July 10, 1956 F. A. TROW ET AL 2,753,694

ICE DISINTEGRATING AND CHIP DELIVERING
SPIRAL ICE CHIP PRODUCING MACHINE

Filed Sept. 17, 1952 2 Sheets-Sheet 1

FIG. 1

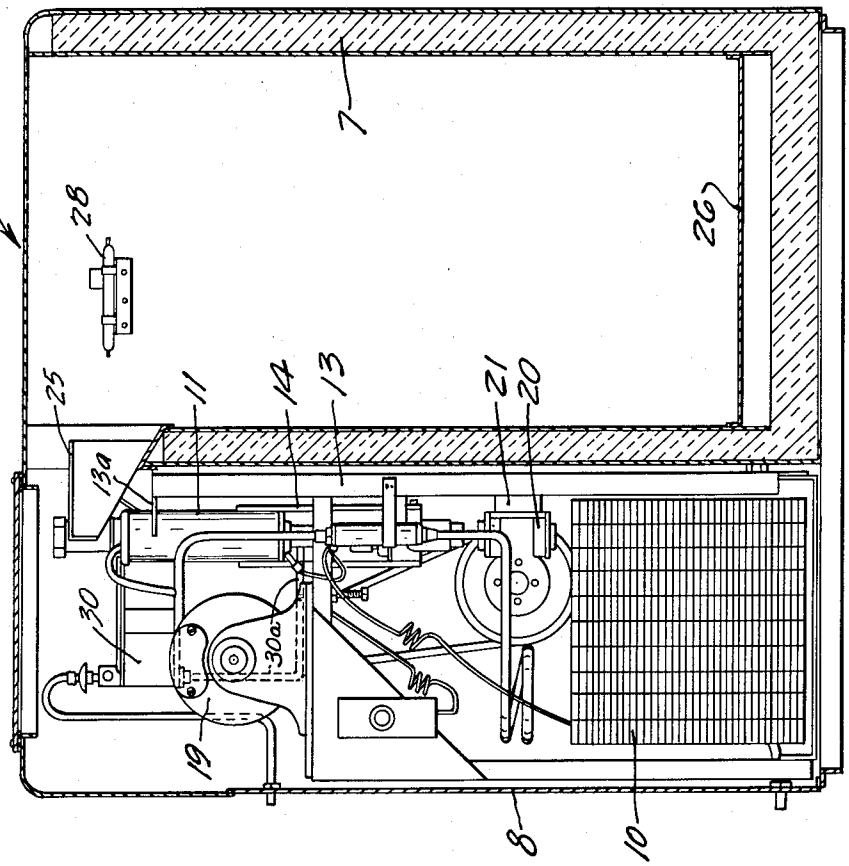

FIG. 2

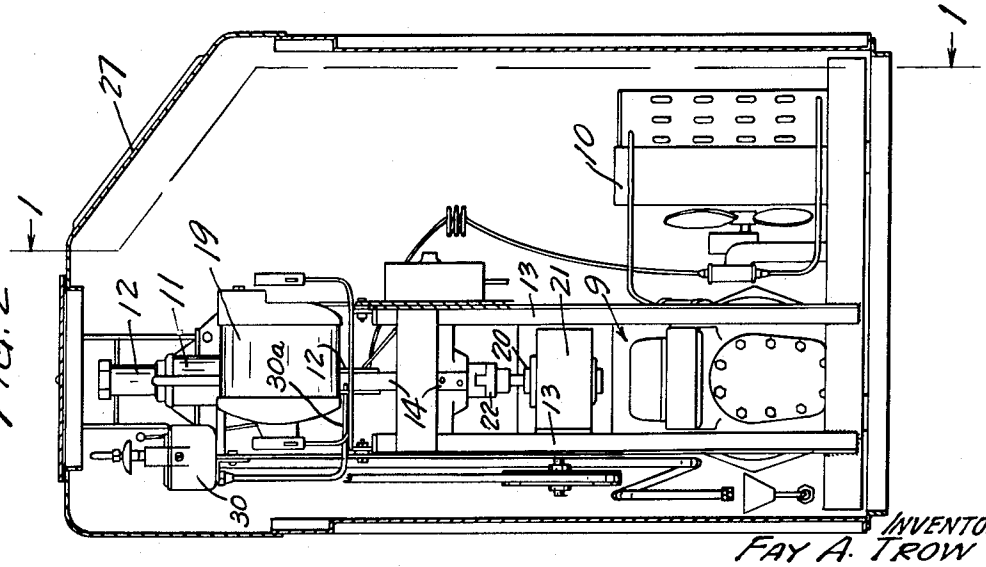

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FIG. 3

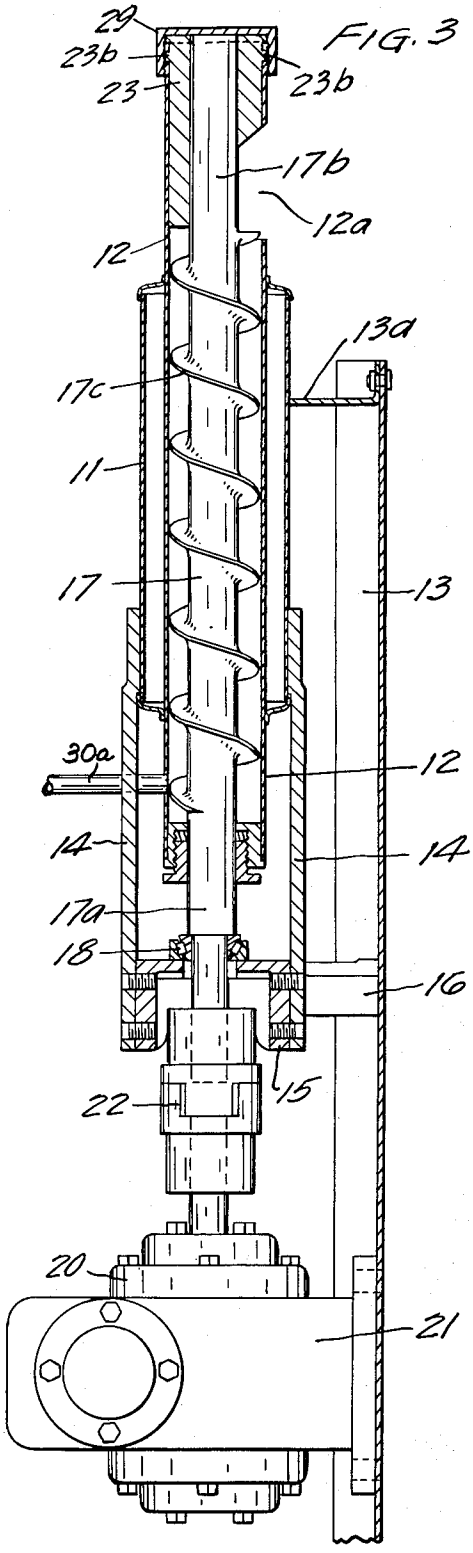
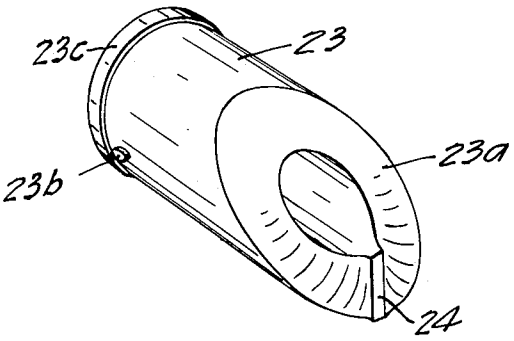


FIG. 4



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ICE DISINTEGRATING AND CHIP DELIVERING SPIRAL ICE CHIP PRODUCING MACHINE

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Application September 17, 1952, Serial No. 310,016

7 Claims. (Cl. 62—106)

This invention relates generally to an ice chip producing machine and is an improvement on the machine disclosed and claimed in Patent No. 2,597,515, granted to John M. Nitsch, May 20, 1952.

The Nitsch patent discloses an ice chip producing machine having an inclined freezing cylinder with a refrigeration jacket surrounding the same for freezing on the side wall thereof liquid supplied thereto and having a delivery auger which removes the layers of ice from the inside cylinder walls and carries said ice upwardly to the discharge end of said cylinder where the weight of the ice projected upwardly along the conveyor shaft above the cylinder is the sole means for causing said ice to fall from the shaft to be broken into small pieces by the impact of the fall into an ice collection receptacle spaced therebelow.

We have found, however, that it is more efficient to provide means for positively breaking and removing the ice from the auger shaft immediately after delivery from the cylindrical freezing chamber and one of the important features of our invention is the means for breaking up and separating from the auger shaft the ice delivered upwardly by the auger from the freezing chamber to discharge finely divided ice chips or flakes into a storage chamber.

It is an object of our present invention to provide a relatively simple, yet highly efficient, ice chip producing machine having a cylindrical freezing chamber with its upper end disposed above its lower end with refrigeration means surrounding the major portion thereof and having liquid supply means for supplying liquid to be frozen therein and including an ice delivering auger mounted in said chamber for carrying ice upwardly therethrough with means for breaking up and separating from the auger shaft, the ice delivered from the freezing chamber and discharge the same in finely divided flakes or chips into a storage chamber.

It is another object to provide a member for breaking up and positively removing ice delivered upwardly by the auger and constructed to closely surround, receive, and provide an upper bushing for the upper end of the auger shaft for an ice chip machine of the type described, said ice breaking and removing member having a beveled ice engaging lower end for positively removing and breaking up the ice from the auger shaft and wedging the same outwardly away from said shaft for discharge into a storage chamber.

It is still another object to provide an ice delivering and wedging member for a machine of the class described constructed to positively split, break up, remove and deliver the ice in a finely divided state to a discharge chute which carries the ice into an insulated storage chamber wherein said ice chips are stored in a substantially dry state.

These and other objects and advantages of this invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same or similar parts throughout the several views and in which:

Fig. 1 is a longitudinal vertical sectional view taken substantially along the line 1—1 of Fig. 2 showing our complete machine;

Fig. 2 is a side view of the ice producing mechanism with the side of the casing removed;

Fig. 3 is a central vertical sectional view of the ice producing and delivering portion of the machine; and

Fig. 4 is a perspective view showing the ice breaking, removing and delivery member.

As illustrated in the accompanying drawings, I provide an enclosing casing, designated as an entirety by the numeral **6**, and divided into an insulated storage chamber **7** and a housing **8** for enclosing the ice producing apparatus adjacent said storage chamber. The ice producing apparatus enclosed within said housing **8** consists in a conventional refrigeration system having a motor driven compressor **9**, condenser **10**, and expansion chamber **11**. The expansion chamber **11** is defined by a jacket **11***a* and surrounds an ice producing cylinder **12** which defines a cylindrical freezing chamber therein and which is, in the form shown, disposed in upright position, as best shown in Figs. 1 and 2. A suitable supporting frame **13** has an attachment bracket **13***a* interconnecting the upper portion thereof with an intermediate portion of the jacket **11***a*, as best shown in Fig. 1, said jacket being fixed in sealed relation at its upper and lower ends to the freezing cylinder **12**, as best shown in Fig. 3. The lower portion of said jacket is rigidly mounted as by a pair of upstanding connector brackets **14**, best shown in Figs. 1 and 3. The lower ends of said brackets are rigidly connected with a bearing support **15** which is fixed to the supporting frame structure **13** as by the mounting members **16**.

As best shown in Fig. 3, an ice conveying auger is centrally mounted within the cylindrical freezing chamber and has a spiral auger body **17** with its spiral edge thereof disposed in closely spaced relation to the inside wall of cylinder **12**. A lower auger shaft **17***a* is mounted in a suitable thrust bearing **18** supported on the bearing support **15** and extends downwardly therethrough. A suitable auger driving motor **19** is provided and drives said auger shaft portion **17***a* through a reduction gear mounted in a gearing box **20** and through any suitable driving connection, such as the Boston Coupling **22** of conventional design. The gear box **20** is securely anchored to upstanding support **13** as by the mounting brackets **21**.

The cylinder **12** extends upwardly above the freezing chamber which is co-extensive with the jacket **11***a* and the spiral body **17** of the ice conveying auger. A discharge opening **12***a* is formed in the side of this upper portion of cylinder **12** disposed above the freezing chamber and auger and said opening, as best shown in Fig. 3, is formed by cutting out a section of said cylinder to a depth of approximately one-half of the cylinder and having a length sufficient to permit the discharge of broken up ice chips therethrough.

An ice disintegrating and removing member **23** which, in the form shown, constitutes a bushing for the upper end **17***b* of the auger shaft, is tightly received within the upper portion of cylinder **12** disposed above the spiral **17***c* of the auger. The lower end of said member **23** has a downwardly beveled surface **23***a* which terminates at the lower extremity thereof in an ice splitting element **24** disposed substantially radially of the auger shaft portion **17***b* and tightly engaged against the rear side thereof, as best shown in Fig. 3. This lower beveled edge **23***a* is of course of substantial thickness, as illustrated, and the portions adjacent said splitting element **24** on each side thereof and adjacent the shaft portion **17***b* slope outwardly away from said shaft and are concavely curved to form, in effect, a pair of stationary ice peeling mold board like surfaces **23***a* to wedge the split pieces of ice apart and away from said shaft as they are progressively delivered upwardly by said auger. The upper end of the

beveled surface 23*a* terminates adjacent the upper end of the opening 12*a* and is of course disposed at the front discharge portion of the auger shaft as shown in Fig. 3. The upper end of cylinder 12 has suitable recesses formed therein to receive the outwardly projecting positioning elements 23*b* formed at the upper portion of the member 23 to prevent said member from turning within the cylinder 12 and an annular flange 23*c* is formed at the top of said member 23 to engage the upper end of said cylinder 12. The portion of said cylinder adjacent said upper end is threaded to receive a retaining cap member 29 which not only retains the member 23 in the proper position but also securely holds the auger shaft against riding upwardly through the member 23 and maintains the desired thrust on thrust bearing 18. The lower end of cylinder 12 is of course sealed in any conventional manner as by a packing gland as shown in Fig. 3 which surrounds the lower auger shaft portion 17*a* disposed adjacent thereto.

A discharge chute 25 is connected with said opening 12*a* and conveys the ice chips delivered therethrough into the insulated storage chamber 7, as best shown in Fig. 1, which has a raised supporting and draining platform 26 in the lower portion thereof to constantly drain off liquid formed from the melting ice. An access door 27 is provided in the top beveled surface of the storage chamber 7, as best shown in Fig. 2, to permit free accessibility to the ice chips supplied thereto and stored therein. A thermostatic control element 28 is mounted in the upper portion of storage chamber 7 and is connected with the refrigeration system to shut off further freezing and delivery of ice when the level of the ice chips within the storage chamber 7 reaches said control element 28.

Suitable means for maintaining the water supply within the cylinder 12 at a predetermined level is provided, such as the float controlled supply tank 30, best shown in Fig. 2, and delivering to the lower portion of the freezing chamber through a suitable conduit 30*a*.

It will be seen that we have provided a relatively simple, yet highly efficient, ice chip producing machine which initially freezes ice within a cylindrical freezing chamber, removes the ice from said chamber and carries the same upwardly to collect the removed ice into a spiral ice mass and then delivers the same outwardly through the open upper end thereof and projects said ice mass against an ice disintegrating member 23 which not only positively breaks up the spiral ice mass into small pieces, but also causes said ice pieces to be progressively discharged through the opening 12*a* formed in the front half of the cylinder wall.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of this invention, which, generally stated, consists in the matter shown and described herein and set forth in the appended claims.

What I claim is:

1. An ice chip producing machine comprising an elongated cylindrical freezing chamber having one end thereof disposed at a higher elevation than the other and having its lower end sealingly closed and its upper end being open, means for supplying water to the inside of said freezing chamber, means for cooling the wall of said freezing chamber to freeze ice on the inside surface thereof, an ice conveying auger having its lower end journalled at the bottom of said freezing chamber with means for rotating the same on its longitudinal axis whereby the spiral edge thereof disposed in closely spaced relation to the inside wall of said chamber shears off layers of ice frozen thereon and carries said sheared off ice masses upwardly through the chamber to collect the same into a spiral mass and deliver said spiral mass upwardly out of said chamber, said auger having an upwardly extending shaft portion disposed axially thereof and extending outwardly beyond the upper end of said chamber, and a mass

disintegrating and removing member surrounding said shaft and having a beveled ice-engaging surface at the lower end thereof with the lower end of said beveled ice-engaging surface being disposed substantially adjacent the upper end of said auger, and said lower end of said beveled portion being constructed into a narrow splitting element for initially dividing the spiral ice mass into two segments while progressive movement of said mass forces said segments upwardly against the beveled ice engaging surface of said member to break up said ice and discharge the same into a storage chamber.

2. An ice chip producing machine comprising an elongated cylindrical freezing chamber having one end thereof disposed at a higher elevation than the other and closed at the lower end thereof, refrigeration means surrounding a portion of said cylinder to form a freezing chamber therewithin, means for supplying water to said freezing chamber, an ice conveying auger having the spiral edge thereof disposed in closely spaced relation to the inside wall of said chamber and co-extensive therewith to remove ice layers from the inside wall thereof and deliver the same upwardly out of said freezing chamber, said cylinder extending upwardly above said freezing chamber and having an opening formed in one side thereof adjacent the top of said chamber at the upper end of said auger, said auger having an upwardly disposed shaft extending above the upper end thereof, and a bushing member surrounding said upwardly extending shaft portion to rotatably support the same and tightly fitting within the upwardly extending portion of the cylinder to be rigidly supported thereby, the lower end of said bushing having a generally beveled surface and extending downwardly behind the opening in said cylinder with the lower beveled end terminating substantially adjacent the upper end of said auger to disintegrate the ice masses delivered upwardly from said auger, removing the same from said shaft and discharge said finely divided masses outwardly through said opening in the cylinder.

3. The structure set forth in claim 2 and the lower beveled end of said bushing having an ice mass splitting element disposed substantially radially of said shaft at the lower extremity of said member and said beveled end sloping away from said shaft portion to guide the split ice masses upwardly therefrom and being concavely curved to form a simulated mold board structure.

4. An ice chip producing machine comprising an elongated freezing chamber having an open end, means for supplying water to the inside of said freezing chamber, means for cooling at least a portion of said freezing chamber to freeze ice on the inside surface thereof, an ice conveying auger rotatably mounted in the freezing chamber with its spiral edge disposed in closely spaced relation to the inside wall of said chamber, means for constantly rotating the auger to cause said spiral edge to shear off ice frozen on the inside wall of the chamber constantly to deliver ice to said open end of the freezing chamber, and an outwardly inclined ice disintegrating and removing member positioned in said open end of the chamber and provided with an ice peeling mold-board-like surface positioned to engage ice carried by the auger, said constant rotation of the auger serving positively and constantly to convey ice to and force it against said mold-board-like surface to break up and positively remove ice from the auger and discharge it as discrete ice chips.

5. An ice chip producing machine comprising an elongated freezing chamber having an open end, means for supplying water to the inside of said freezing chamber, means for cooling at least a portion of said freezing chamber to freeze ice on the inside surface thereof, an ice conveying auger rotatably mounted in the freezing chamber with its spiral edge disposed in closely spaced relation to the inside wall of said chamber, means for constantly rotating the auger to cause said spiral edge to shear off ice frozen on the inside wall of the chamber

constantly to deliver ice to said open end of the freezing chamber, and an ice disintegrating and removing member having a beveled ice engaging surface with the lower end of said surface being disposed substantially adjacent the end of said auger and said lower end of the beveled portion being constituted as a narrow splitting element extending generally outwardly of the axis of rotation of the auger, said disintegrating and removing member serving to break up said ice and discharge the same with rotation of the auger.

6. An ice chip producing machine comprising an elongated freezing chamber having an open end, means for supplying water to the inside of said freezing chamber, means for cooling at least a portion of said freezing chamber to freeze ice on the inside surface thereof, an ice conveying auger rotatably mounted in the freezing chamber with its spiral edge disposed in closely spaced relation to the inside wall of said chamber, means for constantly rotating the auger to cause said spiral edge to shear off ice frozen on the inside wall of the chamber constantly to deliver ice to said open end of the freezing chamber, and an ice disintegrating and removing member positioned at said open end of said chamber and provided with an ice engaging surface disposed to engage ice conveyed by the auger, said surface including an ice splitting lower edge extending generally outwardly of the surface of rotation of the auger and a pair of concave ice peeling mold-board-like surface portions positioned on either side of said lower edge whereby the rotation of said auger progressively moves the ice against said lower edge and against said mold-board-like surface portions to break up said ice and discharge the same.

7. An ice chip producing machine comprising an elongated freezing chamber having one end open, means for supplying water to the inside of said freezing chamber, means for cooling at least a portion of said freezing chamber to freeze ice on the inside surface thereof, an ice conveying auger rotatably mounted in the freezing chamber with its spiral edge disposed in closely spaced relation to the inside wall of said chamber, means for constantly rotating the auger to cause said spiral edge to shear off ice frozen on the inside wall of the chamber constantly to deliver ice to said open end of the freezing chamber, and an ice disintegrating and removing device disposed substantially adjacent the end of said auger, said device having a lower portion forming a narrow knife-like edge positioned immediately adjacent the end of the auger and in the path of ice moved thereby, said knife-like edge extending generally radially outwardly of the axis of rotation of the auger and said ice disintegrating and removing device serving to break up said ice and discharge the same as discrete ice chips with rotation of the auger.

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