May 20, 1941. J. H. FULMER 2,242,702

APPARATUS FOR COOLING DEHYDRATED FORAGE CROPS

Filed March 18, 1940 3 Sheets-Sheet 1

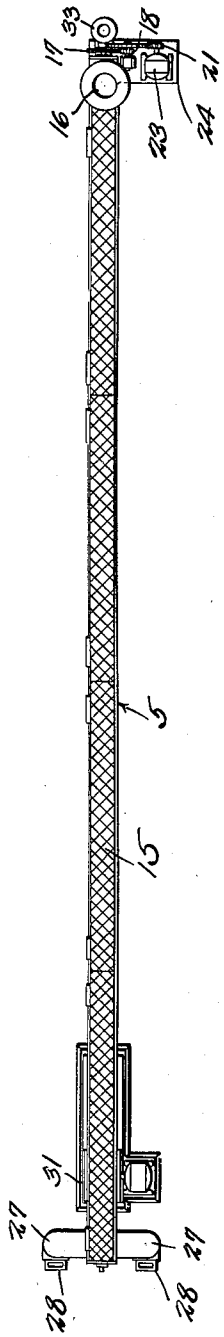



Fig. 1.

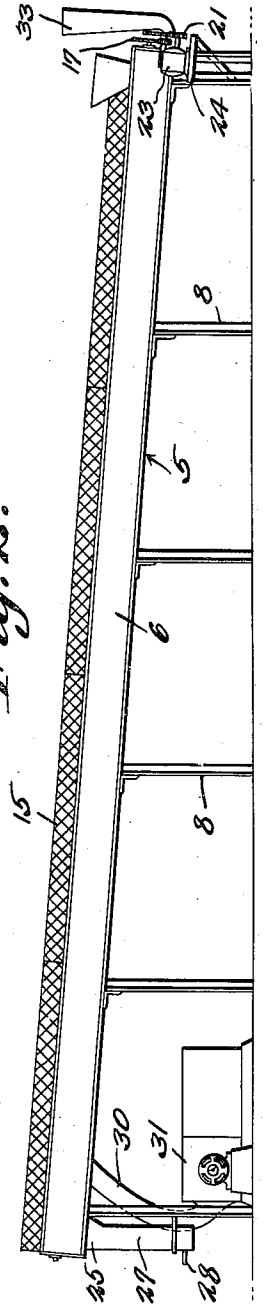



Fig. 2.

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BY Albert & Co.

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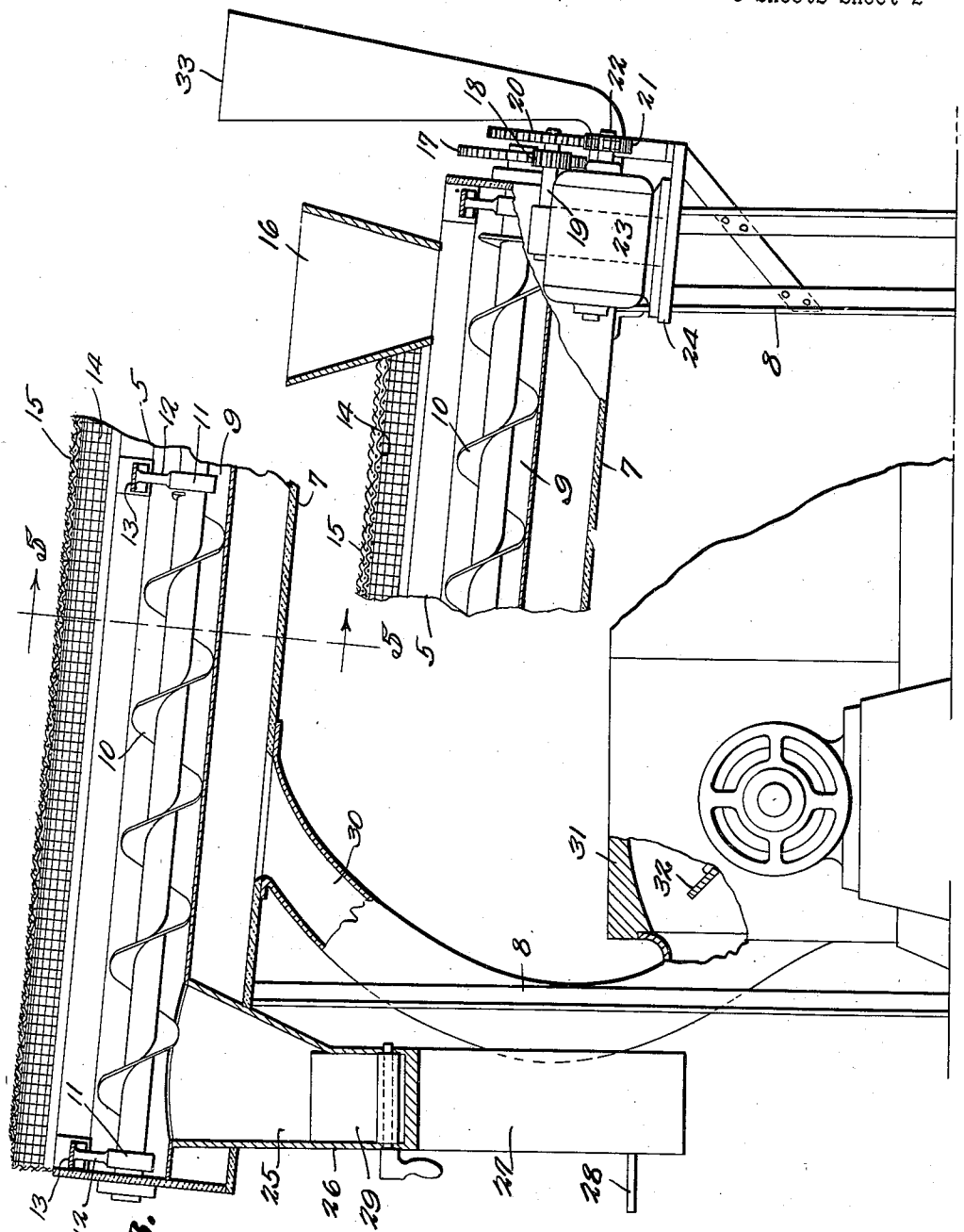


Fig. 3.

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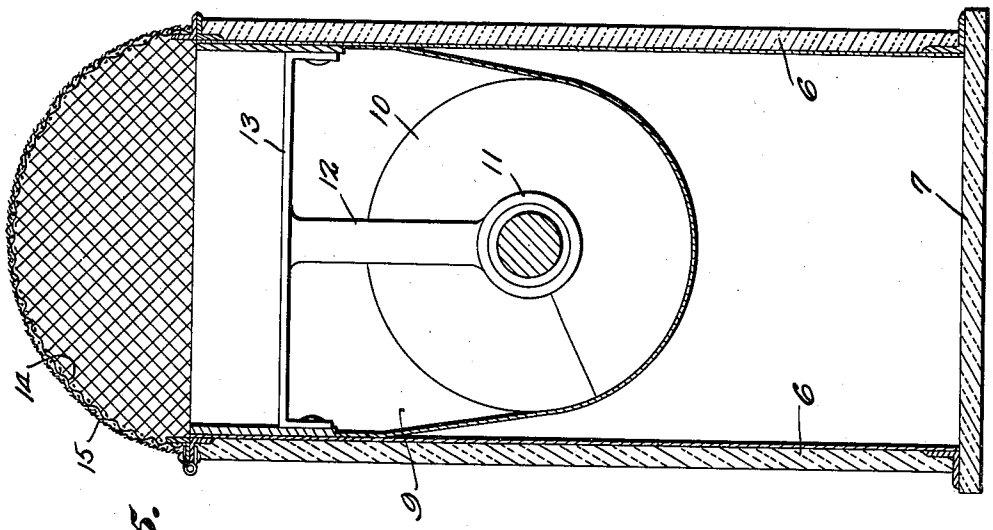



Fig. 5.

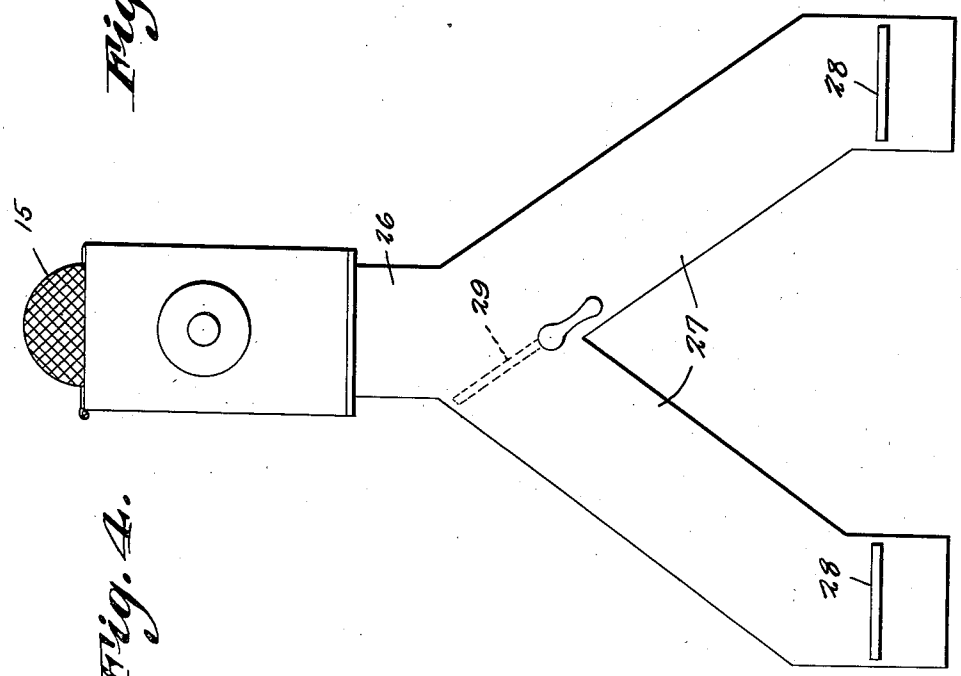



Fig. 4.

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Patented May 20, 1941 2,242,702

# UNITED STATES PATENT OFFICE

2,242,702

## APPARATUS FOR COOLING DEHYDRATED FORAGE CROPS

Joseph Henry Fulmer, Nazareth, Pa.

Application March 18, 1940, Serial No. 324,735

2 Claims. (Cl. 259—9)

This invention relates to an apparatus for cooling dehydrated forage crops, the primary object of the invention being to provide a means which may be used in conjunction with dehydrating machines which grind and package the dehydrated forage crop, for cooling the material, with the result that a better product is produced for delivery to the ultimate buyer and consumer.

The primary object of the invention is to provide a method and means whereby the heat in the finished product, as it comes from the grinding mills of the dehydrating machine, will be dissipated and the product so cooled that it will be slightly below atmospheric temperature, to the end that the product may be packaged in air-tight or near air-tight containers.

It has been found that under the usual practice, when the product is delivered from the dehydrator at a temperature in some instances as high as 250° F., that after going through the grinding mills, due to friction set up within the mills to reduce the high fibrous materials, the temperature of the material may have risen to approximately 300° F. In large operations where one hundred tons or more of the product is produced per day and immediately stored into warehouses or even where the material may be loaded direct from the dehydrating machine into cars direct from the packing platform, due to the high fibrous content, the heat dissipation is very slow. It has also been noted that where large quantities of these products are so stored, there is a very rapid loss of the essential vitamins and carotene contained in the product and a serious deterioration in color.

It has been found that if the material is cooled as it passes from the dehydrating machine, it can be stored in near air-tight containers, and the original vitamin content and color will be preserved, for an indefinite period.

An important object of the invention is to provide an apparatus of this character which will accomplish the cooling of the material as the material is produced and delivered from the grinding mills of the machine, the material being in a powdered form.

A still further object of the invention is to provide means for feeding the material through the cooling chamber, at a predetermined rate of speed to insure the cooling of the material, the feeding means also acting to maintain the material close to the wall of the cooling chamber to effect an even cooling of the material.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein described, may be made within the scope of what is claimed, without departing from the spirit of the invention.

Referring to the drawings:

Figure 1 is a plan view of a cooling apparatus constructed in accordance with the invention.

Figure 2 is a side elevational view thereof.

Figure 3 is an enlarged fragmental sectional view illustrating the interior construction of the cooling apparatus.

Figure 4 is an end elevational view of the cooling device.

Figure 5 is a sectional view taken on line 5—5 of Figure 3.

Referring to the drawings in detail, the device comprises an elongated body portion indicated generally by the reference character 5. The body portion includes vertical side walls 6 and a bottom 7, the bottom 7 and side walls 6 being insulated to retain the temperature of the cooling medium.

The body portion 5 is supported on the framework embodying uprights 8, and as shown, the body portion is supported in an inclined position, the discharge end of the body portion being elevated an appreciable distance above the feed end thereof. However, it is to be understood that the angle at which the body portion may be supported will be varied, to meet various conditions and requirements.

Mounted within the body portion and extending throughout the length thereof is a cooling chamber indicated at 9, the cooling chamber having a curved bottom, conforming to the curvature of the spiral feed member or worm 10 which operates in the bearings 11 that are formed at the lower ends of the arms 12 formed integral with the cross arms 13 that have their ends bolted to the body portion.

As clearly shown by Figure 5 of the drawings, the cooling chamber 9 is spaced an appreciable distance above the bottom 7 of the body portion, providing an air chamber, through which the cooling medium, which is in the form of air, is circulated to accomplish the cooling result. A wire mesh cover indicated at 14 is hingedly connected at one side of the body portion and is curved upwardly, as shown by Figure 5 of the drawings. This wire mesh cover 14 provides a support for a suitable fabric material having a

mesh sufficiently fine to protect the contents of the cooling chamber, which is of a fine powder or dust form, against wind pressure, to prevent the wind from blowing the material from the cooling chamber.

The fabric material is indicated by the reference character 15, and is shaped to fit the wire mesh cover to the end that the fabric material will be held against flapping under wind pressure.

A feed hopper indicated at 16 is disposed at one end of the body portion and is arranged to communicate with the cooling chamber to deliver material to the cooling chamber at one end thereof.

At one end of the shaft of the spiral feed member or worm 10, is a gear 17 that is in mesh with the gear 18 mounted on the shaft 19. Gear 20 is also mounted on the shaft 19 and meshes with the gear 21 that is secured to the end of the motor shaft 22. The motor, which is of the electrical type, is indicated by the reference character 23, and as shown, the motor is mounted on the platform 24 disposed at the feed end of the body portion. Due to this construction, it will be seen that the gearing reduces the speed of operation of the spiral feed member or worm 10 to cause the material to be fed gradually through the cooling chamber 9.

Communicating with the cooling chamber at the opposite end thereof, is a discharge hopper 25 to which the delivery spout 26 is connected. The delivery spout includes branches 27 formed with valves 28, whereby bags or containers may be positioned under the spout to receive material therefrom. A valve member 29 is also positioned within the discharge spout 26 at a point adjacent to the feed ends of the branches 27, so that the operator may by moving the valves, direct material to either of the branches, or both of said branches, simultaneously.

The reference character 30 designates a pipe which establishes communication between the space or chamber formed between the cooling chamber 9 and bottom 7 of the body portion, and the housing 31 in which the blower 32 is mounted, the blower 32 operating to draw air into the housing 31 and force the air into the space between the cooling chamber and bottom 7 of the body portion.

The housing 31 is preferably provided with a compartment in which a suitable refrigerating coil or dry ice container may be held, so that the air which is drawn into the housing 31 will be thoroughly chilled, to effectively accomplish the cooling of the material under treatment, as the air is circulated around the cooling chamber.

An outlet pipe indicated at 33 communicates with the space between the cooling chamber and bottom 7, at the opposite end of the body portion, whereby the air which is forced through the device, may exhaust therefrom.

The operation of the device is as follows:

The material from the usual dehydrating machine, is fed into the hopper 16. The spiral feed member or worm 10 is set in motion which gradually feeds the material, which is in powdered or dust form, to the discharge end of the cooling chamber. During the passage of the material through the cooling chamber, cold air is forced into the space between the cooling chamber and bottom 7, reducing the temperature of the cooling chamber to effectively cool the material which is being agitated during the passage of the material to the discharge end of the apparatus.

It has been found that after the material has been treated by the apparatus forming the subject matter of this invention, the temperature of the material will be reduced to a degree slightly below atmospheric temperature to the end that the product may be packaged in air-tight or near air-tight containers.

What is claimed is:

1. An apparatus for cooling finely ground dry material, comprising an inclined substantially deep body portion including vertical side walls and a bottom, the top of the body portion being open throughout its length, a cooling chamber mounted within the body portion and comprising a length of sheet metal material longitudinally bent intermediate its side edges, providing a curved bottom and substantially straight side walls, the side walls of the cooling chamber being secured to the side walls of the body portion, the curved bottom of the cooling chamber being disposed below a horizontal line drawn transversely through the center of the body portion, the top of the cooling chamber being open, portions of the side walls of the cooling chamber being spaced from the side walls of the body portion, an upwardly bulged cover constructed of wire mesh material, hingedly connected to the body portion, a fabric covering mounted on the wire mesh cover, a spiral conveyor operating within the curved bottom of the cooling chamber and adapted to feed material to the upper end of the cooling chamber, and means for directing a cooling medium to the body portion and against the bottom of the cooling chamber, cooling material carried through the cooling chamber by the conveyor.

2. An apparatus for cooling finely ground material, comprising an inclined substantially deep body portion embodying vertical side walls and a bottom, the top of the body portion being open throughout its length, a cooling chamber mounted within the body portion and comprising a length of sheet metal material curved intermediate its side edges, providing a curved bottom and side walls, the side walls of the cooling chamber being secured to the inner surfaces of the side walls of the body portion, a worm conveyor operating within the cooling chamber and engaging the curved bottom of the cooling chamber, the upper edge of the worm conveyor being spaced an appreciable distance below the open top of the body portion and cooling chamber, an upwardly bulged cover constructed of wire mesh material, hingedly connected to the body portion and adapted to cover the open side of the body portion, a fabric member positioned over the wire mesh cover, means for feeding material to the cooling chamber, and means for directing a blast of cooling air into the body portion below the cooling chamber changing the temperature of the cooling chamber and material conveyed therethrough.

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