Oct. 16, 1934. A. F. THAL 1,977,098

MILLING AND DRYING DEVICE

Filed May 20, 1932 2 Sheets-Sheet 1

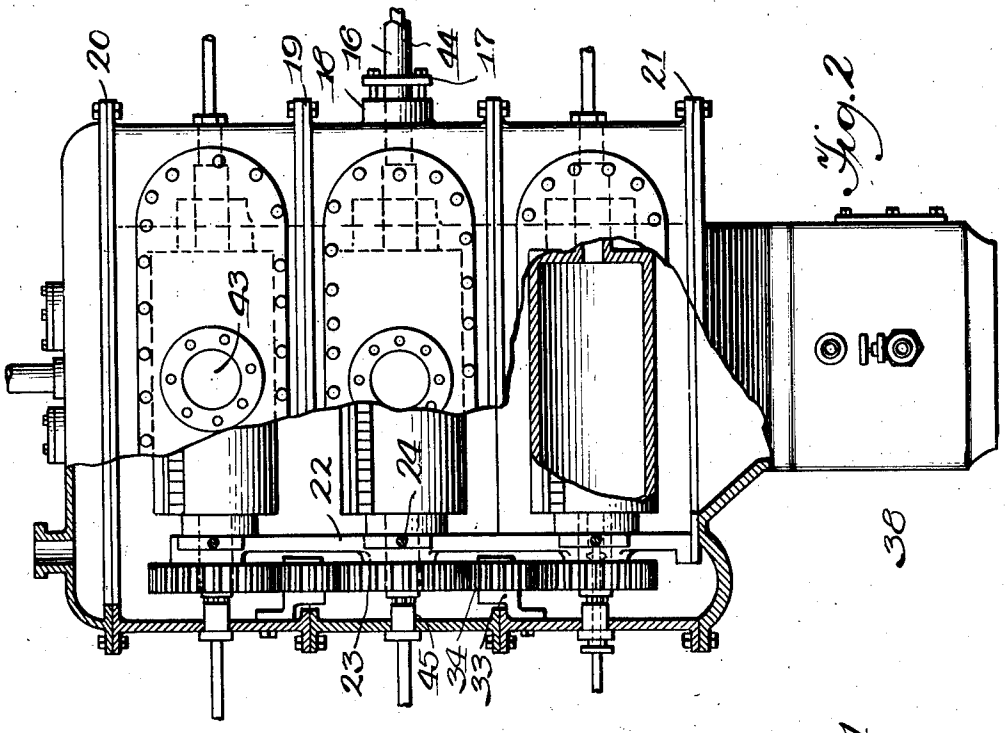


Fig. 2

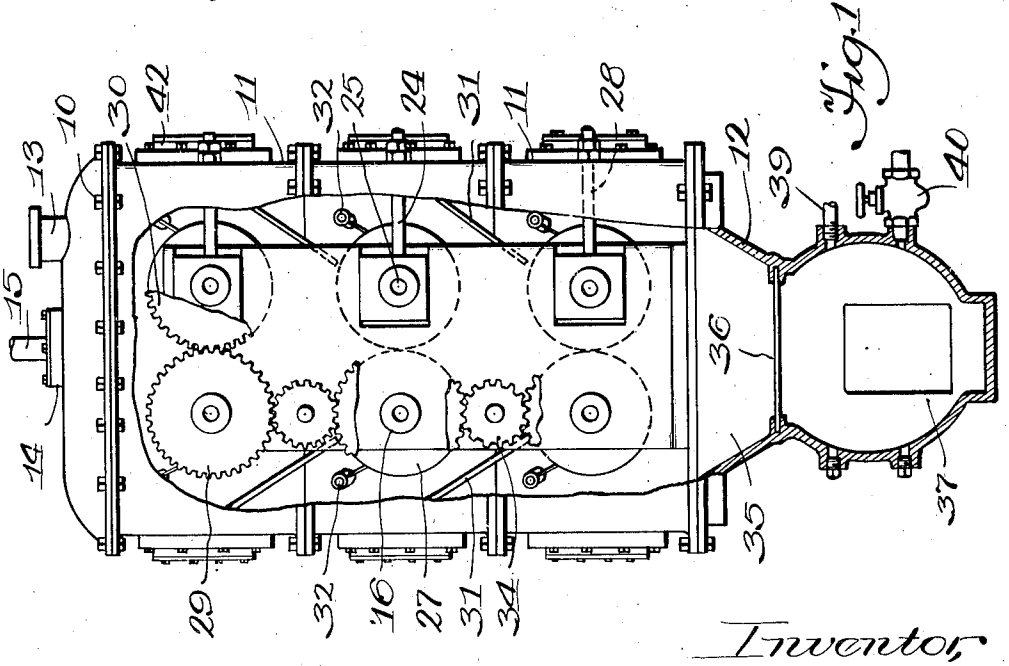


Fig. 1

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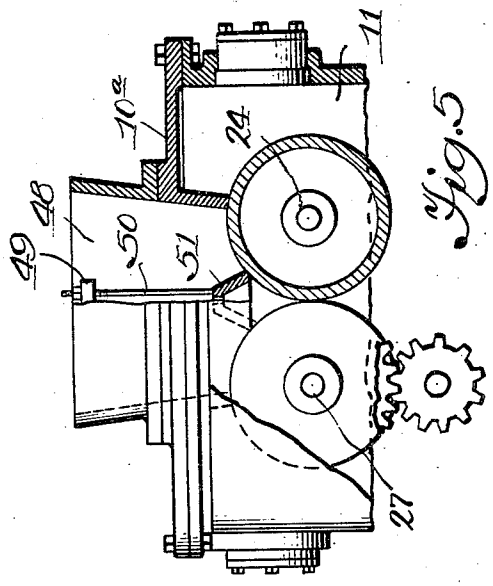


Fig. 5

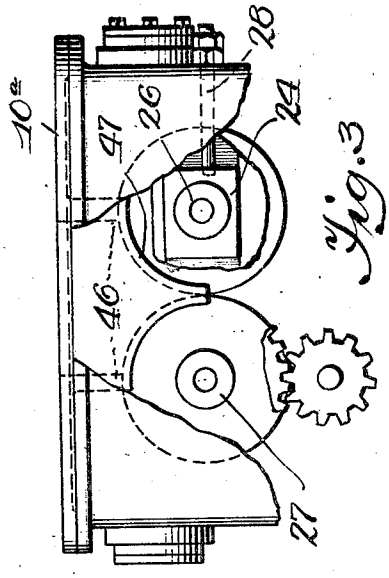


Fig. 3

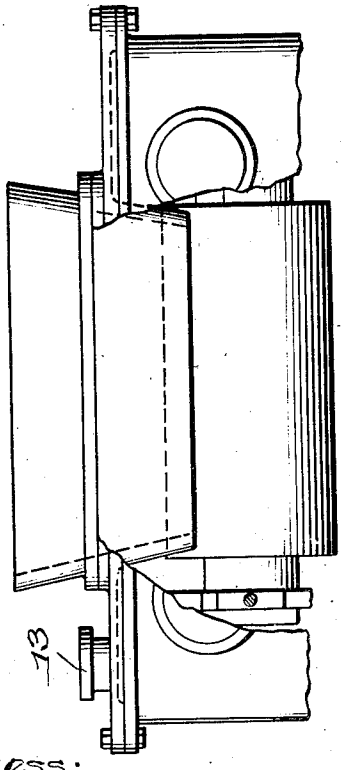


Fig. 6

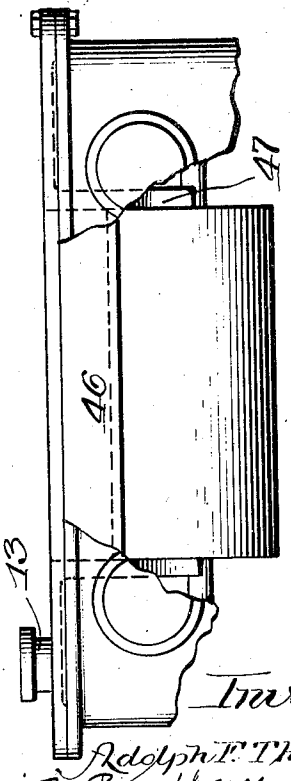


Fig. 4

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UNITED STATES PATENT OFFICE

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MILLING AND DRYING DEVICE

Adolph F. Thal, Elmhurst, Ill.

Application May 20, 1932, Serial No. 612,436

5 Claims. (Cl. 83—12)

My present invention has reference to the provision of a milling and drying device, particularly suitable to the milling and drying of glue and cooked or partially cooked foods, in connection with which the ordinary drying processes now generally employed are peculiarly liable to cause bacteriological or biological contamination. The ordinary drying operation now generally employed involves the conveyance of the material on a conveyor through a drying compartment supplied with large quantities of heated air, which results in subjecting the material to air borne contamination and the creation of conditions highly advantageous to the growth of bacteria and other biological organisms.

As will hereafter be seen, no additional air will be required during the drying and milling operations with my device, as air is exhausted to a considerable extent, and therefore not only will air borne contamination be avoided but the reduction of a normal supply of air during the drying and milling operations result in the creation of conditions inimical to many forms of bacteriological and biological life.

It will also be seen that my apparatus may be used advantageously for drying and milling other materials than those which are capable of nourishing life. The amount of milling and drying which any material may require depends upon the material and the condition thereof which it is desired to secure, which, of course, varies for different materials.

As will hereafter be seen, my apparatus is designed in units, different numbers of which may be assembled together to secure the degree of drying and milling which may be desired for any particular commodity.

The introduction of the commodity to my drying and milling apparatus may be quite important in connection with a particular article. The material to be introduced is either in a fluid, or at least plastic condition, and I have illustrated how such material may be introduced by suitable pumps through a tube into the machine without the necessity of the introduction of any, or at least much, air therewith. In cases in which the material is of sufficient body and consistency to provide a seal itself it may be advantageously introduced into my apparatus through a hopper in connection with rollers and the feed controlled by the adjustment of the rollers or by means of a suitable valve or gate. Such constructions are also illustrated herein.

I have attained the foregoing objects and results by means of the structure illustrated in the accompanying drawings, in which—

Fig. 1 is a vertical end elevation of a structure embodying my invention, a portion of the end thereof being broken away to disclose the interior arrangement.

Fig. 2 is a vertical side elevation of the structure shown in Fig. 1, a portion of the side wall being broken away and a portion of the top, bottom and end wall being shown in section.

Fig. 3 is an end view of a top unit showing one form of hopper feed, a portion thereof being broken away.

Fig. 4 is a side elevation of the structure shown in Fig. 3, a portion thereof also being broken away.

Fig. 5 is an end elevation of a top unit showing a modified form of hopper feed; and

Fig. 6 is a side elevation of the structure shown in Fig. 5.

Similar reference characters refer to similar parts throughout the respective views.

The apparatus consists of a top unit 10 such as is shown in Figs. 1 and 2 or in Figs. 3 to 6 inclusive, together with one or a plurality of intermediate units 11 and a bottom or discharge unit 12. The air is preferably exhausted from the apparatus adjacent the point of induction of material thereto, and I therefore prefer to provide the top units 10 with a hollow stub pipe 13, the bore whereof communicates with the inside of the top and to which stub pipe 13 may be secured a suitable conduit leading to any desired form of pump suitable for exhausting air from the apparatus.

Upon a center line between the ends of the top unit is or are provided one or more hollow embossments 14 establishing communication with the interior of the top to which embossments may be conveniently secured a pipe or pipes 15 for the induction of material to be treated into the apparatus.

Of course, instead of the induction tube 15 it may be, in particular cases, desirable to employ the hopper induction tops, such as are shown in Figs. 3 to 6 inclusive, hereafter to be described.

If but a single intermediate unit is to be employed it is the same as the center unit shown in Figs. 1 and 2, in which a shaft 16 for driving the interior mechanism provided with a suitable packing gland 17 extends exteriorly of the unit to receive a pulley or other desired driving means not shown. The space for the cavity for the packing is provided by an embossment 18 upon the end

wall of the casing. The side and end walls of the intermediate units are provided around their tops and bottoms with lateral flanges 19 perforated at intervals to permit the bolting thereof to the flanges of other intermediate units or to like lateral flanges 20 and 21 upon the top and bottom units.

Provided between the side walls of the units, adjacent the end walls, are substantial webs 22 having horizontal embossments 23 to provide ample support for either stationary or movable journals for the shaft 16 and the other shafts hereinafter to be desired. The shaft 16 rotates in fixed journals and upon shaft 16 between the webs 22 is fixed a hollow roller 24. The shaft 16 and roller 24 are disposed to one side of the vertical transverse center of the unit below and to one side of the port for the introduction of the material, and symmetrically disposed on the opposite side of said center is a shaft 25, the ends whereof are journaled in sliding blocks 26 reciprocable in slideways provided therefor in the webs 22. On the shafts 25 are mounted hollow rollers 27 which co-operate with rollers 24. The adjustment of the rollers 24 and 27, with respect to each other, is accomplished through a rod 28 extending through the side walls of the unit. Upon the shafts 16 and 25, between the web 22 and the left hand end wall of the casing, are mounted meshing gears 29 and 30, which, as shown in Fig. 1, cause the rotation of the shafts 16 and 25 and the rollers 24 and 27 carried thereby from their tops downwardly and inwardly to the point where these rollers are most closely adjacent to each other.

Extending from the opposite sides of the units 11 and between the webs 22 are guide plates 31 which incline inwardly under the rollers 24 and 27 so as to deliver the material falling from or scraped from the said rollers to a like pair of rollers beneath them or to the bottom unit 12 of the apparatus. Extending between the webs 22—22 are scrapers 32—32 for removing from the rollers 24 and 27 any material which may adhere to the said rollers after it has passed between them.

In Figs. 1 and 2 I have illustrated an assembly comprising three of the intermediate roller containing units 11 which are identical with the exception that but one, preferably the central one, has the shaft 16 extending exteriorly thereof and each of the other units is provided with facilities for securing thereto brackets 33 in which are journaled the transmission rollers 34 for transmitting the power from the rollers in one unit to the rollers in the adjacent units.

The bottom unit, which is bolted to the intermediate unit immediately above it in the manner heretofore mentioned, comprises a receiving hopper 35, the bottom of which is closed by a suitably packed valve plate 36, beneath which is a discharge chamber 37. The discharge chamber is provided with an air tight door 38 and a port 39 connected by suitable conduit with the exhaust pump. The discharge chamber 37 is also provided with another port 40 fitted with a valve 41 by means of which air may be admitted into the discharge chamber 37. When it is desired to take the dried and milled material from the apparatus air is exhausted through the port 39 and the valve plate 36 is then withdrawn so as to permit the materials to fall into the discharge chamber 37. The valve plate 36 is then closed and the valve 41 is opened to permit air to enter the discharge chamber 37 so that the door 38 may be opened to remove the material from the discharge chamber.

The side walls of the apparatus are provided with ports 42 in which are inserted air tight bullseyes 43 through which the progress of the operations occurring upon the inside of the intermediate units may be observed. The shafts 16 and 25 are hollow so as to give access to the interior compartments of the hollow rollers 24 and 27, and connecting with these hollow shafts 16 and 25 are pipes 44 suitably packed by means of glands 45 for passage through the walls of the units for securing the circulation of a heating fluid through the rollers.

In this connection it may be said that the amount of heat, or the degree of temperature which can be employed in drying commodities in the ordinary way, is hardly any index to the temperatures which may advantageously be employed with my apparatus. For instance, the evaporation which takes place in the rarefied atmosphere of my apparatus absorbs a great deal of heat, and a great deal hotter temperature may be employed in the rarefied atmosphere of my apparatus than can be employed in the open air without causing oxidation or any other chemical change so that the drying and milling may be accomplished with my apparatus at substantially higher temperatures and at greater rates of speed with a consequent economy of time and operating costs.

Differences in fluidity and other characteristics in the materials treated in my apparatus result in considerable differences in the reaction of the mechanism to the material. Some materials of considerable fluidity require a relatively large opening between the first pair of rolls through which it passes. The heat of the rolls also has considerable effect upon the passage of the material through the apparatus. While a forced feed through the pipe 15, as shown in Figs. 1 and 2, may be the most generally desired manner of introducing material, nevertheless, with material of a suitable consistency to provide a reliable air lock or seal a hopper feed may be used, as shown in Figs. 3 and 4 or 5 and 6.

As shown in Figs. 3 and 4 the top unit 10*a* consists of a plate depending from the center of which are the hopper side and end walls 46 and 47. The side walls 46 come down closely adjacent the tops of the rollers 24 and 27 and the end walls 47 slightly lap the ends of the rollers 24 and 27. The feed with this form of hopper is regulated by the adjustment of the roller 24 by moving the bearing 26 through the adjustment of the rod 28.

In the modified form of hopper shown in Figs. 5 and 6 the top unit 10*b* also consists of a plate in the center of which is formed a hopper 48, the end and side walls of which are extended to adjacent the rollers 24 and 27 mounted in the adjacent underlying intermediate section 11. Upon the end walls of the hopper 48 are inwardly extending embossments 49 bored for the passage of a rod 50 upon the lower end of which is carried a gate 51 co-operating with the rollers 24 and 27, so that by elevating or lowering the gate 51 the feed to and between the rollers may be controlled.

While the presence of the bullseyes 43 in the sides of the intermediate units do not in any way effect the functioning of the apparatus, they do materially facilitate the control of such functioning which, by reason of being carried on in a rarefied atmosphere, is different from what

would normally be expected and the proper control thereof is greatly facilitated by observing the resultant product as it passes from one to the other of the intermediate units.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A milling and drying device comprising separable, introduction, discharge and one or more intermediate units, said introduction unit having a port for the introduction of material therethrough and means for preventing a circulation of air through said port; said intermediate unit or units having installed therein hollow rollers, means for circulating a temperature controlling medium through said rollers, means for rotating said rollers in opposite directions, means for disengaging material from the face of said rollers, means for directing the material so disengaged, together with means for exhausting air from the structure formed by the assembly of said units.

2. A milling and drying device comprising separable, introduction, discharge and one or more intermediate units, said introduction unit having a port for the introduction of material therethrough and means for preventing a circulation of air through said port; each intermediate unit having installed therein a pair of hollow rollers, means for rotating said rollers in opposite directions, means for disengaging material from the face of said rollers, means for directing the material so disengaged, together with means for exhausting air from the structure formed by the assembly of said units, and means for circulating a heat modifying fluid through said hollow rollers.

3. A milling and drying device comprising separable, introduction, discharge and a plurality of intermediate units, said introduction unit having a port for the introduction of material therethrough and means for preventing a circulation of air through said port, said intermediate units having installed therein rollers, means for rotating said rollers in opposite directions including means for transmitting power from one intermediate unit to adjacent units, means for disengaging material from the face of said rollers, means for directing the material so disengaged, together with means for exhausting air from the structure formed by the assembly of said units.

4. A milling and drying device comprising separable, introduction, discharge and a plurality of intermediate units, said introduction unit having a port for the introduction of material therethrough and means for preventing a circulation of air through said port, said intermediate units having installed therein rollers, means for rotating said rollers in opposite directions including means for transmitting power from one intermediate unit to adjacent units, means for disengaging material from the face of said rollers, means for directing the material so disengaged, together with means for exhausting air from the structure formed by the assembly of said units, and bullseyes located in the walls of said intermediate units whereby the operations taking place therein may be observed.

5. A milling and drying device comprising a casing, means for exhausting air from said casing, means for introducing material into the top of said casing without destroying the vacuum therein, a plurality of pairs of rollers located in vertical alignment beneath the point at which materials are introduced into said casing, means for rotating said rollers, means for disengaging material from the face of said rollers, means for directing the material so disengaged and a discharge compartment located in the bottom of said casing with means for separating said discharge compartment from the main compartment within said casing and means for exhausting air from and admitting air to said discharge compartment.

ADOLPH F. THAL.