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APPARATUS FOR DISPERSING MATERIALS

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FIG. 1.

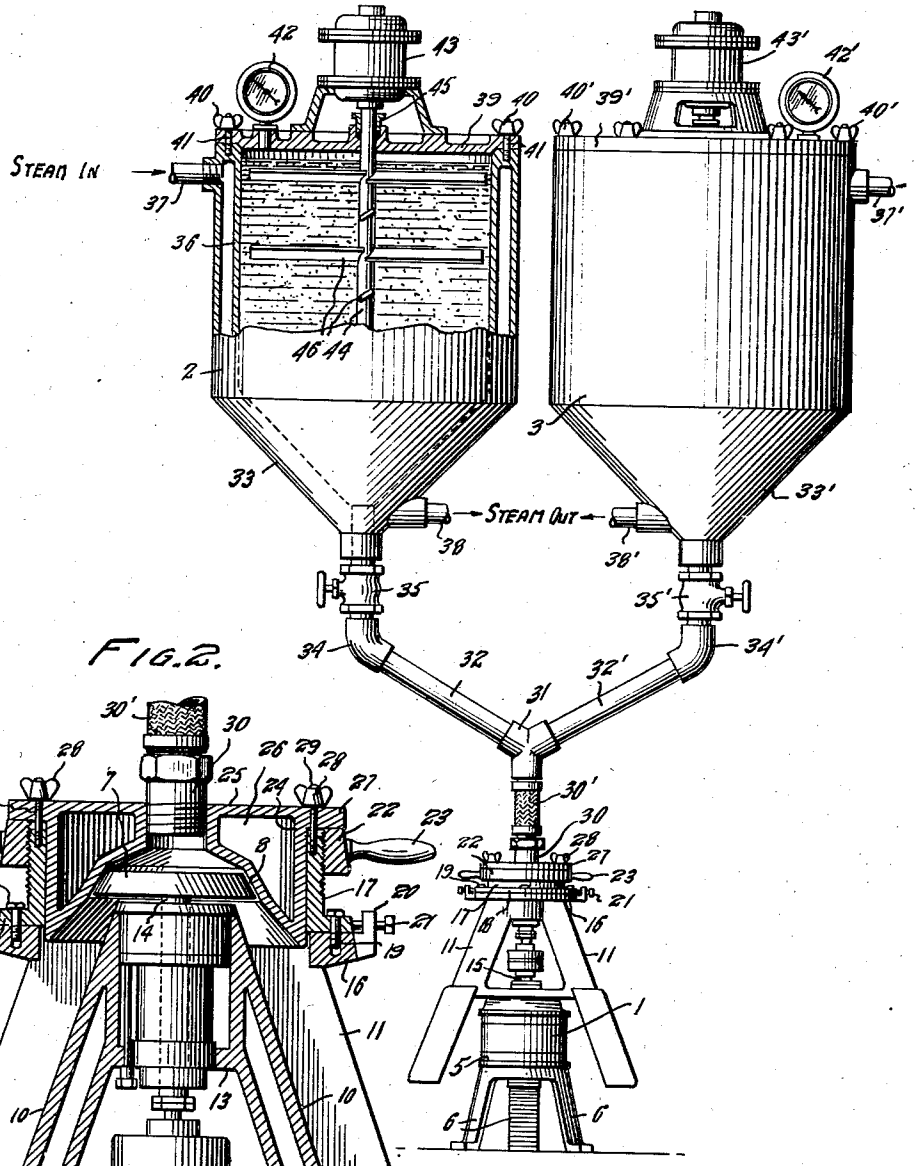


FIG. 2.

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APPARATUS FOR DISPERSING MATERIALS

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3 Claims. (Cl. 83—93)

This invention relates in general to colloid mills, and more particularly has reference to an apparatus for dispersing materials which melt or become soft at a temperature above that at which water boils.

Previous to this time, processes of this character have been practiced in a closed system, and the pressure on the material operated upon has thus been maintained throughout the process, through and including a final cooling step. The maintenance of a closed system throughout the process is deemed undesirable, and it is the purpose of this invention to provide a process and apparatus for carrying on the operation specified, in which the pressure on the material is released prior to the cooling.

Although the products to be hereinafter described are obtained through an emulsification method, it will be clearly understood that the end product is not an emulsion but a dispersion of solids in a liquid medium; that is, a colloidal suspension is produced.

The materials which it is contemplated to employ in accordance with this invention, as already stated, are of the character which melt or become soft at a temperature above that at which water boils. Foremost among those principally contemplated for use in conjunction with this invention are sulphur, asphalt, waxes, etc. The end product is usable in cases where an emulsion or dispersion is desirable in place of the same material let down with a solvent; or where the material is desired in a finely divided state, equivalent to fine grinding.

The process provides for adapting these materials to use, such as for example, the use of sulphur in insecticides, rubber compounds, or pharmaceutical products; the use of asphalts, waxes, resins, and so on, for water-proofing, impregnating paper, textiles, and so on, or as paints, or water-proofing material with or without combination with mica, asbestos, and so on, or for pressing into different shapes and forms.

An object of this invention, therefore, is to provide a process for dispersing materials which melt or become soft at a temperature above that at which water boils.

Another object of this invention is to provide an apparatus for dispersing materials which melt or become soft at a temperature above that at which water boils.

Still another object of this invention is to provide a process for dispersing materials which melt or become soft at a temperature above that at which water boils, and in which a pressure placed upon the material operated upon is released prior to the cooling step.

A further object of this invention is to provide a process and apparatus for dispersing materials which melt or become soft at a temperature above that at which water boils which may be carried on continuously.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawing means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions, which for the purpose of explanation, have been made the subject of illustration.

In the drawing,

Figure 1 is a front view, partly broken away, of my apparatus for carrying out my process of dispersing materials which melt or become soft at a temperature above that at which water boils;

Figure 2 is a front fragmentary sectional view of a colloid mill portion of my apparatus.

Referring more particularly by numerals to the drawing, there is shown a colloid mill generally designated as 1, having a plurality of kettles 2 and 3, connected jointly thereto for introducing the material between the rotor and stator surfaces thereof. The mill, as is better illustrated in Figure 1, comprises a suitable source of power, such as an electric motor 4, mounted in a housing 5, as shown in Figure 1, which is supported on legs 6.

A frame is integrally formed on the motor-housing for mounting a rotor 7, and a stator surface 8. This frame comprises a base portion 9 superimposed on the motor-housing, having upwardly sloping faces 10, formed thereon, and provided with spaced fins 11. Internal jackets 12 are provided within the faces 10, and an annular flange 13 for receiving a rotor assembly. The rotor 7 is keyed on the end of a shaft 14 which is coupled to a shaft 15, being the drive shaft of the motor.

An annular flange 16 is formed on the top of the fins 11 for receiving a sleeve 17 in which the stator face 8 is adapted to be mounted. The

sleeve 17 is formed with a lower annular flange 18 adapted to rest on the flange 16 for screwing thereon by bolts 19. The flange 16 is provided with flange 20, having bolts 21 extending therethrough for fixing the position of the sleeve 17 thereon.

The sleeve 17 is externally threaded for receiving a threaded ring 22 having handles 23 mounted thereon. The stator surface 8 is integrally formed on a sleeve 24 having an integral top portion 25, and providing a jacket 26. The sleeve 24 carrying the stator surface 8 is formed with a top peripheral flange 27 adapted to rest on the ring 22 mounted on the sleeve 17, and fixed thereon by nuts 28 secured on the bolts 29 seated in the top of the sleeve 17.

It will be seen from the foregoing, that the stator surface 8 may be vertically and horizontally adjusted with respect to the rotor 7. By loosening the nuts 28 and rotating the ring 22, the sleeve 24, carrying the stator, may be raised or lowered, and its final position fixed by fastening the nuts 28. By loosening the bolts 19, the horizontal position of the sleeve 24 may be varied by selectively screwing the bolts 21, and its final position secured by tightening the bolts 19.

Material for passage between the rotor and stator surfaces is adapted to be introduced through a line 30 having a threaded end for screwing in the central aperture provided in the top 25 of the sleeve 24, carrying the stator surfaces.

The colloid mill thus cursorily described, excepting the dimensions of the rotor and stator surfaces for practice of my present process, is fully disclosed and claimed in my co-pending application Ser. No. 478,212, filed Aug. 27, 1930.

In accordance with the present invention, further, a Y-connection 31 is screwed on the inlet line 30 having lines 32 and 32' extending therefrom for connection to the kettles 2 and 3, which are provided with tapered ends 33 and 33', through elbows 34 and 34' and valves 35 and 35'. A conventional telescopic or flexible coupling 30' is interposed in the inlet line 30, to allow for vertical adjustment of the stator.

The kettles 2 and 3 are, as is better shown in connection with kettle 2, provided with integral internal jackets 36 communicating with inlet and outlet steam lines 37 and 38, and 37' and 38'. The kettles are also equipped with closures 39 and 39' secured on the top rims thereof by nuts 40 screwed on bolts 41 fixed in the rims thereof. Pressure gauges 42 and 42' are mounted in the closures. Electric motors 43 and 43' are also mounted on each closure and connected to suitable sources of current, having the drive shafts thereof 44 extending through center apertures in the closures and packing glands 45. A plurality of blades 46 are mounted on the shafts. These bladed shafts are adapted to provide a suitable agitating mechanism. Manifestly, however, any other type of mechanism may be substituted, if found desirable.

While the colloid mill described herein is peculiarly adaptable to carrying out my present process, it will be distinctly understood that my invention is in nowise restricted to application with this mechanism only, but is susceptible of practice with any other suitable machine.

In carrying out my process, the material to be operated on, such as sulphur, asphalt, wax, resin, etc., is adapted to be placed in the kettles 2 and 3 with water. There may be added to this mix any desirable stabilizer. In the case of sulphur, the stabilizer may be a suitable gum.

There may be used all varieties of stabilizers, such as soap, gums, starches, caseins, dextrin, and so on, or combinations of these. It will be distinctly understood that the invention is in no wise limited to any particular stabilizer formula for any particular mix operated upon.

For acting on sulphur, it has been found that 60% sulphur and 4% gum and 36% water makes a very good sulphur dispersion. Higher concentrates do not tend to act as well, and lower concentrates than 50%, are not commercially practical.

However, another typical formula for the dispersion of sulphur in accordance with my process may be sulphur 50%, dry casein in solution form 1½%, water 48½%.

The mix of the material to be dispersed, together with the water and a stabilizer placed in the kettle, is adapted to be brought to a temperature which will melt or liquefy the ingredients through circulation of steam in the jacket of the kettle.

The containers may be filled with the mix within an inch of the top when heat is supplied to raise the contents to approximately 130° C. so that the water in the mixture produces a pressure of 25 to 30 pounds. This acts automatically, and after the mixture has been kept at the above mentioned temperature for a sufficient time, under agitation by the rotation of the bladed shafts in the kettles, the valve is opened, and the pre-mix from one kettle is allowed to flow to the mill.

During the heating step, the mixing paddle is kept running so that a fairly thorough mix is made of the melted solid and the water containing the emulsifying or dispersing agent.

The temperatures and pressures used are such as to raise the boiling point of water to temperature which is equivalent to that which is necessary to make liquid the material being operated upon.

In some cases, such a temperature could go beyond that necessary for improvement of the final product. It is in no wise desired to place any limit on the amount of temperature and pressure employed.

For example, theoretically, sulphur becomes liquid at 113° C.; nine pounds gauge pressure, which is nine pounds above atmospheric pressure, raising the boiling point of water to an equal temperature.

The invention, as stated, is not confined to these exact temperatures and pressures, and each may be higher. In the table of absolute pressure, pounds per square inch atmospheric pressure is 14.7; therefore, nine pounds above that is approximately twenty-four pounds absolute pressure.

In all other substances acted upon the same treatment may be carried on according to the different temperatures at which they become liquid, and to which the boiling point may be raised, and the pressure regulated. When the material has been brought to a proper heat, the mill 1 previously heated by circulation of steam through the jackets provided therein is set running and the valve, for example, the valve 35, from one of the mixing kettles is opened for the flow of material between the rotor and stator surfaces in the mill through the inlet line 30.

By using a rotor and stator properly adjusted as to clearance and as to breadth of working surfaces the material is emulsified in the clearance at the top end of the rotor, and as it passes down through the clearance, the pressure is re-

leased, causing the material to harden, instantaneously, into a colloidal dispersion.

By the time the emulsion or dispersion has passed completely through the clearance, the pressure has been released in the natural course, and the exterior phase is at such a temperature that the interior phase is completely hardened and does not coalesce.

Experiments in running the material with rotors and stators of different thickness has demonstrated this theory to be true. With a thin rotor the material does not have a chance to solidify before leaving the mill, so that it comes out in a sticky mass which immediately coalesces. By using a thicker rotor it is found that this does not occur, and that the material is ejected from the mill in the form of a very fine suspension, passing down the surface 10 between the blades 11 for collection.

In the course of my process, there is little, if any, vaporization of the water, and the sulphur or other material hardens immediately, producing a fine dispersion which does not range over two microns in size.

Upon the exhaustion of one kettle, the other kettle may be set in operation, and the exhausted kettle refilled so that the process may be continuous by alternate operation of the valves 35 and 35'.

It will be understood from the foregoing that the end product is not an emulsion, but a dispersion of solids in a liquid medium by emulsification under heat and pressure. Thus, the same results as far as the end product is concerned, are obtained with sulphur for example, whether it is ground cold as a solid or whether it is emulsified hot as a liquid to become a solid on cooling.

There is accomplished by this invention a process and apparatus for continuously dispersing materials which melt or become soft at a temperature above that at which water boils, in which a desirable dispersion of such materials is obtained with the release of the pressure prior to the cooling step.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In an apparatus for dispersing materials having a melting point higher than that at which a liquid in which the dispersion is to be effected boils, a jacketed kettle for heating a mix of the materials with the liquid under pressure, an agitator operating in the kettle, a colloid mill comprising rotor and stator elements having working surfaces between which the mix is adapted to be passed in a thin film, a pressure conduit between the kettle and the mill so that the mix is delivered to the input side of the working surfaces at the pressure in the kettle, jacketing means for the stator element, the rotor and stator surfaces being dimensioned and spaced to effect a dispersion of the materials in the liquid while maintaining the heated mix at a pressure that will retain the materials in liquid form, and a discharge chute into which the output from the working surfaces directly discharges, said chute being open to the atmosphere and permitting immediate release of the pressure on the mix after passing between the working surfaces of the colloid mill so that there shall be a quick solidification of the material when it leaves such surfaces.

2. In an apparatus for dispersing materials having a melting point higher than that at which a liquid in which the dispersion is to be effected boils, a jacketed kettle for heating a mix of the materials with the liquid under pressure, an agitator operating in the kettle, a colloid mill comprising rotor and stator elements having working surfaces between which the mix is adapted to be passed in a thin film, a pressure conduit between the kettle and the mill so that the mix is delivered to the input side of the working surfaces at the pressure in the kettle, jacketing means for the stator element, the rotor and stator surfaces being dimensioned and spaced to effect a dispersion of the materials in the liquid while maintaining the heated mix at a pressure that will retain the materials in liquid form, and a plurality of discharge chutes into which the output from the working surfaces directly discharges, said chutes being open to the atmosphere and permitting immediate release of the pressure on the mix after passing between the working surfaces of the colloid mill so that there shall be a quick solidification of the material when it leaves such surfaces.

3. In an apparatus for dispersing materials having a melting point higher than that at which a liquid in which the dispersion is to be effected boils, a jacketed kettle for heating a mix of the materials with the liquid under pressure, an agitator operating in the kettle, a colloid mill comprising rotor and stator elements having working surfaces between which the mix is adapted to be passed in a thin film, a pressure conduit between the kettle and the mill so that the mix is delivered to the input side of the working surfaces at the pressure in the kettle, jacketing means for the stator element, the rotor and stator surfaces being dimensioned and spaced to effect a dispersion of the materials in the liquid while maintaining the heated mix at a pressure that will retain the materials in liquid form, outwardly and downwardly sloping discharge chutes into which the output from the working surfaces directly discharges, said chutes being open to the atmosphere and permitting immediate release of the pressure on the mix after passing between the working surfaces of the colloid mill so that there shall be a quick solidification of the material when it leaves such surfaces.

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