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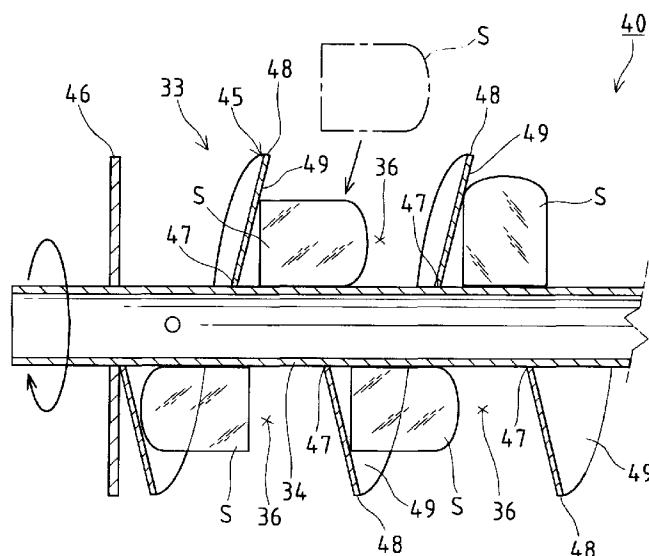
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(54) **Ice-cube releasing apparatus**

(57) An ice-cube releasing apparatus capable of achieving the efficient conveyance of ice cubes and the stabilization of the release of ice cubes. In the ice-cube releasing apparatus, an ice-cube feeding screw 33 has a fin 45 for feeding ice cubes, and the fin 45 is spirally mounted on a rotary shaft 34 in the axial direction of the fin 45. The ice-cube releasing screw 33 is connected to drive means and disposed inside an ice stock compartment that stores a large number of ice cubes S. The fin

45 has an abutting face 49 directed toward an ice releasing section, and the abutting face 49 is formed so as to tilt toward the ice releasing section as it goes outward in the radial direction of the fin 45. With this structure, the movement of the ice cubes S in the radially outward direction is suitably regulated when they are conveyed to the ice releasing section by rotation of the ice-cube feeding screw 33. Thus, there is no possibility that the ice cubes S will be moved outward from the screw 33.

FIG. 1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates generally to an ice-cube releasing apparatus, and more particularly to an ice-cube releasing apparatus that efficiently conveys the ice cubes stored in an ice stock bin to the ice releasing section.

Description of the Related Art

[0002] For example, the ice making machine 10 shown in FIG. 8 is basically composed of a lower machine chamber 14 where freezing machines such as a compressor 12 and a condenser 13 are housed, an ice stock bin 17 in box shape located above the lower machine chamber 14, and an ice making unit 18 disposed in the internal upper portion of this ice stock bin 17. Said ice stock bin 17 is surrounded by heat insulating materials 15 and defines an ice stock compartment 16 therein. The lower machine chamber 14, ice stock bin 17, and ice making unit 18 are provided in the interior of a housing 11, which constitutes the main body of the ice making machine. Said ice making unit 18 is equipped with a water tray 19 in which water for making ice cubes is stored at a predetermined level and further equipped with an ice making base plate 21 having ice-making projections 20 immersed into the water. When an operation of the ice making machine is changed into an ice removing cycle, the water tray 19 is tilted by a predetermined angle to release the water remained in the water tray 19 to a drainage receiving section 22, and the ice cubes S formed around the ice making projections 20 are released to said ice stock compartment 16. In addition, said ice stock bin 17 disposed inside the housing 11 is formed into the box shape which is open upward and forward. An ice releasing section 24 with an ice releasing port 23 is provided in the front lower portion of the ice stock compartment 16. Furthermore, an ice-cube releasing apparatus 30 for conveying the ice cubes S toward said ice releasing port 23 is disposed in the bottom portion of the ice stock compartment 16.

[0003] The ice-cube releasing apparatus 30 is composed of a motor (drive means) 31 mounted on the front side of a cover body 25 detachably attached to a front opening of the ice stock bin 17 and an ice-cube feeding screw 33 connected to the motor 31 through a speed reducer 32. Said ice-cube feeding screw 33 consists of a cylindrical rotary shaft 34 driven by said motor 31, and a fin 35 spirally mounted at predetermined pitches on the outer circumference of the rotary shaft 34. At the bottom portion of the ice stock compartment 16, said ice-cube feeding screw 33 extends toward the ice releasing port 23. Accordingly, in the state where a large number of ice cubes S released from the ice making unit 18 have

been stored on the bottom portion of the ice stock compartment 16, on condition that the motor 31 is driven under control to rotate said ice-cube feeding screw 33 in a predetermined direction, the ice cubes S facing gaps 36 of the fin 35 are serially fed toward the ice releasing port 23. Thereafter, the fed ice cubes S are released from the ice releasing section 24 into an ice container 26 mounted on the front surface of the ice making machine 10.

[0004] In the aforementioned conventional ice-cube releasing apparatus 30, as shown in FIG. 9, said spiral fin 35 constituting the ice-cube feeding screw 33 extends vertically and linearly from the outer circumferential surface of the rotary shaft 34 in the external radial direction of the fin 35. For this reason, even if the aforementioned ice cube S properly faced the gap 36 of the fin 35, the ice cube S will be displaced in the external radial direction while being moved toward the ice releasing port 23, when the ice-cube feeding screw 33 is rotated by the motor 31. As a result, said conventional ice-cube releasing apparatus 30 had a defect that the ice conveying efficiency is considerably reduced, because the ice cubes S are disengaged from the fin 35 before being moved toward the ice releasing port 23. Particularly, in the case where the number of ice cubes S to be released at a time is set based on the rotating speed of the ice-cube feeding screw 33, the number (amount) of ice cubes S to be released from the ice releasing port 23 is relatively reduced. Consequently, another problem is pointed out where release of ice cubes S becomes instability.

SUMMARY OF THE INVENTION

[0005] In view of the aforementioned disadvantages, the present invention has been proposed in order to solve them suitably. Accordingly, the object of this invention is to provide an ice-cube releasing apparatus that is capable of achieving the efficient conveyance of ice cubes and stabilization of release of ice cubes, by suitably tilting all or a portion of the abutting face of the fin directed toward the ice releasing section to the side of the ice releasing section in order to suitably regulate the radially external displacement and disengagement of ice cubes facing the gaps of the fin.

[0006] To achieve the above object suitably and in accordance with one aspect of the present invention, there is provided an ice-cube releasing apparatus comprising: an ice storing chamber for storing a great number of ice cubes; drive means provided in the ice storing chamber; an ice-cube feeding screw having a rotary shaft connected to the drive means and a fin spirally mounted on the rotary shaft in an axial direction of the rotary shaft; and an ice releasing section provided at a predetermined position in the ice storing chamber, the ice cubes being fed to the ice releasing section through the fin by rotation of the ice-cube feeding screw; wherein an abutting face of the fin directed to the ice releasing section

is formed so as to tilt toward the ice releasing section as it goes outward in a radial direction of the fin.

[0007] In accordance with another aspect of the present invention, there is provided an ice-cube releasing apparatus comprising: an ice storing chamber for storing a great number of ice cubes; drive means provided in the ice storing chamber; an ice-cube feeding screw having a rotary shaft connected to the drive means and a fin spirally mounted on the rotary shaft in an axial direction of the rotary shaft; and an ice releasing section provided at a predetermined position in the ice storing chamber, the ice cubes being fed to the ice releasing section through the fin by rotation of the ice-cube feeding screw; wherein on an outer circumferential end portion of an abutting face of the fin directed to the ice releasing section, a second abutting face is formed so as to tilt toward the ice releasing section as it goes outward in a radial direction of the fin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present invention will be described in further detail with reference to the accompanying drawings wherein:

FIG. 1 is a longitudinal side view partially showing the ice-cube feeding screw in an ice-cube releasing apparatus according to the first embodiment of the present invention;

FIG. 2 is an enlarged sectional view of the fin of the ice-cube feeding screw in the first embodiment;

FIG. 3 is a longitudinal side view partially showing the ice-cube feeding screw in an ice-cube releasing apparatus according to the second embodiment of the present invention;

FIG. 4 is an enlarged sectional view of the fin of the ice-cube feeding screw in the second embodiment;

FIG. 5 is a longitudinal side view partially showing the ice-cube feeding screw in an ice-cube releasing apparatus according to the third embodiment of the present invention;

FIG. 6 is an enlarged sectional view of the fin of the ice-cube feeding screw in the third embodiment;

FIG. 7 is a schematic diagram showing the entire constitution of an ice-cube releasing apparatus according to the embodiment of the present invention;

FIG. 8 is a longitudinal side view showing the schematic constitution of an ice making machine in which the ice-cube releasing apparatus may be implemented; and

FIG. 9 is a longitudinal side view partially showing the ice-cube feeding screw in a conventional ice-cube releasing apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] An ice-cube releasing apparatus according to the present invention will hereinafter be described by giving preferred embodiments in reference to the accompanying drawings. Note that since the ice-cube releasing apparatuses according to the preferred embodiments are equipped in the aforementioned existing ice making machine 10 informally shown in FIG. 8 and the basic structure of said ice making machine itself is substantially the same, a detailed description thereof will not be given. The same reference numerals will be applied to the same members already described in connection with FIG. 8. Furthermore, for convenience of explanation, the right side of FIG. 8 is designated to be the "front side" of the ice making machine 10 and the left side thereof is designated to be the "rear side" of the ice making machine 10.

[0010] FIG. 7 is a schematic diagram common to the ice-cube releasing apparatuses according to the first embodiment through the third embodiment, all of which will be described later. The basic structure of the ice-cube releasing apparatuses is basically the same as the aforementioned conventional ice-cube releasing apparatus 30 so that the structure thereof will be described in further detail. That is, the ice-cube releasing apparatuses 40, 50, and 60 in the embodiments are composed of a motor (drive means) 31 fixed to the front side of a cover body 25 detachably attached to the front opening of said ice stock bin 17 and an ice-cube feeding screw 33. Said motor 31 is attached to a gear box 41 and the output shaft 42 of this gear box 41 is connected to the rotary shaft 34 of said ice-cube feeding screw 33 by means of said speed reducer 32. Therefore, when the motor 31 is rotated in a predetermined direction, said ice-cube feeding screw 33 will be rotated with reduced speed in the predetermined direction.

[0011] Said ice-cube feeding screw 33 according to each embodiment consist of a cylindrical rotary shaft 34, the front end side thereof is supported by a bearing (not shown) disposed in the cover body 25 as well as the rear end side is supported by a bearing hole 27 formed in the ice stock bin 17, and a fin 45 (51 and 61 for the second and third embodiments) spirally mounted at predetermined pitches on the outer circumference of the rotary shaft 34. At the bottom portion of said ice stock compartment 16, the ice-cube feeding screw 33 is arranged at an inclined angle that becomes an appropriate up slope toward the ice releasing port 23 of said ice releasing section 24 (front side). Therefore, as illustrated in FIG. 7, in the state where the ice cubes S released from the ice making unit 18 have been stored on the bottom portion of the ice stock compartment 16, when

the motor 31 is driven under control to rotate said ice-cube feeding screw 33 in a predetermined direction, each ice cube S facing the gap 36 of the fin 45 (51 and 61 for the second and third embodiments) is serially fed toward the ice releasing section 24. Thereafter, the fed ice cubes S are released from the ice releasing port 23 into the ice container 26 mounted on the front surface of the ice making machine 10. In addition, a disc-like end plate 46 is disposed on the rear end side of said rotary shaft 34. Said ice-cube feeding screw 33 is arranged to face a groove 70 formed in the bottom portion of the ice stock compartment 16 and almost the half of the screw 33 is housed in said groove 70.

(First Embodiment)

[0012] FIG 1 is a longitudinal side view of the ice-cube feeding screw 33 according to the first embodiment of the present invention and FIG 2 is an enlarged sectional view of the fin 45 of the ice-cube feeding screw 33. In the ice-cube feeding screw 33 according to the first embodiment, the outer circumferential end portion 48 of the fin 45 in the radial direction is somewhat tilted toward the ice releasing section 24 with respect to the proximal portion 47 (portion coupled to the rotary shaft 34) of said fin 45. More specifically, said fin 45 is spirally mounted at predetermined pitches on the outer circumference of the rotary shaft 34, while the entire abutting face 49 of the fin 45 directed toward the ice releasing section 24 is being tilted at a predetermined angle as it goes outward in the radial direction. With this arrangement, when the ice-cube feeding screw 33 is rotated, the ice cubes S facing the gaps 36 of the fin 45 in the screw 33 are moved toward the ice releasing section 24 while being pushed to the ice releasing section 24 by the abutting face 49 tilted toward the ice releasing section 24, as shown in FIG. 1.

[0013] In the ice-cube releasing apparatus 40 thus constructed according to the first embodiment, the abutting face 49 of the fin 45 is tilted toward the ice releasing section 24, so that the outer circumferential end portion 48 of the fin 45 becomes to extend to the upper side of the ice cube S facing the gap 36, as shown in FIG. 1. With this movement, for the ice cubes S facing the gaps 36 of the fin 45, the displacement in the external radial direction is appropriately regulated when the ice cubes S are moved toward the ice releasing section 24 by rotation of the ice-cube feeding screw 33. As a result, the ice cubes S are properly prevented from being moved out of the screw 33. That is to say, the ice cubes S facing the gaps 36 of the fin 45 are reliably conveyed to the ice releasing port 23 of the ice releasing section 24 without being moved outward from the fin 45. Thus, the efficient conveyance of the ice cubes S and the stabilization of the release of the ice cubes S can be achieved.

(Second Embodiment)

[0014] FIG 3 is a longitudinal side view of the ice-cube feeding screw 33 according to the second embodiment of the present invention and FIG 4 is an enlarged sectional view of the fin 51 of the ice-cube feeding screw 33. In the ice-cube feeding screw 33 according to the second embodiment, a portion of the fin 51 from its predetermined portion in the radial direction to the outer circumferential end portion 53 of the fin 51 is curved so that it tilts in the form of a curved surface toward the ice releasing section 24 as it goes outward in the radial direction. More specifically, the abutting face 54 of the fin 51, directed to the ice releasing section 24, basically consists of a first abutting face 54a extending from the proximal portion 52 to a radial predetermined portion in a direction perpendicular to the rotary shaft 34 and a second abutting face 54b curved in the form of a curved surface at that predetermined portion toward the ice releasing section 24. Said fin 51 is wound at required pitches and firmly mounted on the outer circumference of the rotary shaft 34. With this arrangement, when the ice-cube feeding screw 33 is rotated, the ice cubes S facing the gaps 36 of the fin 51 in the screw 33 are moved to the ice releasing section 24 while being pushed by the first abutting face 54, as shown in FIG. 3.

[0015] In the ice-cube releasing apparatus 50 thus constructed according to the second embodiment, the second abutting face 54b of the fin 51 is curved toward the ice releasing section 24, so that the outer circumferential end portion 53 of the fin 51 extends to the upper side of the ice cube S facing the gap 36, as shown in FIG. 3. With this movement, for the ice cubes S facing the gaps 36 of the fin 51, the radially outward displacement thereof is appropriately regulated by the second abutting face 54b when the ice cubes S are moved toward the ice releasing section 24 by rotation of the ice-cube feeding screw 33. As a result, the ice cubes S are properly prevented from being moved outward from the screw 33. That is to say, the ice cubes S facing the gaps 36 of the fin 51 are reliably conveyed to the ice releasing port 23 of the ice releasing section 24 without being moved outward from the fin 51. Therefore, the efficient conveyance of the ice cubes S and the stabilization of the release of the ice cubes S can be achieved.

(Third Embodiment)

[0016] FIG. 5 is a longitudinal side view of the ice-cube feeding screw 33 according to the third embodiment of the present invention and FIG. 6 is an enlarged sectional view of the fin 61 of the ice-cube feeding screw 33. In the ice-cube feeding screw 33 according to the third embodiment, a portion of the fin 61 from its predetermined portion in the radial direction to the outer circumferential end portion 63 of the fin 61 is bent so that it tilts linearly toward the ice releasing section 24 as it goes outward in the radial direction. More specifically,

the abutting face 64 of the fin 61, directed to the ice releasing section 24, basically consists of a first abutting face 64a extending from the proximal portion 62 to a radial predetermined portion in a direction perpendicular to the rotary shaft 34 and a second abutting face 64b tilted at that predetermined portion facing the outer circumferential end portion 63 toward the ice releasing section 24. The fin 61 is wound at required pitches and firmly mounted on the outer circumference of the rotary shaft 34. With this arrangement, when the ice-cube feeding screw 33 is rotated, the ice cubes S facing the gaps 36 of the fin 61 in the screw 33 are moved to the ice releasing section 24 while being pushed by the first abutting face 64a, as shown in FIG. 5.

[0017] In the ice-cube releasing apparatus 60 thus constructed according to the third embodiment, the second abutting face 64b of the fin 61 is tilted toward the ice releasing section 24, so that the outer circumferential end portion 63 of the fin 61 extends to the upper side of the ice cube S facing the gap 36, as shown in FIG. 5. With this movement, for the ice cubes S facing the gap 36 of the fin 61, the radially outward displacement thereof is appropriately regulated by the second abutting face 64b when the ice cubes S are moved toward the ice releasing section 24 by rotation of the ice-cube feeding screw 33. As a result, the ice cubes S are properly prevented from being moved outward from the screw 33. That is to say, the ice cubes S facing the gaps 36 of the fins 61 are reliably conveyed to the ice releasing port 23 of the ice releasing section 24 without being moved outward from the fin 61. Therefore, the efficient conveyance of the ice cubes S and the stabilization of the release of the ice cubes S can be achieved.

[0018] While it has been described that the ice-cube releasing apparatuses 40, 50, and 60 according to the aforementioned first embodiment through the third embodiment are applied to the ice making machine 10 shown in FIG. 8, the present invention is not to be limited to that machine, but is suitably applicable to various types of ice making machines and ice stock bins.

[0019] According to an ice-cube releasing apparatus in one embodiment of the present invention, as described above, the entire abutting face of the fin in the ice-cube feeding screw tilts toward the ice releasing section. Therefore, when ice cubes facing the gaps of the fin are moved toward the ice releasing section by rotation of the ice-cube feeding screw, the radially outward movement of the ice cubes can be suitably regulated. As a result, since the ice cubes facing the gaps can be prevented from being displaced outward of the ice-cube feeding screw, the efficient conveyance of ice cubes and the stabilization of the release of ice cubes can be achieved.

[0020] In addition to the above, according to an ice-cube releasing apparatus in another embodiment of the present invention, the second abutting face on the side of the outer circumferential end of the fin in the ice-cube feeding screw tilts toward the ice releasing section.

Therefore, when ice cubes facing the gaps of the fin are moved toward the ice releasing section by rotation of the ice-cube feeding screw, the radially outward movement of the ice cubes can be suitably regulated. As a result, since the ice cubes facing the gaps can be prevented from being displaced outward of the ice-cube feeding screw, the efficient conveyance of ice cubes and the stabilization of the release of ice cubes can be achieved.

Claims

1. An ice-cube releasing apparatus wherein an ice-cube feeding screw (33) having a rotary shaft (34) connected to a drive means (31) and a fin (45) spirally mounted on said rotary shaft (34) in an axial direction thereof is rotatably provided in an ice stock compartment (16) for storing a large number of ice cubes (S), and said ice cubes (S) are fed to an ice releasing section (24) provided at a predetermined position in said ice stock compartment (16) under rotational operation of said ice-cube feeding screw (33);

the improvement wherein an abutting face (49) of said fin (45) directed to said ice releasing section (24) is formed so as to tilt toward said ice releasing section (24) as it goes outward in a radial direction of said fin (45).

2. The ice-cube releasing apparatus according to claim 1, wherein said ice-cube feeding screw (33) is disposed at an inclined angle that becomes an up slope toward said ice releasing section (24).

3. An ice-cube releasing apparatus wherein an ice-cube feeding screw (33) having a rotary shaft (34) connected to a drive means (31) and a fin (51,61) spirally mounted on said rotary shaft (34) in an axial direction thereof is rotatably provided in an ice stock compartment (16) for storing a large number of ice cubes (S), and said ice cubes (S) are fed to an ice releasing section (24) provided at a predetermined position in said ice stock compartment (16) under rotational operation of said ice-cube feeding screw (33);

the improvement wherein a second abutting face (54b,64b) is formed on an outer circumferential end portion (53,63) of an abutting face (54,64) of said fin (51,61) directed to said ice releasing section (24) and said second abutting face (54b,64b) tilts toward said ice releasing section (24) as it goes outward in a radial direction of said fin (51,61).

4. The ice-cube releasing apparatus according to claim 3, wherein said ice-cube feeding screw (33) is disposed at an inclined angle that becomes an up slope toward said ice releasing section (24).

5. The ice-cube releasing apparatus according to claim 3 or 4, wherein said second abutting face (54b) in said fin (51) tilts in the form of a curved surface.

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6. The ice-cube releasing apparatus according to claim 3 or 4, wherein said second abutting face (64b) in said fin (61) tilts linearly.

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FIG. 1

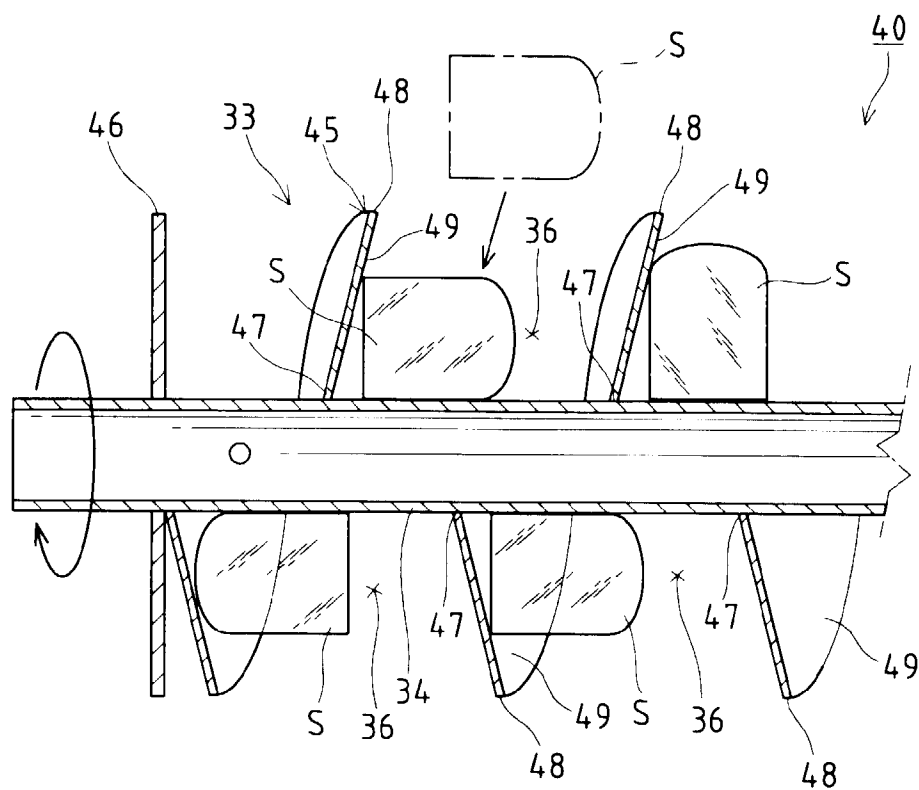


FIG. 2

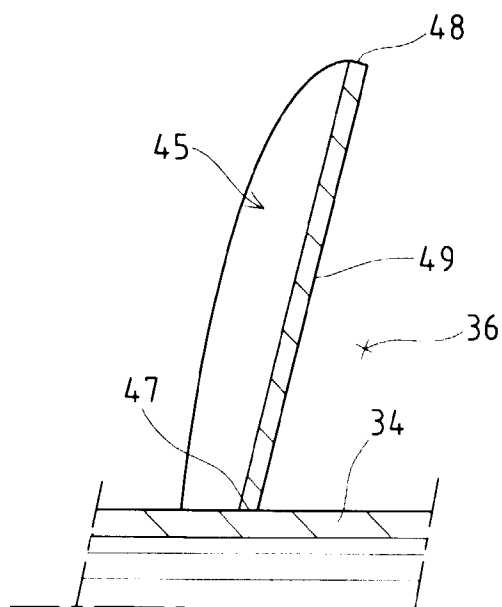


FIG. 3

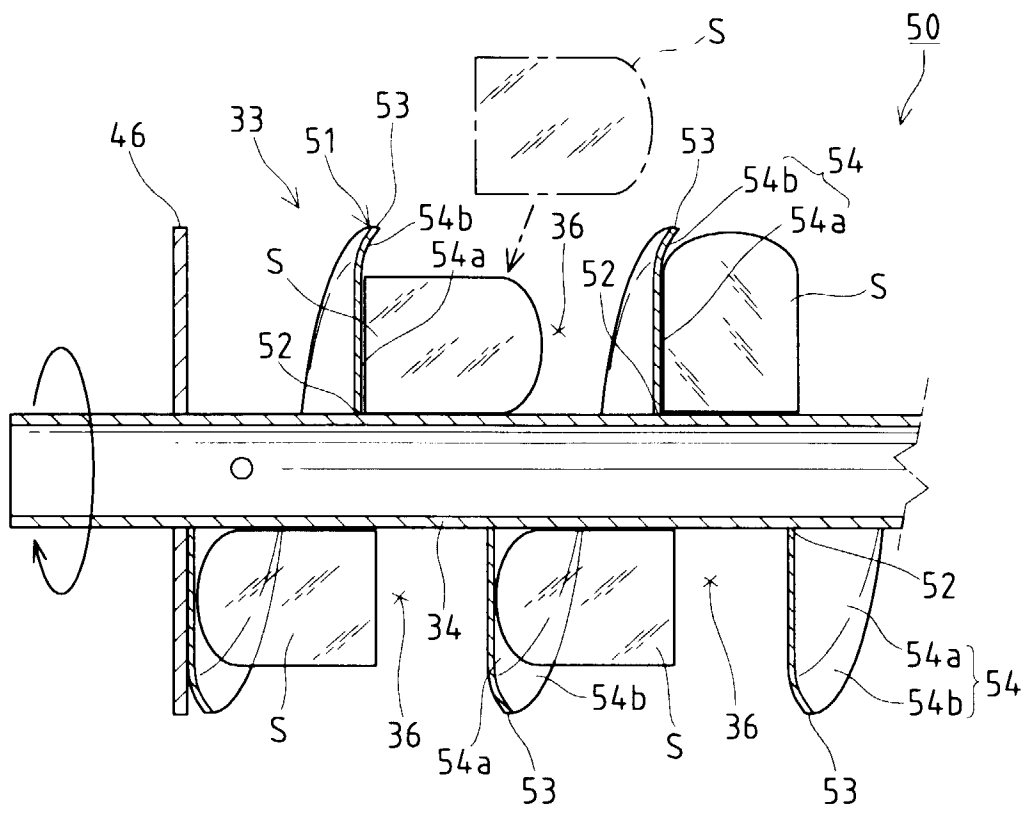


FIG. 4

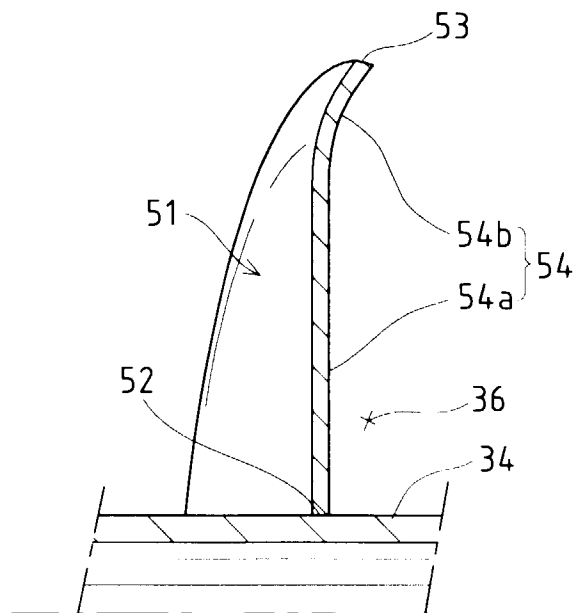


FIG. 5

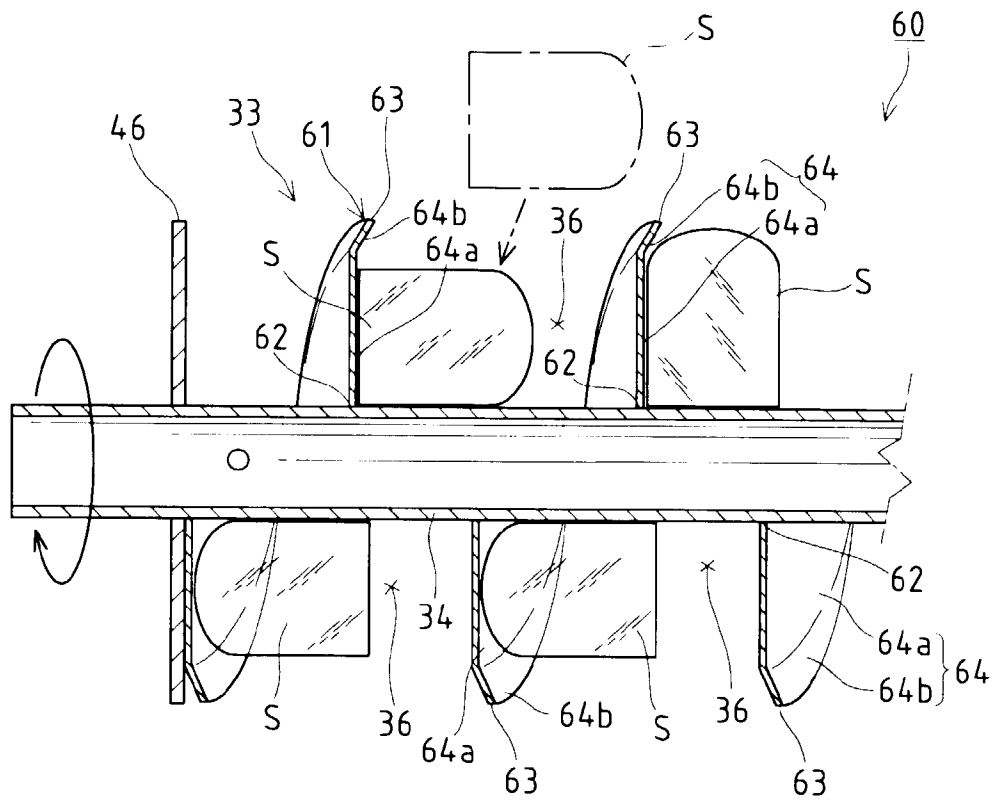


FIG. 6

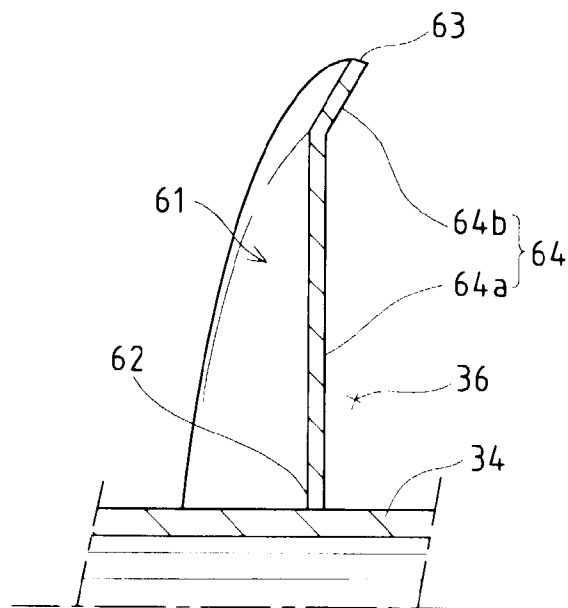


FIG. 7

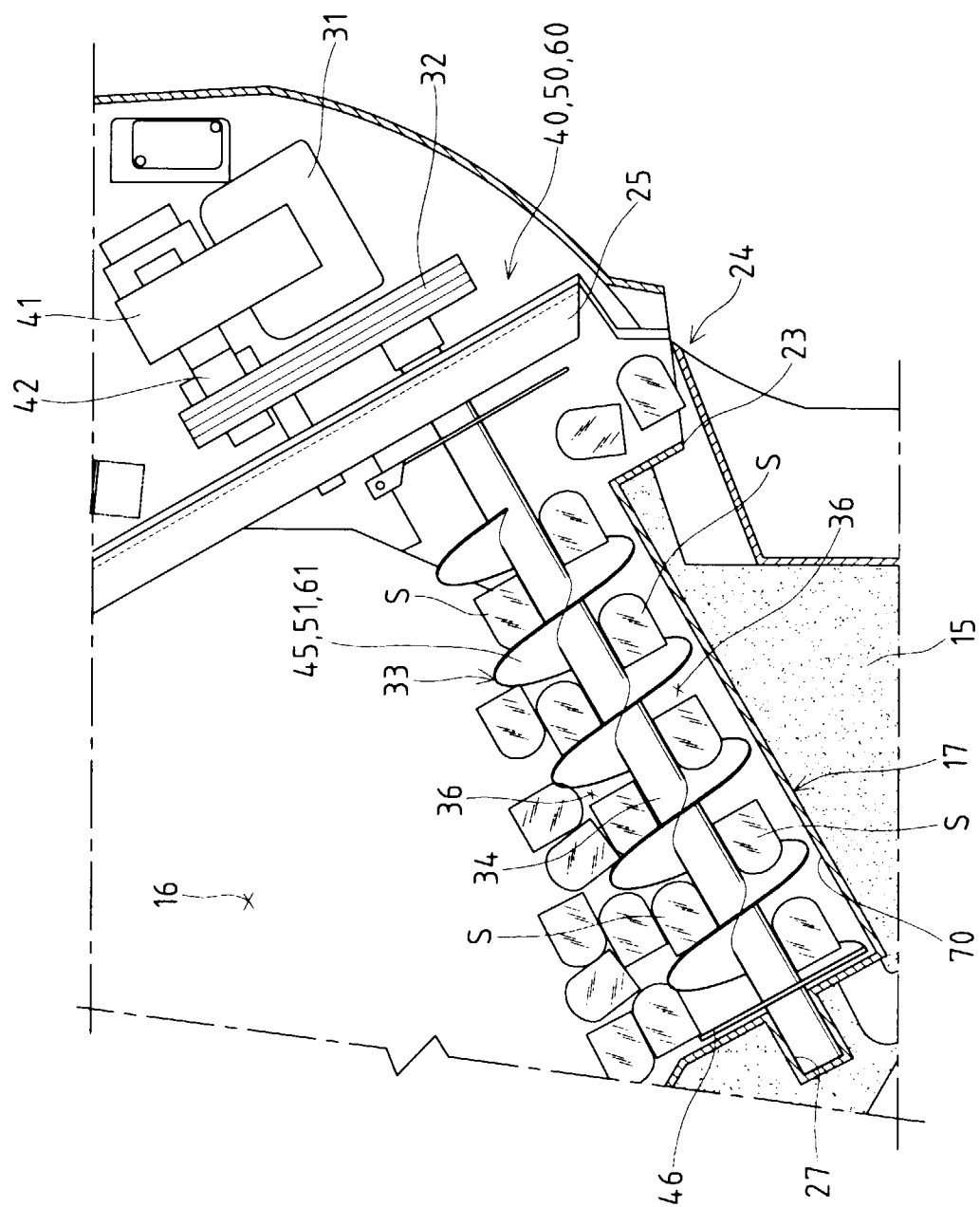


FIG. 8

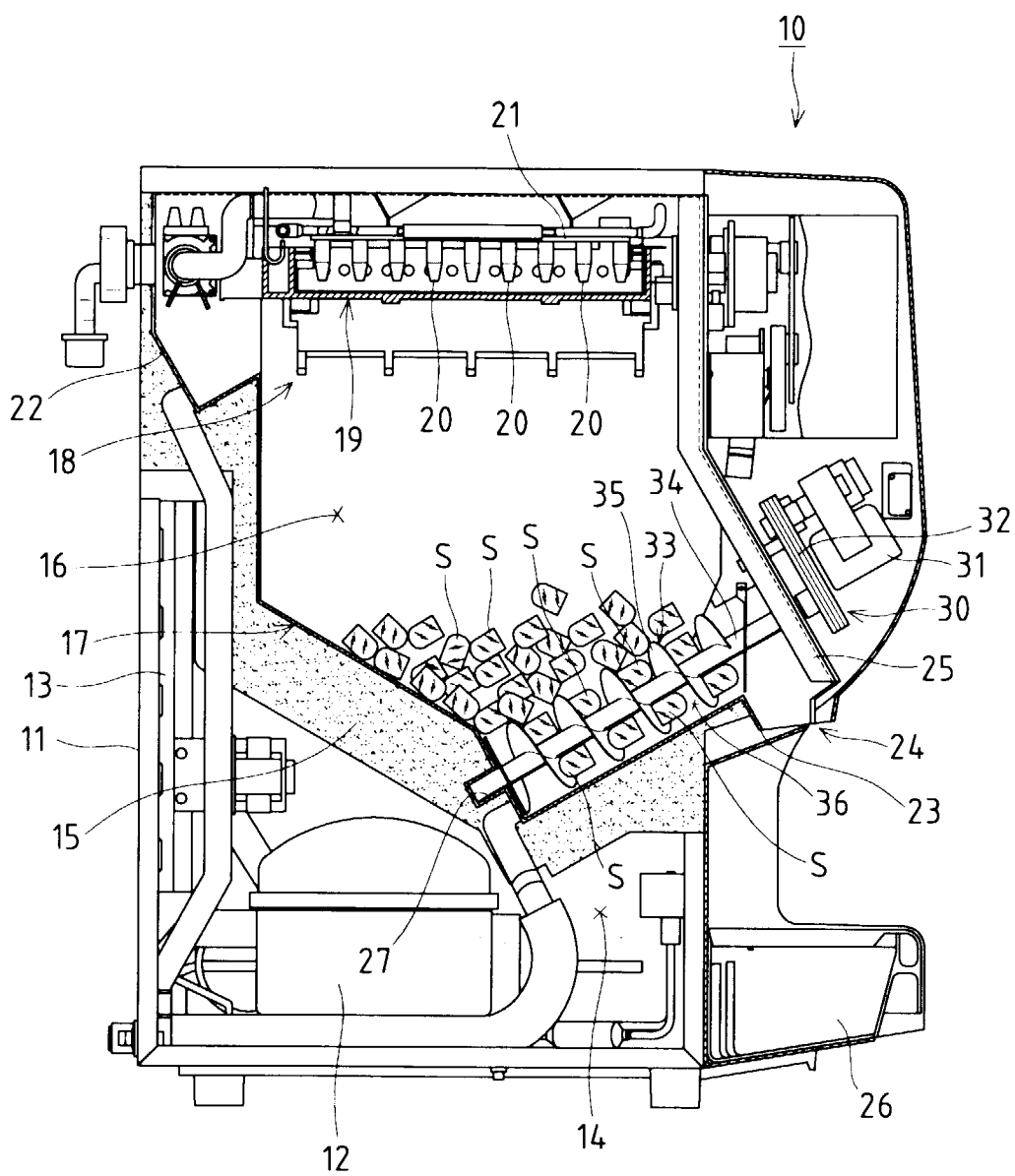
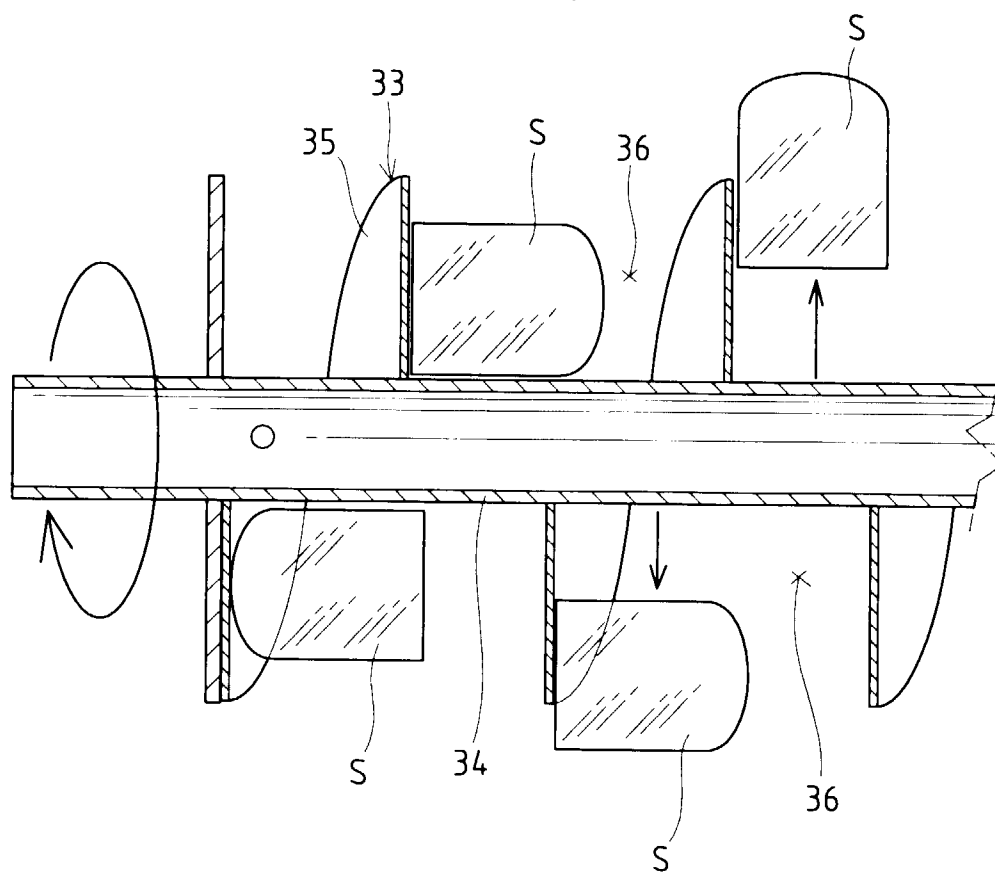


FIG. 9
(PRIOR ART)





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 3316

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	US 3 719 307 A (LARSON A) 6 March 1973 * figure 4 * * column 2, line 48 - column 3, line 43 * ---	1-4,6	F25C5/00 B65G33/26
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A	EP 0 779 483 A (CASTEL MAC SPA) 18 June 1997 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F25C B65G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		3 June 1999	Busuioescu, B
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EP 99 10 3316

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03-06-1999

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82