from which germs are removed by a filtration processing portion; and further

25 the water introduction path that has the open/close valve

is connected to the water supplying portion.

6. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

5 the open-upper-end water storage tray has a flat portion that receives the "water for shaved ice" and a shallow recess that is continuous with the flat portion.

7. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

the left and right bearing members are formed into a cylindrical body that has a flange portion using a synthetic resin material.

15 8. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

a cover that covers the exposed outer circumferential surface of the ice layer forming rotary drum and the shaving blade is provided in the attachment space portion of the protruding support portions.

9. The rapid cooling shaved ice manufacturing device according to claim 1, characterized in that:

the outer narrow elongated circular cylindrical pipe
25 sprays, in a vaporized state, a refrigerant that is sent by

pressure from a compressor that is housed inside the casing,
into an internal space of the ice layer forming rotary drum
through a small spray hole, and meanwhile, the inner narrow
elongated circular cylindrical pipe receives the vaporized gas
5 that has been sprayed into the internal space and lost cooling
temperature through a suction opening, and returns the vaporized
gas to the compressor that is housed in the casing.

10. The rapid cooling shaved ice manufacturing device
10 according to claim 1, characterized in that:

the guidance plate has an opening through which a shallow
water storage tray can be freely inserted and removed.