Aug. 28, 1962 A. J. HUCK 3,051,401

ICE CRUSHER

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Fig. 1

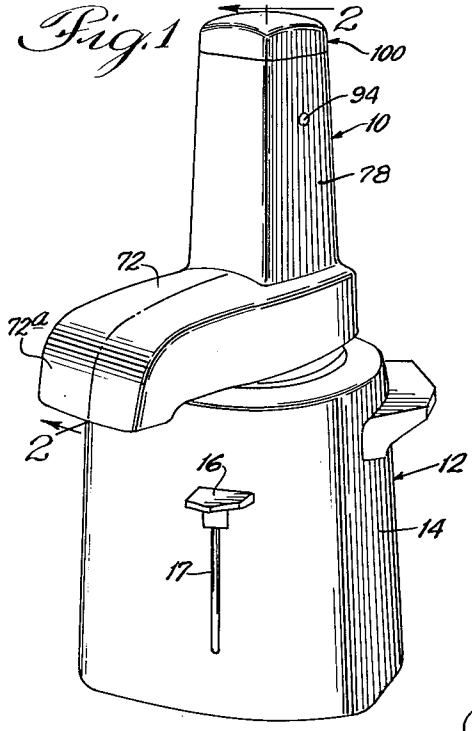


Fig. 2

Fig. 3

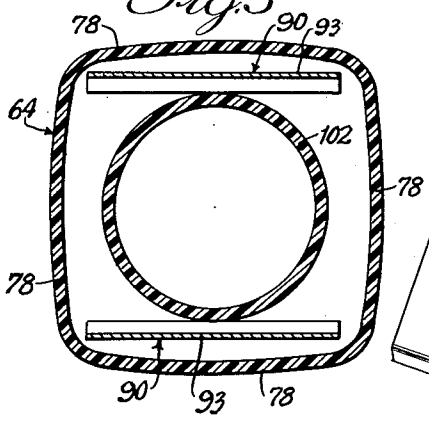
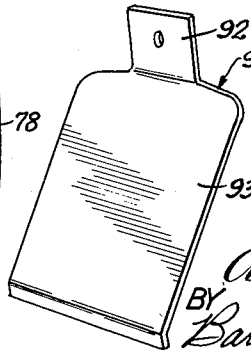


Fig. 7



INVENTOR:
Alfred J. Huck,
BY
Bair, Freeman & Molinare
ATTORNEYS.

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Fig. 4

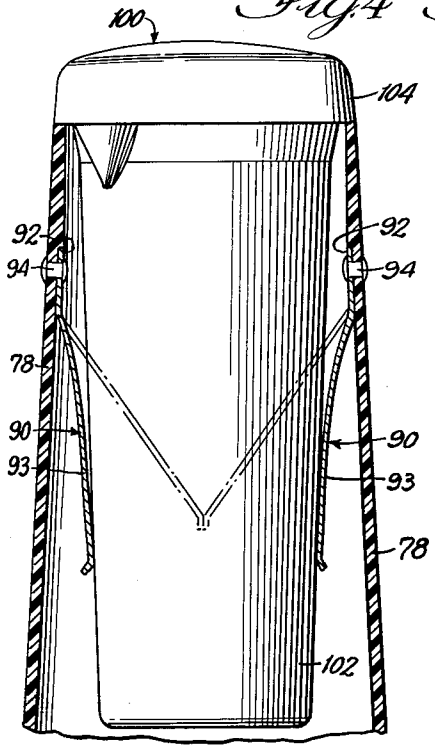


Fig. 5

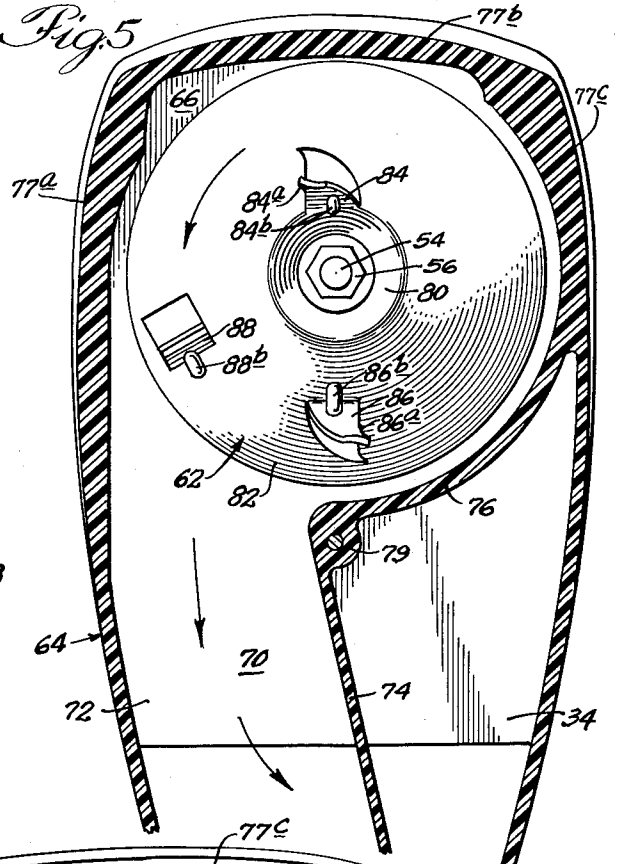
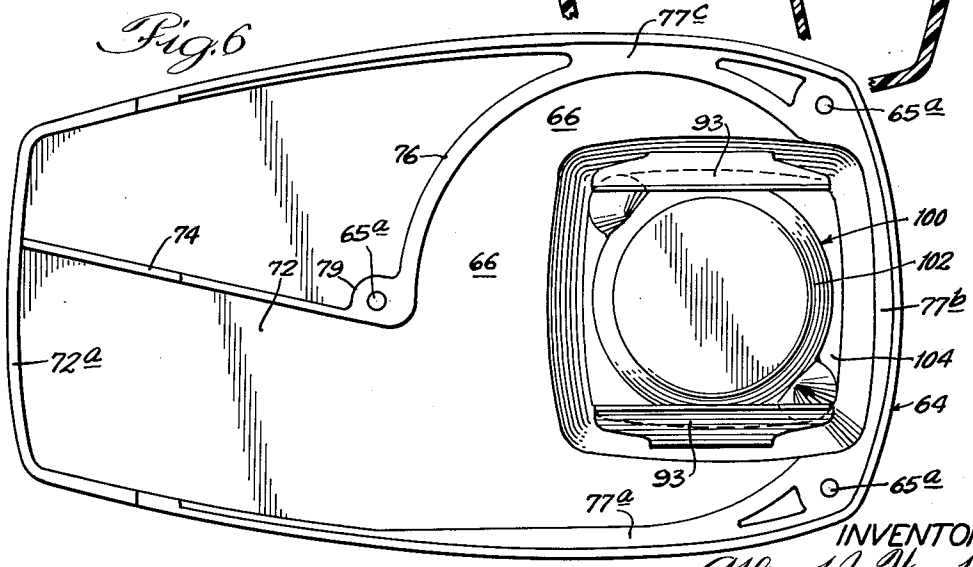


Fig. 6



INVENTOR:
Alfred J. Huck,
BY Bair, Freeman & Molinare
ATTORNEYS.

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3,051,401

ICE CRUSHER

Alfred J. Huck, St. Louis, Mo., assignor to Knapp-Monarch Company, St. Louis, Mo., a corporation of Delaware

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5 Claims. (Cl. 241—257)

This invention relates to an ice crusher and more particularly relates to an ice crusher having rotor means therein adapted to be driven by the motor of a kitchen appliance or the like.

The general object of this invention is to provide an improved ice comminuter or crusher of the type which is adapted to be driven by the motor of a kitchen appliance such as is provided for domestic drink blendors or food comminuting machines, which ice crusher receives ice in block, or cube, form and grinds it up with means rotatable about a vertical axis, and then, utilizing the centrifugal force of the means rotating about the vertical axis, discharges the ground-up ice laterally of the motor drive for the ice crusher.

Another object of this invention is to provide an ice crusher having improved means therein for grinding up ice cubes and the like and for discharging the ground-up ice from the ice crusher under centrifugal force.

A further object of this invention is to provide an ice crusher with improved feed means and inlet means for receiving the ice cubes or the like which are to be ground up, and which prevents the ground-up ice from being inadvertently discharged through said inlet means.

Still another object of this invention is to provide an improved ice crusher wherein undesirable accumulations of ground-up ice within the ice crusher are substantially avoided.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawings, in which:

FIGURE 1 is a perspective view showing the ice crusher of this application mounted on a motor drive therefor;

FIGURE 2 is an enlarged vertical cross-section view taken on line 2—2 of FIGURE 1;

FIGURE 3 is a cross-sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary cross-section of the upper end of the ice crusher housing illustrating the ice feed means and gate means therein and is taken substantially on line 4—4 of FIGURE 2;

FIGURE 3 is a cross-section view taken on line 3—3 on line 5—5 of FIGURE 2 and shows the interior of the ice crusher looking downwardly on the ice comminuting and centrifugal discharging plate;

FIGURE 6 is a view looking upwardly into the housing of the ice crusher with the ice comminuting plate and drive therefor removed; and

FIGURE 7 is a perspective view of one of the leaf spring members which serve as part of the gate means in the inlet means of the ice crusher housing.

Referring now to the drawings, there is shown in FIGURE 1 an ice crusher, generally indicated at 10, mounted atop a base, generally indicated at 12, within which is positioned a drive motor for driving ice-crushing elements within the crusher 10. The base 12 is of the type used for food comminuting, or drink blending, machines and includes a casing 14 from whence extends a control knob 16 which is vertically movable along a track, or slot, 17 for the purpose of varying the speed of the motor within

the base 12. The details of the base 12 need not be disclosed herein, but the construction may, for example, be similar to that disclosed in U.S. Patent 2,585,255. Extending upwardly from the base 12 is a drive shaft 18 having a fluted tip 19, as can best be seen in FIGURE 2.

Now, the ice crusher 10 is more fully disclosed in the remaining figures and includes a casing, generally indicated at 20, which is secured to a resilient mounting cup 22. The cup 22 is shaped to define a cylindrical sleeve part 24 having a plurality of circumferentially spaced, upright recesses 26 therein, for the purpose of cooperation with ribs in the cup-receiving recess of the base 12. Such construction is more fully illustrated in said U.S. Patent 2,585,255, and it should be understood that the resilient mounting cup 22 of this invention provides an adapter for connection to the base 12 in much the same way as the resilient mounting cup provides a connector in the said U.S. Patent 2,585,255. The mounting cup 22 also defines an annular resilient flange, or disc, 28. Positioned inwardly of cup 22 is a rigidifying cup 30 formed of sheet metal, or the like, the peripheral edge of said cup fitting into and cooperating with a recessed shoulder 32 defined in resilient cup 22.

Engaging the upper side of disc 28 is a flat, rigid, mounting plate 34 formed of sheet metal or the like. Means are provided for clamping together the rigid cup 30, the resilient mounting cup 22, and the mounting plate 34. These means include an exteriorly threaded ferrule 36, having a radially enlarged head 37 which abuts the transverse well of cup 30, and a nut member 38 threaded onto ferrule 36. A first washer 40, surrounding ferrule 36, is provided between cup 30 and resilient disc 28, and a second washer 42 is positioned between nut 38 and mounting plate 34. A short sleeve portion 44, formed on disc 28, is positioned between ferrule 36 and the inner edges of mounting plate 34 and washer 42. The arrangement is such that when the nut 38 is drawn up tightly, the parts are clamped in sealing relation to each other and there is rigid connection effected between the mounting cups 22 and 30 and the mounting plate 34.

Positioned within the central bore of ferrule 36 is a sleeve bearing 46, within which is journaled a shaft 48. The lower end of shaft 48 carries thereon a socket member 50 having a splined recess 52 for driving cooperation with the splined tip 19 of drive shaft 18. The upper end of shaft 48 carries a reduced, threaded stud, thereby defining an annular support shoulder 55 on shaft 48. The stud 54 is adapted to receive a clamping nut 56. An anti-friction washer 58 is provided surrounding the portion of the shaft 48 which extends above ferrule 36, and the width of washer 58 is such as to overlie the ends of both the sleeve bearing 46 and at least a portion of the ferrule 36. The shaft 48 has a reduced groove portion 60 located between the lower end of ferrule 36 and the socket 50, and a positioning ring, or washer, 61, located in said groove 60 operates to engage portions of the lower terminus of sleeve bearing 46 and ferrule 36, thereby serving to locate the shaft 48 relative to the ferrule 36 and to limit axial movement therebetween. Mounted on the support shoulder 55 of shaft 48, and clamped between said shoulder 55 and the assembly nut 56, is an ice-crushing disc member, generally indicated at 62.

Now, the housing, which was generally referred to at 20 hereinabove, includes both the mounting plate 34 and a molded casing member 64 formed of plastic and secured to the mounting plate 34 by means of a plurality of screws 65, the tapped holes for which are best seen at 65a in FIGURE 6. The casing member 64, together with the mounting plate 34, defines a chamber, generally noted at 66, within which the ice crushing takes place. The casing member 64 also defines an upright, first, elongated pas-

sageway 68, through which ice in the form of blocks, or chunks, may be introduced or advanced downwardly toward the ice-crushing chamber 66. There is also defined a second, laterally-extending, elongated passageway 70, which extends generally transversely of the first passageway and which communicates with the ice-crushing chamber 66 and through which crushed ice is delivered laterally from the ice-crushing chamber 66. More specifically, the second passageway 70 is defined by an upper side 72, which is part of casing member 64, a lower side which is part of mounting plate 34, and spaced upright sides, one of which is part of the exterior wall of casing member 64, and the other being an interior wall 74 which is molded integral with the casing member 64. The longitudinal axis of the second passageway 70 is laterally offset and transverse to the longitudinal axis of the first passageway 68, and the longitudinal axis of the second passageway 70 is laterally offset from the axis of shaft 48, which is also the axis of rotation of the ice-crushing means 62.

The ice-crushing chamber 66 is defined, in part, by portions of the casing member 64, which include wall portions 76, 77*a*, 77*b*, and 77*c*, that are best noted in FIGURE 5. The casing member 64 is shaped to define four upright walls 78 which cooperate to surround the first passageway 68, and it will be seen that said upright walls 78 merge at their lower ends into the lower housing wall portions 77*a*, 77*b*, 77*c*, and the transverse wall 72. The walls 76 and 74 merge at an enlarged corner 79, which serves as a convenient anchor place for one of the assembly screws 65, as heretofore described.

Turning now to the specific details of the ice-crushing-and-discharging means, such means include the disc member 62, which is best seen in FIGURES 2 and 5, and which is of generally frusto-conical shape with a central dished portion 80 wherein is located the clamping nut 56. The greater portion of the disc 62 is a frusto-conical part 82 which carries a pair of ice cutters, 84 and 86, and a ground-ice ejector 88, thereon. The disc 62 is of sheet metal, and the ice cutters, 84 and 86, and the ejector 88 are stamped out of the material of the disc 62 and are bent transversely of the frusto-conical plane of the disc portion 82. The cutters respectively provide cutter edges 84*a* and 86*a*, which face tangentially of disc 62, so that rotation of the disc 62 causes the cutter edges 84*a* and 86*a* to bite into the ice and to comimnute it under the action of the rapid rotation of the disc 62. The edges of the ejector 88 face radially, so that the ejector 88 presents its broad face tangentially and operates to effect discharge of the comminuted ice through the tangentially extending, lateral discharge passageway 70. The cutters 84 and 86 are located at different spacings radially outwardly of the axis of rotation of the disc 62, and the cutter 84 is located innermost and the second cutter 86 is located radially about midway between the inner cutter 84 and the ejector 88, and the ejector 88 is located close to the outer periphery of the rotating disc 62. The upstanding cutters and ejector, are structurally reinforced by the formation of embossed, or dimpled, reinforcement ribs 84*b*, 86*b* and 88*b*, respectively, adjacent the junctures of the respective members with the frusto-conical plate portion 82.

The positioning of disc 62 in ice-crushing chamber 66, as best seen in FIGURES 2 and 5, locates the upper edges of the cutters 84 and 86 close to the lower terminus of the first passageway 68, so that block ice entering the cutting chamber 66 is immediately engaged by the rapidly rotating cutters 84 and 86 and is ground up. The longitudinal axis of passageway 68 is located rearwardly of the axis of disc 62, as best seen in FIGURE 2, so that there is little tendency of large pieces of ice being forced out of the device through passageway 70. The ice-crushing means, which includes the disc 62, also cooperates with the sides of the first passageway which seek to restrain the block of ice that is being fed into the ice-crushing chamber 66, so that the rotary action of disc 62 relative to the housing 64 operates to impose ice-crushing

forces to the block of ice advancing through first passageways 68. The sides of chamber 66 defined by housing 64, and which are located peripherally of, and above, the ice-crushing disc 62, operates to provide jamming, or abutment, surfaces which cooperate with the rotatable ice-crushing disc 62 to insure that the relatively large blocks of ice are ground to relatively small flakes or chips before being discharged from the ice crusher.

It will be understood that these cooperating surfaces defined by housing 64 are plastic, and the relatively low heat conductivity of the plastic prevents ice accumulations on the surfaces of the housing 64. The feature of having the housing 64 formed of plastic has been found to really provide an advantage in that the shaved ice does not adhere to it and, consequently, there is no build-up of ice on the walls thereof which might interfere with proper operation of the device.

The particular disposition of the cutting disc 62 that is here utilized is also desirable with regard to the using of centrifugal force to discharge the ground-up ice from the device. The ejector 88 provides the necessary tangential impetus, and the centrifugal force operates to throw the comminuted ice particles laterally through the passageway 70, from whence the particles are directed downwardly by means of the downwardly curved wall 72*a*, which is an extension of the top wall 72 and which is spaced from the terminal end of mounting plate 34, as best seen in FIGURE 2.

It has also been found desirable to incorporate a gate means in the portion of the housing defining the first passageway 68. These gate means include a pair of oppositely mounted leaf spring plates 90 which have mounting portions 92 which extend transversely to gate portions 93, and which are adapted to be secured to the walls 78 of the casing 64 by means of rivets 94, or the like. The gates 93 are arranged so that they normally are in a substantially closed position, as shown in the dot-dash lines in FIGURE 4, spaced above disc 62. The downward movement of an ice chunk, or block, between the gate members 93 forces them apart until the ice moves below the lower ends of the gate members 93, whereupon the gate members automatically close, and this arrangement prevents the inadvertent throwing of ice chips by the ice-crusher disc 62 upwardly through the entrance end of passageway 68. The downwardly and outwardly inclined walls 78 of housing 64 provides for the full opening of the gate members 93 to permit passage therebetween of the largest of blocks that could be introduced through the upper terminus of passageway 68. The inherent spring bias of the plates 90 restores the gate members 93 to their normally closed condition.

There is also provided a combination ice-block-advancer and closure member 100. This latter member is made of plastic and includes a hollow reduced stem 102 and an enlarged head 104 which is shaped to cooperate with the upper terminus of casing 64 to define an attractive closure member for passageway 68. The ice-block-advancer 100 may be manually used to thrust the ice blocks in passageway 68 against the ice-cutting disc 62, and when the advancer 100 is seated on the upper terminus of casing 64, as seen in FIGURE 2, the lower end of the stem 102 is spaced above the upper reach of the cutting blades on the rotating disc 62, thereby spacing the advancer from the ice-crushing means.

In the use of the above invention with the variable speed motor base 12, it has been found that the device will produce relatively coarsely ground-up ice, such as used for drinks and the like, when the motor control 16 is set at "low" speed and will produce relatively fine particles of ground-up ice, such as used for making snow cones, when the motor control 16 is set at "high" speeds. It is believed that this result is obtained by reason of the disposition of the cutting blades 84 and 86 in relation to the walls of the casing 64. It will be understood that the blocks of ice moving down into the ice-crushing chamber 66 may move at only a limited speed and then there is

but little space between the blades **84** and **86** and the lower terminus of first passageway **68**, so that at high rotational speeds the blades 84 and **86** operate to effect a finer comminuting action than is obtained at lower rotational speeds. In any event, this end result is one that is desirable and which may be conveniently achieved by the simple combination of the ice crusher herein described and a variable speed motor for rotating the ice-crushing disc **62** at selective high or low speeds of the range normally provided for by motor base **12**.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new, and desire to secure by Letters Patent of the United States is:

1. An ice crusher comprising, in combination, means defining a first elongated passageway through which block ice may be introduced and advanced, means defining a second elongated passageway, extending generally transversely to said first elongated passageway, through which crushed ice is to be delivered, means including a rotary disc defining an ice crushing chamber above said rotary disc with which said first and second passageways communicate directly, and rotary ice crushing means carried on one side of said disc and positioned in said ice crushing chamber and arranged for rotation therein about an axis generally transverse to and laterally offset from the longitudinal axis of said second passageway and with the inlet to said second passageway located in the same horizontal plane with said ice-crushing means, so as to be adapted to receive crushed ice directly from said ice-crushing means, said ice crushing means cooperating with said means defining said first passageway to engage and impose ice-crushing forces against a block of ice advancing through said first passageway into engagement with said rotary ice crushing means, and means including said rotary ice crushing means for driving the crushed ice above said rotary disc through said second passageway.

2. An ice crusher comprising, in combination, means defining a first elongated passageway through which block ice may be introduced and advanced, means defining a second elongated passageway, extending generally transversely to said first elongated passageway, through which crushed ice is to be delivered, means including a rotary disc defining an ice crushing chamber above said rotary disc with which said first and second passageways communicate directly, and rotary ice crushing means carried on one side of said disc and positioned in said ice crushing chamber and arranged for rotation therein about an axis generally transverse to and laterally offset from the longitudinal axis of said second passageway and with the inlet to said second passageway located in the same horizontal plane with said ice-crushing means, so as to be adapted to receive crushed ice directly from said ice-crushing means, said ice crushing means being operative to engage and impose ice-crushing forces against a block of ice advancing through said first passageway into engagement with said rotary ice-crushing means, means including said rotary ice-crushing means for driving the crushed ice above said rotary disc through said second passageway, and a pair of leaf spring members each having a portion thereof independently and rigidly secured to the means defining said first passageway and another portion thereof projecting into said first passageway toward the other leaf spring member to define normally closed gate means which may be forced open by passage of block ice along said first passageway toward said ice-crushing means.

3. An ice crusher comprising, in combination, means defining a first elongated passageway through which block ice may be introduced and advanced, means defining a laterally extending discharge passageway having an entrance end and a distal discharge end, means including a rotary disc defining an ice crushing chamber above said rotary disc which communicates directly with said first passageway and with the entrance end of said discharge passageway, a rotary ice-crushing-and-discharging means carried on one side of said disc and positioned in said ice crushing chamber and arranged for rotation about an upright axis, the discharge passageway being located relative to said ice crushing chamber so as to communicate with said chamber laterally off-set from the chamber's center and with the axis of said laterally extending discharge passageway disposed tangential of said ice-crushing-and-discharging means, the axis of rotation of said ice-crushing-and-discharging means being spaced laterally of the longitudinal axis of the first passageway in the direction toward the entrance end of the lateral discharge passageway, said ice crushing means cooperating with said means defining said first passageway to impose ice-crushing forces against a block of ice advancing through said first passageway into engagement with said rotary ice crushing means, and means including said rotary ice crushing means for driving the crushed ice above said rotary disc tangentially through said second passageway.

4. An ice crusher comprising, in combination, means defining a first elongated passageway through which block ice may be introduced and advanced, means defining a second elongated passageway, extending generally transversely to said first elongated passageway, through which crushed ice is to be discharged, means including a rotary disc defining an ice-crushing chamber with which said first and second passageways communicate, rotary ice-crushing-and-discharging means in said ice crushing chamber positoned to receive block ice from said first passageway and for grinding up the block ice into relatively small flakes and chips within the ice-crushing chamber and above the rotary disc and for directing the flakes and chips tangentially through said discharge passageway, said ice-crushing-and-discharging means including said rotary disc arranged for rotation about an upright axis and shaped to provide a frusto-conical upper surface portion inclined downwardly and outwardly, a plurality of upstanding ice cutters on the upper side of said disc located at different spacings radially outwardly of the axis of rotation of said disc, and an upstanding ejector on the upper side of said disc located adjacent the outer periphery of said disc for assisting in discharge of the flakes and chips of ice above said rotary disc tangentially from the inclined upper surface of the disc through said discharge passageway.

5. An ice crusher comprising, in combination, means defining an upright elongated passageway through the upper end of which block ice may be introduced and advanced downwardly, means defining a laterally extending passageway through which crushed ice is to be laterally delivered, means including a rotary disc defining an ice crushing chamber above said rotary disc which communicates with one end of each said passageway, rotary ice-crushing-and-discharging means on said disc in said ice crushing chamber arranged for rotation about an upright axis and with said laterally extending passageway disposed relatively tangentially of said ice-crushing-and-discharging means, said ice-crushing-and-discharging means being positioned to have the downwardly advancing block ice thrust thereagainst while said ice-crushing-and-discharging means grinds up the block ice into relatively small flakes and chips and effects discharge of the flakes and chips above said rotary disc under centrifugal force through said tangentially extending lateral passageway, the portions of said means defining said ice crushing chamber that are located peripherally of and above said disc providing jamming surfaces which cooperate with the rotatable ice-crushing means to insure that the block ice is ground to relatively small flakes and chips before discharge from the ice crusher, said jamming surfaces being formed of plastic to prevent ice accumulations thereon, and means for varying the speed of rota-

tion of said ice-crushing means to selectively produce relatively coarsely ground-up ice at low speeds and relatively finely ground-up ice at high speeds.

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