Oct. 27, 1942. F. A. WILLARD 2,299,866

ICE COMMINUTING MACHINE

Filed April 22, 1941

Fig. 1

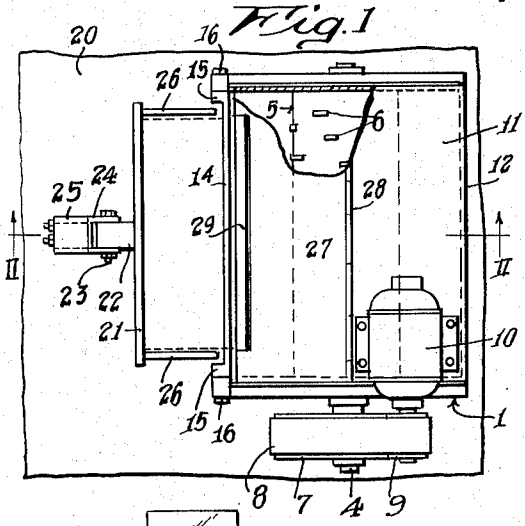


Fig. 3

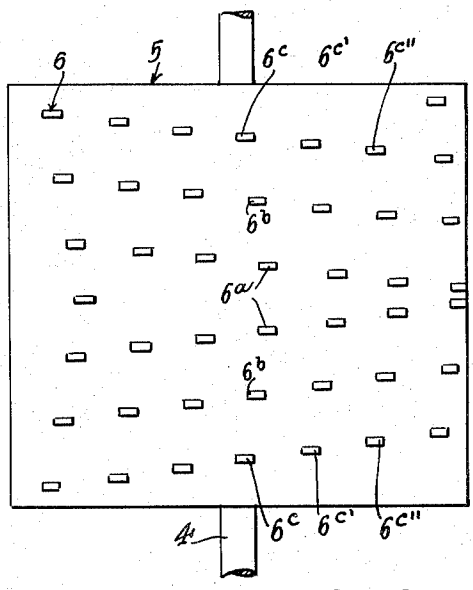


Fig. 2

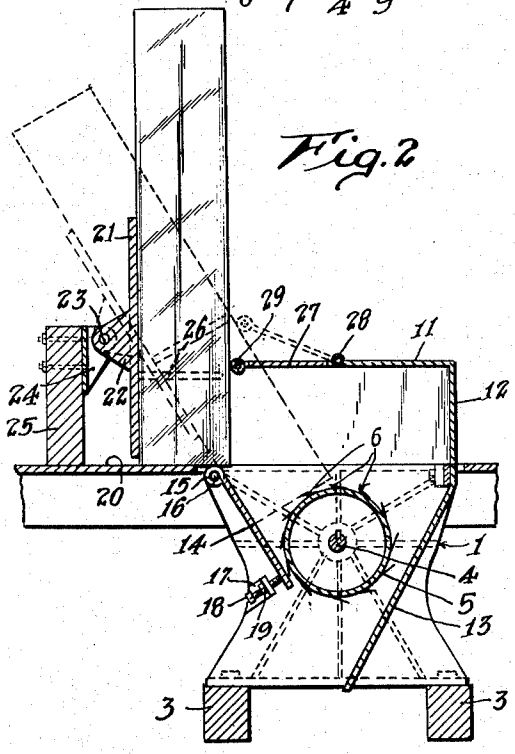
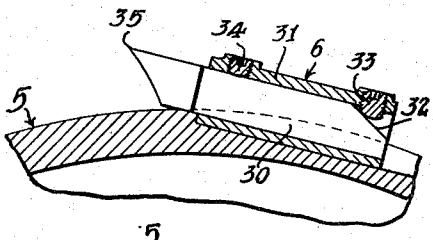


Fig. 4



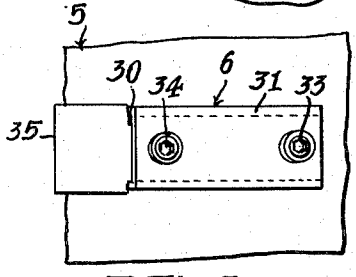


Fig. 5

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ICE COMMINUTING MACHINE

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Application April 22, 1941, Serial No. 389,731

6 Claims. (Cl. 83—63)

This invention relates to devices for producing fine ice, snowlike in texture, from standard cakes of ice.

A general object of the invention is to provide a machine of this type of improved efficiency both from the standpoint of power required and speed of operation.

Another object is to provide an ice shaving machine that produces shaved ice of desired fine texture in a single operation.

Another object is to provide an ice shaving machine that is durable and requires little maintenance.

Another object is to provide an ice shaving machine for handling large cakes of ice, which machine is particularly easy to load.

Other objects, together with various features of the machine, will become apparent from the detailed description to follow of a particular embodiment of the invention, which refers to the drawing.

In the drawing:

Fig. 1 is a plan view of a machine in accordance with the invention;

Fig. 2 is a vertical section, taken substantially in the plane II—II of Fig. 1;

Fig. 3 is a developed view of the surface of the drum of the machine;

Fig. 4 is a detail section showing one of the teeth and the manner in which it is mounted on the drum; and

Fig. 5 is a plan view of the structure shown in section in Fig. 4.

Referring to Figs. 1 and 2, my machine comprises a pair of end frame and wall members 1, each of which may be supported upon beams 3. Extending between the end frame members 1 and rotatably supported in bearings therein, is a shaft 4 which supports and rotates a drum 5, the drum being equipped with teeth 6 for shaving ice fed into the machine. The shaft 4 extends through the end wall 1 at one end and the outboard end of the shaft carries a pulley 7 which is coupled by a belt 8 to the pulley 9 of an electric motor 10 which is mounted upon the top wall 11 of the machine.

The machine is provided with a vertical rear wall 12 extending downwardly from the rear edge of the top wall 11, and a rear wall 13 which slopes downwardly and forwardly from the lower edge of the vertical wall 12.

Immediately in front of the drum 5 is an adjustable ice-guiding wall 14. Thus it has at its upper ends a pair of lugs 15 which are connected by bolts 16 to the frame members 1 so that it is capable of swinging movement about the axis of the bolts 16. In order to permit accurate adjustment of the lower end of the wall 14 toward and away from the drum 5, a screw adjustment is provided. Thus on each of the walls 1 there is provided a lug 17 having a threaded hole for receiving a bolt 18. The inner ends of the bolts 18 bear against and support the wall plate 14 and by turning the bolts the position of the plate 14 can be accurately adjusted. To retain the adjustment, locknuts 19 are provided on the bolts 18.

For convenience in loading the machine, it is preferably mounted with the upper edge of the wall 14 substantially at the level of the floor 20, a suitable hole being provided in the floor for the machine to project up through. To further facilitate loading, I provide a vertical plate 21 having lugs 22 projecting from its rear face, these lugs being hingedly connected by a hinge rod 23 to lugs 24 secured to an upright 25, the latter being secured to the floor 20 immediately in front of the shaving machine. The whole loading mechanism including the plate 21 is positioned such a distance in front of the shaving machine as to permit room for a standard cake of ice to rest on the floor between the plate 21 and the machine. There is preferably attached to the plate 21 a pair of forwardly extending side arms 26 to center the cake of ice. The forward portion of the machine above the guide plate 14 is open, and the forward portion of the top wall 11 is constituted by a plate 27 hinged to the wall member 11 by any suitable hinge means 28 and having an enlarged, rounded lip 29 on its forward edge.

To load a cake of ice into the machine, the cake is first set vertically on the floor in front of the plate 21 and between the guiding arms 26. An operator then hooks a pair of ice tongs into the upper portion of the cake, and pulls the upper portion to the left, thereby swinging the plate 21 counterclockwise about the hinge rod 23 into the position shown in dotted lines in Fig. 2, in which the surface of the plate 21 is in alignment with the wall 14, whereupon the operator lowers the cake of ice along the wall 14 into contact with the drum 5. The drum will be rotating at the time and will immediately begin shaving the cake of ice.

I have shown in the drawing that the shaved ice is simply discharged out of the machine through the opening therein below the guide plate 14. However it will be understood that the ice may be conveyed away from the machine in

any desired manner, various types of belt conveyers, screw conveyers and blowers being in general use for this purpose.

Referring now to Fig. 3, which is a developed view of the surface of the drum, the teeth **6** are arranged in definite order on the surface of the drum. It will be observed that the teeth are arranged in curved rows extending transversely across the drum. There are six teeth in each transverse row, except the leftmost, and the two middle teeth **6***a* are even with each other. The intermediate teeth **6***b* that are next to the center teeth **6***a*—**6***a* are slightly in advanve thereof and the two outer teeth **6***c* in each row are slightly in advance of the teeth **6***b*. It is found that with this arrangement the drum tends to center a cake of ice intermediate the lateral edges of the drum. In fact if a small piece of ice is thrown into the machine, it will be automatically moved to the center of the drum by the action of the teeth thereon. Corresponding teeth in the different circumferentially spaced transverse rows are slightly displaced laterally. Thus it will be observed that the tooth **6***c'* in the row back of the row containing tooth **6***c*, is displaced slightly inwardly with respect to the tooth **6***c*. Likewise the tooth **6***c''* is slightly nearer the middle of the drum than tooth **6***c'*, and so on.

The result is that each of the teeth **6***c* cuts a furrow in the ice cake and the following teeth **6***c'*, **6***c''*, etc. cut additional furrows adjacent to the furrow cut by the next tooth in advance thereof. The action is exactly the same as that of a gang plow moving across a field, and, as with the gang plow, each of the teeth **6***c'*, **6***c''*, etc. shaves the ice and feeds it laterally into the groove or furrow cut by the tooth in advance thereof.

It will be observed from Fig. 3 that in effect the teeth are arranged in a right-hand helix or screw, beginning at the lower end of the drum, and are arranged in a left-hand helix extending from the center to the upper end of the drum.

The teeth **6** may be secured to the drum **5** in various ways, but I prefer to mount them as shown in Figs. 4 and 5. Thus each tooth comprises a bar **30** of rectangular cross section mounted in and projecting from a sleeve **31** which is welded to the drum **5**. Each bar **30** has a sloping surface **32** near the rear end thereof which is engaged by an adjusting screw **33** threaded into the upper wall of the sleeve **31**. A similar screw **34** is provided near the forward end of the sleeve for locking the bar **30** in place. By loosening the screw **34** and then tightening the screw **33**, the bar can be advanced a desired distance out of the sleeve **6**, and then locked in position by tightening the screw **34**. The forward end of each bar **30** is hollow-ground on the underside to provide a chisel edge **35** which extends at an angle of approximately 30° to a radius of the drum. The bars **30** are preferably broadened laterally at their forward ends so that the cutting edges **35** extend laterally beyond the supporting sleeve **31** and thereby assure that the edge will clear a path for the sleeve.

By making the removable tooth bars **30** of high-grade material, such as high-speed steel, the machine can be operated for long periods without resharpening. However if and when resharpening is necessary, it can be easily done by detaching the teeth from the sockets and grinding them on a suitable wheel.

Although various dimensions may be employed, I have found that highly efficient results are obtained with teeth one-half inch in width and set to cut a furrow one-half inch in depth, the actual transverse dimensions of the teeth being ⅜'' x ½''. Because of the angular positioning of the teeth relative to the radii of the drum, teeth ⅜-inch in thickness provide a cutting adge projecting ½-inch from the drum. In operation, the teeth cut to their full depth, the ice cake contacting the surface of the drum in front of each tooth. I have found it satisfactory to hollow-grind the front ends of the teeth to a 2-inch radius.

A machine constructed as described is extremely fast and at the same time produces shaved ice of ideal texture for vegetable packing operations. Thus a machine dimensioned to receive a standard cake of ice 11½'' x 22½'' x 44'' and driven by a 7½ H. P. motor is capable of shaving four cakes of ice a minute.

Although it might appear from the fact that each tooth takes a cut ½'' in depth that the cut ice would be in relatively large chunks, this is not the case. Actually the ice produced is substantially of the texture of coarse, crystalline snow, being sufficiently fine and free of lumps to eliminate any danger of bruising vegetables packed therewith. At the same time the crushed ice is not of such fine texture as to readily refreeze into solid chunks, a difficulty encountered when the ice is ground too fine.

Although for the purpose of explaining the invention, a specific embodiment thereof has been described in substantial detail, it is to be understood that various changes may be made in the particular construction shown without departing from the invention, which is to be limited only to the extent set forth in the appended cleams.

I claim:

1. An ice comminuting machine for comminuting a block of ice of the order of magnitude of a cubic foot or greater comprising a rotatable drum member having a smooth, solid surface adapted to slidably contact said block of ice, means for rapidly rotating said member at a substantially uniform speed, and means for delivering said block of ice against said member, said member having a plurality of cutting teeth thereon, each of said teeth having a laterally extending cutting edge of substantial width arranged parallel with the axis of said drum member, said teeth being arranged in a plurality of transverse rows extending across said surface, with the next adjacent teeth in each said row being spaced apart a distance at least twice as great as the width of one tooth, said teeth also being arranged circumferentially on a helix, the successive teeth of said helix in the direction of motion of said member being laterally staggered substantially the width of one tooth, whereby successive teeth cut overlapping furrows in the ice block and the ice cut by each tooth is discharged laterally from that tooth to one side only into the furrow cut by the tooth ahead.

2. An ice comminuting machine comprising, a rotatable drum member having a smooth, solid surface adapted to slidably contact and support a block of ice, means for driving said drum member at a substantially uniform speed, and means for delivering said block of ice against said drum member, said drum member having a plurality of cutting teeth thereon, each of said teeth having a laterally extending cutting edge of substantial width arranged parallel with the axis of said drum member, said teeth being arranged in a plurality of transverse rows extending across

said drum surface with the next adjacent teeth in each said row spaced apart a distance at least twice as great as the width of one tooth, said teeth also being arranged circumferentially on a helix, the successive teeth of said helix in the direction of motion of said drum member being laterally staggered substantially the width of one tooth, whereby successive teeth cut overlapping furrows in the ice block and the ice cut by each tooth is discharged laterally from that tooth to one side only into the furrow cut by the tooth ahead, the successive teeth of said helix forming said transverse rows also being spaced circumferentially a distance sufficient to permit said block of ice to engage said drum while said teeth cut said furrows in said block.

3. Apparatus as described in claim 2, in which said teeth have chisel edges, the outer side of each tooth being substantially straight and inclined substantially 30° to the direction of movement of the tooth, the forward end of the tooth being hollow ground to define, with said outer side, said chisel edge.

4. An ice comminuting machine for converting a block of ice of volume of the order of magnitude of a cubic foot or greater comprising a drum having a solid cylindrical surface, means for rotatably supporting said drum, means for rotating said drum, means for delivering said block of ice against said drum, said drum having a plurality of ice-cutting teeth thereon, each of said teeth having a lateral cutting edge of substantial width extending parallel to the axis of said drum and projecting from the drum and adapted to cut a furrow through said block of ice in contact with the drum, said teeth being arranged in a plurality of transversely extending rows, the rows being uniformly, circumferentially spaced about the drum, the teeth in each transverse row being so positioned as to define a curved or crescent-shaped row the outer ends of which are in advance of the middle, and the teeth in the different rows being differently positioned crosswise of the drum upon opposed meeting helixes, whereby each tooth of a helix is laterally staggered substantially the width of a tooth from the tooth in the next row in advance thereof, and each tooth cuts a furrow through the ice and discharges the cut ice into the adjacent furrow previously formed by the tooth in advance thereof.

5. In an ice comminuting machine, a rotating cutting drum member, a sloping wall member extending upwardly and outwardly from said drum member and approximately tangential thereto, said wall member being adapted to guide a cake of ice against said drum member, a supporting floor extending substantially horizontally from the upper edge of said wall member, and means for facilitating the operation of delivering a cake of ice to said wall member, said means comprising a plate member, and means supporting it for pivotal movement from a vertical position extending upwardly from said floor at a point spaced away from said guiding wall into angular position with respect to said floor and in substantial alignment with said guiding wall.

6. An ice comminuting machine comprising a rotatable member and means for rotating it, means for feeding a block of ice against said member, and a plurality of teeth on said member for engaging and comminuting said block of ice, each of said teeth comprising a sleeve rigidly secured to said member, and a detachable tooth element in the sleeve, said tooth element being slidable in the sleeve in all longitudinal positions and having a side portion at its trailing extremity cut away to provide a beveled rear end, a first stop-screw threaded through the wall of said sleeve for engaging said beveled rear end of said tooth and acting as a stop against rearward motion of the tooth in the sleeve, and second screw means threaded through the wall of said sleeve for engaging a side of said tooth element and frictionally supporting it against longitudinal movement.

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