

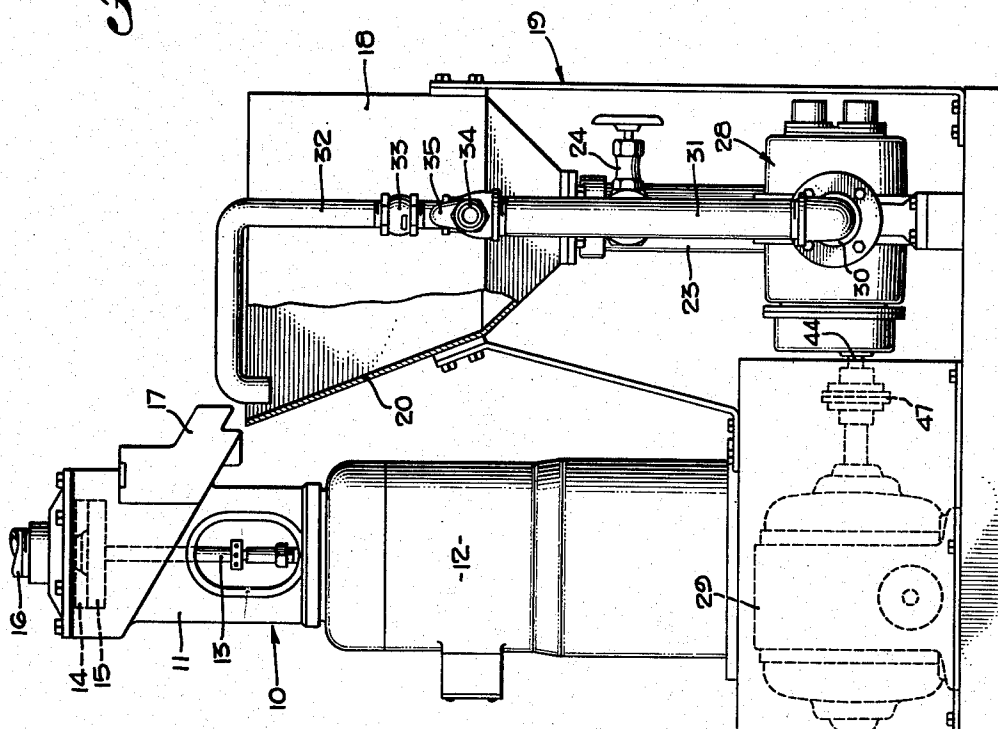
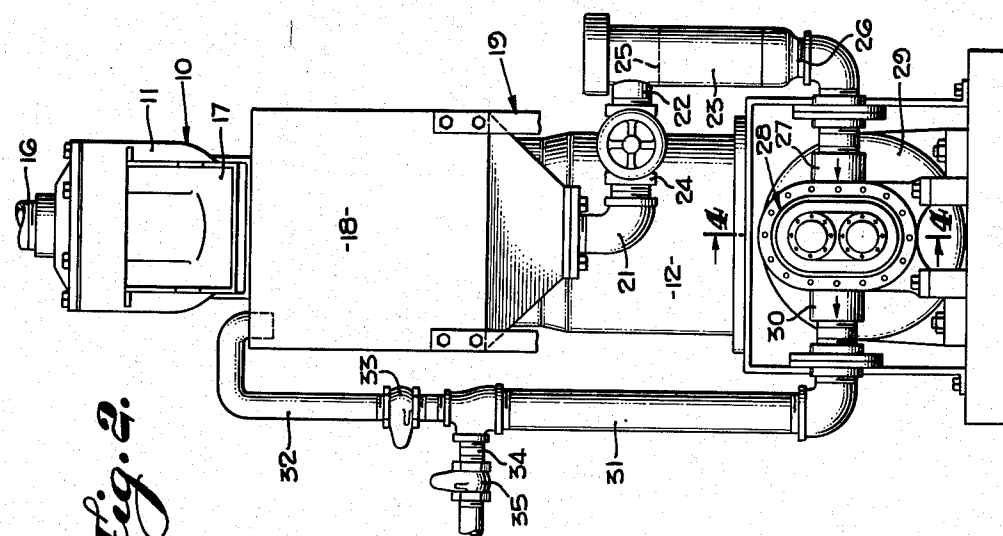
Nov. 24, 1953

G. H. MOREHOUSE
DEAERATING APPARATUS

2,660,259

Filed May 23, 1950

2 Sheets-Sheet 1



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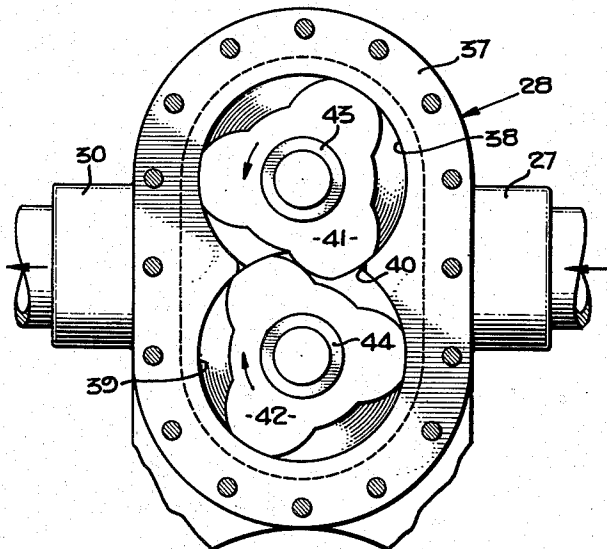
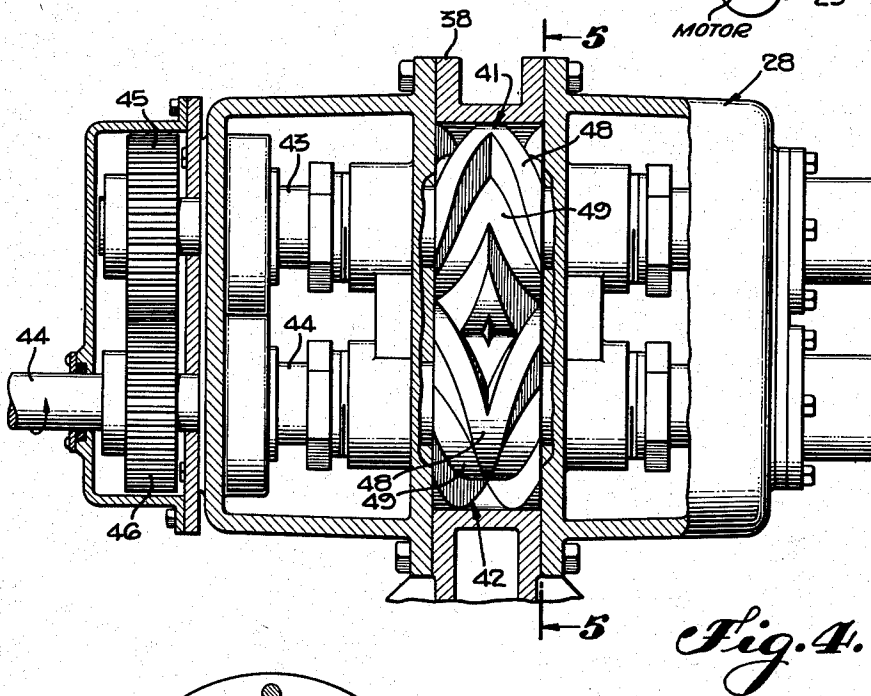
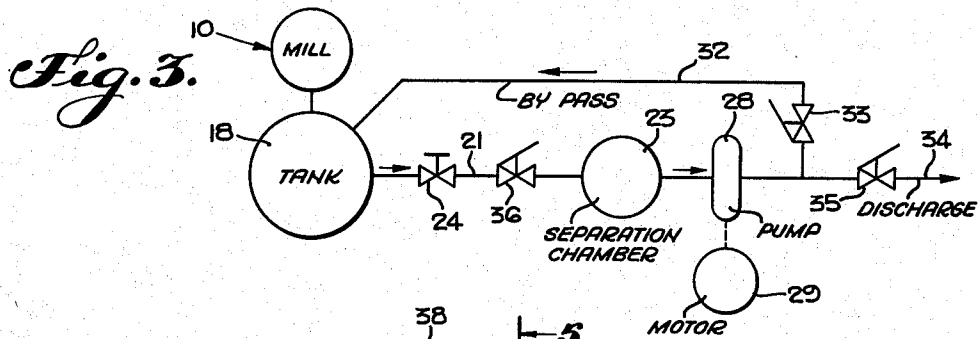
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DEAERATING APPARATUS

Filed May 23, 1950

2 Sheets-Sheet 2



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2,660,259

DEAERATING APPARATUS

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Application May 23, 1950, Serial No. 163,758

8 Claims. (Cl. 183—2.5)

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The present invention relates to an improved apparatus for producing a substantially air free compounded and milled grease product, and makes possible the production of a superior product by the use of a combination including a col-

loidal mill. The invention is particularly advantageous of use in the mixing of greases and other unctuous materials. Colloid mills have been found to be excellent for mixing the various constituents, but heretofore have not been generally utilized due to the aerating effect. The entrained air in the material undesirably reduces its net weight per unit volume. For example; after putting the grease through the colloid mill, it was only possible to get approximately 200 pounds of the grease into a container of a size capable of normally receiving 400 pounds of substantially air-free grease.

In order to take advantage of the advantageous features of a colloid mill for the working and further milling of said unctuous materials, the present invention contemplates in its broad aspect the provision of an improved process for de-aerating the materials during the milling operation; and the provision of simple apparatus by which the process may be carried out efficiently and economically.

Briefly the invention comprises means for conducting the milled material to a separating chamber having an inlet and outlet, the inlet being controlled by a regulating valve, and the outlet of the separating chamber being connected to a rotary pump. By restricting the inlet of material to the separating chamber so that a less amount is admitted than the full handling capacity of the pump, the pump will act not only as a pumping device for removing the material, but will also reduce the pressure in the separating chamber below that of atmosphere so that a substantial vacuum will be created in the separating chamber.

The vacuum and the separating chamber will act to expand air which may be entrapped and entrained in the mixture, and by exerting a squeezing or rolling action during the pumping operation, this air is compressed and caused to move ahead of the material, so that a separation takes place and a substantially air-free product is obtained.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations on its scope.

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Referring to the drawings, which are for illustrative purposes only:

Fig. 1 is a side elevational view of apparatus embodying the features of the present invention;

Fig. 2 is a front elevation of the same;

Fig. 3 is a view schematically illustrating the sequence of various steps in the operation of the apparatus in the practice of the process;

Fig. 4 is an elevational view of the particular pumping means utilized, portions being cut away and shown in section to disclose important details of construction and operation; the sections being taken substantially on line 4—4 of Fig. 2; and

Fig. 5 is a transverse section of the same, taken substantially on line 5—5 of Fig. 4.

Referring generally to the drawings, the invention is shown in Figs. 1 and 2 as applied to a colloid mill as generally indicated at 10.

In the illustrated embodiment, the colloid mill is disclosed as being of the vertical type having a head portion 11 which is supported on a suitable frame structure above a driving electric motor 12 which is connected through a driving shaft assembly 13 operatively connected with relatively movable grinding stones or plates 14 and 15.

In the operation of the colloid mill, the materials to be mixed are compounded by subjection to the action of the plates 14 and 15, and introduced through an inlet 16. The materials are then discharged from a discharge spout 17.

Manufacturers of greases and other products in which it is desired to mix and compound materials such as soaps, lubricants and the like, have found that colloid mills are admirably suited to the compounding operation, and result in substantial savings because of the more complete dispersion obtained, whereby it is possible to utilize less material and still obtain the same quality of product. Heretofore, the difficulty has been that the utilization of colloid mills for this purpose has resulted in the product becoming undesirably aerated. It is with the problem of removing the air from the product, that the present invention is primarily concerned.

For completing the milling process, apparatus is provided for removing the air from the mixture discharged from the colloid mill 10. More specifically, the material discharged from the spout 17 is collected in a tank 18 supported on a suitable framework, generally indicated at 19. This tank 18 has an inclined wall 20 which is positioned to receive the flow of material from the discharge spout 17 and provide a smooth flow thereof into the tank with a minimum of agitation and with little or no air entrapment, as

compared to the results obtained where the material upon discharge is free to fall under gravity into the tank.

From the tank 18, the material is conducted through a conduit 21 to the receiving inlet 22 of a separator 23, a regulating valve 24 being positioned in the conduit 21 between the tank outlet and separator inlet 22 for variably restricting the flow of material to the separator, for a purpose which will subsequently be explained.

The separator 23 provides a vertically disposed chamber having a screen or foraminous member 25 therein for breaking up the material flow from the inlet 22 to an outlet 26 of the separator.

The outlet 26 of the separator is connected to an inlet 27 of a rotary pump 28, this pump being operatively connected and driven by an electric motor 29, as shown in Fig. 1. The details of the rotary pump will subsequently be described.

A pump outlet 30 is connected with a conduit 31 having a branch connection 32 which forms a bypass for conducting all or a part of the material from the pump back into the tank 18, control of bypassed material being obtained by means of a gate valve 33.

The conduit 31 also connects with another branch connection 34 through which the de-aerated product is discharged, control of flow to the branch connection 34 being by means of a gate valve 35.

The apparatus described above is schematically illustrated in Fig. 3, and if desired, an additional gate valve control may be placed as indicated at 36 in the conduit 21 between the valve 24 and inlet to the separation chamber, by which additional control of the flow of material to the separation chamber may be obtained.

In carrying out my improved process for the milling of greases and the like, to remove entrained or entrapped air therefrom, so as to obtain a substantially air-free product, my invention contemplates that the pressure within the separator 23 will be reduced to a value below atmosphere, for example a vacuum of 26 inches Hg. This reduced pressure causes an expansion of the entrapped or entrained air, and it has been found that if the material can be removed from the separator with a squeezing action, the air as thus expanded will be compressed and forced to move through and ahead of the material, whereby a substantially air-free product is obtained.

For producing the required vacuum in the separator, and the squeezing or rolling action of the material containing expanded air, I have utilized a rotary pump 28 in which a pump housing 37 is divided into a pair of cylindrical bores 38 and 39, respectively, which are interconnected through a common passage 40.

The cylindrical bores 38 and 39 have operatively associated therewith helical rotors 41 and 42 which are secured to shafts 43 and 44 for rotation therewith, these shafts being interconnected by timing gears 45 and 46. The shaft 44 is extended and has a driving connection with the motor 29 through a suitable coupling 47.

As shown in Fig. 4, the helical rotors 41 and 42 are of double-helical construction with projections 48 and recesses 49 forming in effect a herring-bone arrangement in which the projection on one rotor will be moved into the recess of the other rotor as the pump is operated. By driving the pump so that the rotor 41 travels

in a counterclockwise direction, and the rotor 42 in a clockwise direction, as viewed in Fig. 5, the unmeshing of the helical projections of one rotor with the helical recesses of the other rotor will create a suction at the inlet 27. At the outlet 30, the material carried around in the helical rotor recesses formed between the walls of the cylinder bores and the rotor projections is positively and gradually displaced against the discharge pressure by the meshing of the helical rotors.

By regulating the valve 24 to restrict the inlet to the separator 23, the inlet capacity is reduced below the full operating capacity of the pump 28, and under such conditions the pump 28 will not only remove the material from the separator chamber, but will also function to reduce the pressure in the separator chamber as mentioned above. By the rolling and squeezing action of the rotors 41 and 42, as a result of their meshing on the outlet side of the pump, the expanded air in the material is compressed and forced through the material so as to cause a separation of the air and material. At the discharge point of the product, the product and air will be discharged in intermittent spurts, that is, a slug of grease, then a slug of air, etc. In disassembling the conduits on the discharge side of the pump, the product is found to be formed in a layer on the pipe interior with a central open core through which the air appears to pass. In any event, the process produces a product which is substantially air-free, thus enabling the manufacturer to utilize a colloid mill for the compounding and mixing of the materials in the product, and effectively and efficiently remove any air which may have been entrapped or entrained during the mixing or compounding.

The branch connection 32 is utilized where it is desired to return all or a part of the material to the tank for running through the separator chamber again. By subsequent passages, it is possible to regulate the amount of air or extent to which air has been removed from the product.

I claim:

1. Apparatus for de-aerating a product such as grease or the like comprising: a chamber having an inlet and outlet for said mixed materials; means for adjustably restricting inlet flow to said chamber; rotary pumping means connected at its inlet to the chamber outlet, and including rotors having helical projections and helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump; means operating said pumping means at such speed with relation to the flow of mixed materials into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means, to effect separation of air from said materials and discharge of the materials and the separated air from the pump outlet; and a by-pass for conducting mixture from the pump outlet back to the chamber inlet.

2. Apparatus for de-aerating a product such as grease or the like comprising: a chamber having an inlet and outlet for said mixed materials; means for adjustably restricting inlet flow to said chamber; rotary pumping means connected at its inlet to the chamber outlet, and including rotors having herring-bone double helical projections and double helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump means operating said

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pumping means at such speed with relation to the flow of mixed materials into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means, to effect separation of air from said materials and discharge of the materials and the separated air from the pump outlet.

3. Apparatus for de-aerating a product such as grease or the like comprising: a chamber having an inlet and outlet for said mixed materials; means for adjustably restricting inlet flow to said chamber; vacuum pumping means connected at its inlet to the chamber outlet, and including rotors having helical projections and helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump; and means operating said pumping means at such speed with relation to the flow of mixed materials into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means, to effect separation of air from said mixture and discharge of the mixture and the separated air from the pump outlet.

4. Apparatus for de-aerating a product such as grease or the like comprising: a chamber having an inlet and outlet for said mixed materials; means in said chamber to break up the flow of the mixed materials; means for adjustably restricting inlet flow to said chamber; vacuum pumping means connected at its inlet to the chamber outlet, and including rotors having helical projections and helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump; and means operating said pumping means at such speed with relation to the flow of mixed materials into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means, to effect separation of air from said mixture and discharge of the mixture and the separated air from the pump outlet.

5. In means for de-aerating a product such as milled grease or the like: wall means forming a path of flow to receive the product and entrained air; a vacuum pump connected to said path of flow to move both the product and the air by suction through said path of flow; means for driving said pump; flow restricting means in said path of flow upstream from said vacuum pump adapted to create a vacuum in said path of flow and in the inlet of said pump; and means in said path of flow between said flow restricting means and said pump adapted to break up the flow of said product.

6. In apparatus for continuously de-aerating a product such as grease or the like: a chamber having an inlet and outlet for the product; means for restricting inlet flow to said chamber; rotary pumping means connected at its inlet to

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the chamber outlet, and including rotors having herring-bone double helical projections and double helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump; and means operating said pumping means at such speed with relation to the flow of product into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means to effect separation of air from said product and discharge of the product and the separated air from the pump outlet.

7. In apparatus for continuously de-aerating a product such as grease or the like: a chamber having an inlet and outlet for the product; means for restricting inlet flow to said chamber; rotary pumping means connected at its inlet to the chamber outlet, and including rotors having herring-bone double helical projections and double helical recesses actuated so as to move into unmeshed relation on the inlet side of the pump and meshed relation on the outlet side of the pump; means in said chamber to break up the flow of the product which is moving therein; and means operating said pumping means at such speed with relation to the flow of product into said chamber as to create a vacuum in the said chamber and in the inlet of said pumping means to effect separation of air from said product and discharge of the product and the separated air from the pump outlet.

8. In means for continuously de-aerating a product such as milled grease or the like: wall means forming a path of flow to receive the product and entrained air; a vacuum pump connected to said path of flow to move both the product and the air by suction through said path of flow; means for driving said pump; and flow restricting means in said path of flow upstream from said vacuum pump adapted to create a vacuum in said path of flow and in the inlet of said pump when the pump is in operation to effect expansion of the air contained in the product, whereby the product and separated air will be discharged from the outlet of the pump.

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