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METHOD FOR MANUFACTURING GREASE

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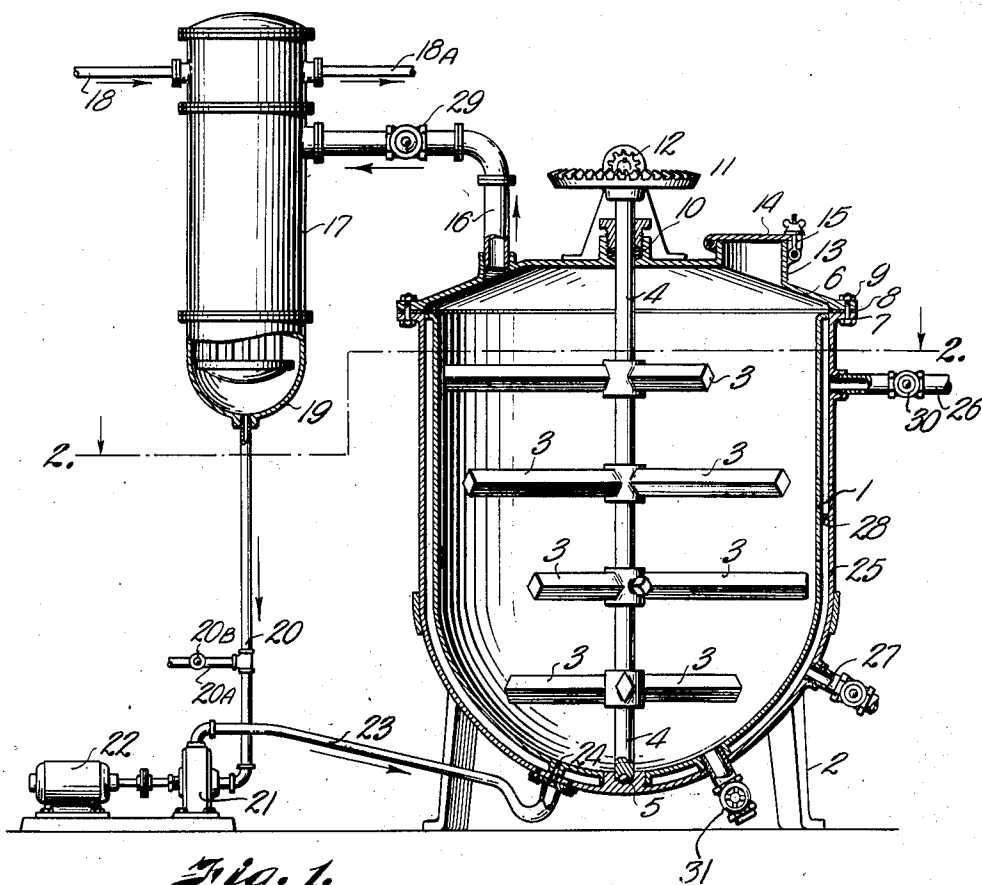


Fig. 1.

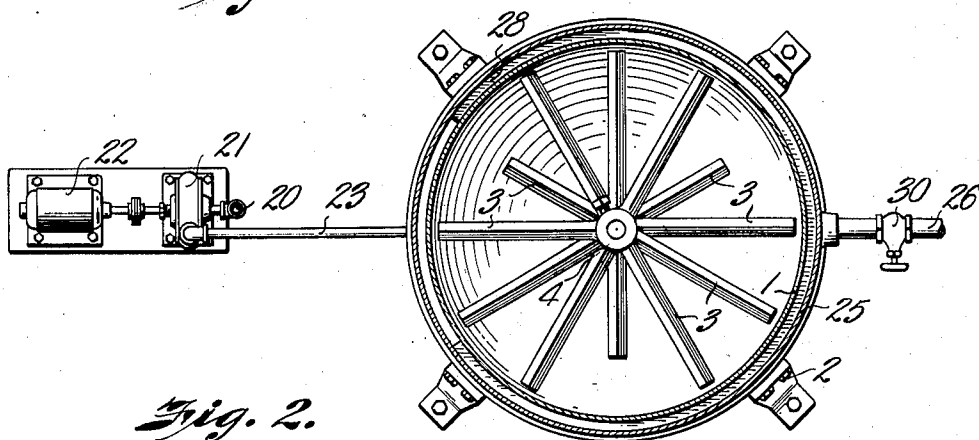


Fig. 2.

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METHOD FOR MANUFACTURING GREASE

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4 Claims. (Cl. 87—9)

My invention relates to a method and apparatus for manufacturing grease and more particularly to manufacturing lubricating greases from mineral oil and soaps such as calcium, magnesium, barium base soaps, which require water for grease manufacture.

Most lubricating greases are made by compounding mineral oil and soaps of fatty acids saponified or neutralized with an alkaline earth metal. Most generally, the hydroxide of sodium or calcium, or both, are used to saponify either or both animal and vegetable fats or fatty acids. To produce a stable grease from alkali soaps such as calcium soap, the soap must be hydrated with a definite quantity of water.

Any particular fatty acid saponified with lime and other such alkalies must contain a definite quantity of water, properly combined to produce a grease consistent in yield, appearance, and texture. The quantity of water necessary to produce a stable soap from any particular fatty acid or combinations of fatty acids and whole fats must be predetermined. The exact quantity of water determined must be rigidly controlled.

A large percentage of grease manufactured is not of satisfactory quality, because of dehydrated soap lumps, varying in size from minute particles to substantially large lumps. Greases containing such lumps are poor in appearance and present difficulty in lubrication application. Greases containing water in excess of the required amount are usually poor in appearance, inferior lubricants because of their lack of stability, and yields are reduced. This invention provides a process by which soaps for grease manufacture may be hydrated properly at atmospheric pressure.

Greases are hydrated by two common methods. One is by the pressure kettle method, the other by the open kettle method.

In practicing the pressure method, a pressure kettle is charged with the required quantity of fats, water, saponifying agent, and mineral oil. The kettle is closed, and the heat is turned on the kettle walls. Saponification takes place; and as soon as the soap and oil are mixed, the kettle is opened and the batch drawn. When fatty acids are used with the alkali, the reaction is by direct neutralization of the acid; and water is given off as a product of reaction. When fatty acids are used in greases made by the pressure method, an excess of water is present. Such processes require high temperatures and pressures which tend to darken light colored mineral oils under prolonged heating. The rate of saponification in the presence of a large volume of mineral oil requires pro-

longed heating. The heavy type of equipment necessary to sustain high temperatures and pressures is expensive.

Another method used, as previously mentioned, is the open type kettle. Water is added to the hot soap mass, and a portion is evaporated while hydration is taking place. It is left to the operator's estimation as to how much water is necessary to make up that loss. Greases made by this method vary widely in yield, appearance, and lubricating qualities.

One object of this invention is to provide improved methods for the manufacture of grease, with more consistent yields, better appearance, better lubricating qualities, and lower cost of production.

Another object is to devise a process for making those greases which require hydrated soaps in their composition.

It is also an object of this invention to provide a process whereby the making of grease can be standardized, and the operation may become mechanical rather than a manual art.

A further object of my invention is to provide a novel apparatus for the confection of lubricating greases.

A still further object of my invention is to provide novel apparatus for the controlled cooling of the soap-oil mixture, during the process of grease manufacture.

In the accompanying drawing which forms part of the instant specification and is to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views;

Figure 1 is a sectional elevation of apparatus embodying and capable of carrying out the method of my invention.

Figure 2 is a sectional view taken on a line 2—2 of Figure 1.

In general, my invention contemplates apparatus comprising any suitable closed top kettle having an eduction vapor line communicating with the top thereof and leading to a reflux condenser. Vapor from the kettle is condensed and recirculated to the kettle.

In carrying out my method, a proper quantity of water is added to the kettle containing a dehydrated and neutral soap. The soap is at the dehydrating temperature, that is, it is above the boiling point of water. When water comes in contact with the hot soap, it will be vaporized to form steam which, in turn, is condensed and the condensate returned to the soap by means of a recycle pump.

More particularly referring now to the drawing, a soap kettle 1 is mounted upon a suitable support 2 and is provided with a plurality of agitating blades 3 of any suitable construction.

5 The agitating blades are supported by a shaft 4 adapted to rotate in a lower bearing 5. The kettle is provided with a vapor tight cover member 6 which is seated upon a gasket 8, mounted upon a flange 7 of the kettle. The cover member

10 6 is secured to the kettle in any suitable manner such as by bolts 9. The cover member is provided with a stuffing box 10 adapted to pack the shaft 4. A bevel gear wheel 11 is keyed to the upper end of shaft 4 and meshes with a drive

15 pinion 12, driven by any suitable means. A manhole 13 is provided with a cover 14 adapted to be secured by dogs 15. A vapor eduction pipe 16 leads to the vapor side of a condenser 17 to which a cooling medium is supplied through pipe 18 and

20 withdrawn through 18A. Condensate collects in the lower portion 19 of the condenser 17 and is removed through a pipe 20 by a pump 21, driven by an electrical motor 22. The pump discharges

25 through pipe 23 to the bottom of the kettle 1. The pipe 23 terminates in a jet 24 to prevent soap in the kettle from plugging the water line. The kettle is formed with a steam jacket 25 into which

30 steam at any suitable temperature, or any other heating or cooling medium, may be introduced through pipe 26, and removed through pipe 27, the jacket being formed with a baffle 28 to prevent

35 short circuiting of the steam between the inlet 26 and the outlet 27. Valve 31 is provided to draw the finished grease from the kettles.

In carrying out my process, a quantity of a suitable soap made by saponification, neutralization or double decomposition either in the subject kettle or placed in the subject kettle after being

40 made in another vessel, is mixed with an equal weight of mineral oil. The mixture is heated by the introduction of steam through pipe 26. The valve 29 is closed and the manhole 14 is left open during the process of heating and dehydration.

45 When the soap reaches about 290° F. the heating is discontinued by closing valve 30 and releasing the pressure from the kettle jacket through valve and line 27. Agitation of the soap mass is continued until the mixture becomes completely

50 dehydrated. The soap mass should be agitated until the temperature reaches about 250° to 260° F. at which temperature the water is usually expelled.

Another procedure may be employed in handling the soap during heating and dehydration.

55 After the soap or its ingredients have been charged to kettle 1, manhole 14 may be closed and valve 29 opened. Water or any other cooling medium may be started through pipe 18, into condenser 17 and out pipe 18A. The water evaporating from the hot soap mass during dehydration

60 will then be removed from the system through drain 20A until all water is expelled from the soap. After complete dehydration, valve 20B may be closed.

65 Water may be pumped into the system for hydration with the supply connected to the suction of the pump at valve 20B. This feature is not shown on the drawing.

A quantity of water, varying from 10 to 150

70 pounds for each 1000 pounds of soap, (depending on the type of soap employed; usually an amount of water between 40 and 80 pounds is employed) is then poured into the manhole 14 and the manhole immediately closed and then dogged tightly

75 by means of dogs 15. Grease kettle 1 or manhole

14 may be equipped with a water delivery line in which event the required amount of water may be added by pumping or otherwise with manhole 14 completely closed. Line 20 or 23 may also be equipped with a water delivery line. The steam supply through pipe 26 is shut off by closing valve 30, and the agitation continued. The water is vaporized by the heat contained in the mass of soap and the equipment. The steam escapes from the kettle 1 through the vapor line 16, valve

10 29 being opened as soon as the manhole cover 14 is closed. The steam is condensed in the condenser 17 and collects in the sump 19 of the condenser, and is pumped back into the kettle through pipe 23. The heat in the mass of soap is

15 thus gradually extracted in the condenser 17. The soap will gradually drop in temperature until it reaches one below the boiling point of water. In this manner, the soap is not only cooled gradually but the water is evenly disseminated

20 throughout the entire mass of soap. The condenser 17 is sufficiently large to condense the steam at very low pressures, thus causing a rapid reflux of water in the beginning and decreasing as the soap cools and absorbs water.

By way of illustration and not by way of limitation, a thousand pounds of fat of which 20 percent by weight was tallow and 80 percent by weight was a vegetable fatty acid such as fatty acids obtained from cottonseed oil, were charged

30 to the kettle through the manhole and mixed with a thousand pounds of high grade lubricating oil having a viscosity of 300 seconds A. S. T. M. Saybolt at 100° F. The mixture of oil and fats was heated by steam from pipe 26, while being

35 agitated. 140 pounds of hydrated lime, which had been screened and freed from lumps, was then added through the manhole. After the initial reaction was completed, water was added in portions up to 20 pounds at intervals of from 10

40 to 15 minutes until the fats were completely saponified and the soap was neutral. When the foregoing operation was completed, the soap mass had a temperature of approximately 280° to 290°

45 F. In some other cases, however, this temperature may be as high as 350° F. The steam supply was then stopped by closing valve 30 and no further water was added. The agitation was continued by operating the paddles until a temperature of 250° F. was reached. In some cases this

50 temperature may be as low as 220° F. At this point, the soap was free of water. Then 57 pounds of water was poured into the kettle and the manhole 14 closed and dogged. Cooling water

55 was then passed through the reflux condenser 17 by means of pipe 18. Agitation of the soap was continued. When a temperature of 210° F. was reached, the soap was at a temperature insufficiently high to boil off water and was completely hydrated. The pump 21 was then stopped

60 and the manhole cover then opened. Oil was then added in quantities of 20 to 30 gallons at a time, while continuing the agitation until the total weight of the batch was about 10,000 pounds.

The advantages of my process are manifold. All greases made by my method have a definite water content absolutely controlled and not varying between batches. A slow and uniform cooling of the soap is effected. A proper amount of water is always in contact with the soap at the hydration temperature. Not only are highest possible yields obtained, but the batches of soap are constant in quality. Dehydrated grains of soap are not formed. These usually lower yields and form a poor appearing grease. The cost of

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manufacture is reduced by minimizing the quantity of unsalable grease and increasing the yield of usable grease per pound of soap employed. Since the operation is conducted at substantially atmospheric pressure, it may be operated at lower temperatures, with the result that temperatures which burn or darken the soap are not reached.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, I claim:

1. A method of making a lubricating grease including the steps of mixing a soap and a mineral oil at temperatures above the boiling point of water, continuing the mixing step while at said temperatures until the soap is completely dehydrated, adding a predetermined quantity of water to the hot mass of soap while confining the soap to the mixing zone, continuously removing water vapor from the mixing zone, condensing the same and returning the condensate to the mixing zone until the temperature of the soap mass drops to one at which water is no longer vaporized.

2. In a method of manufacturing lubricating greases, confining a dehydrated grease at a temperature above the boiling point of water in a mixing zone, adding a predetermined quantity of water to the soap mass in the mixing zone, removing vapors from the mixing zone, condensing the same and returning the condensate to the mixing zone until the temperature of the mass drops to a point at which water will no longer vaporize.

3. A method of confecting a grease including the steps of charging an open kettle with a quantity of fats, water and mineral oil, adding a saponifying agent to said mixture and heating it to a temperature between 250° and 300° F., periodically adding water to the agitated heated mass until the fats are saponified into a neutral soap, discontinuing the heating while continuing the agitating step until the mass reaches a temperature in the vicinity of 250° F., then adding a predetermined quantity of water to the hot mass and confining the same in the mixing zone, removing vapors from the confined mixing zone, condensing the vapors, returning the condensate to the mixing zone and continuing said condensing and returning steps until the mass cools to a temperature at which water is no longer vaporized.

4. A method of confecting a grease including the steps of charging an open kettle with a quantity of fats, water and mineral oil, adding a saponifying agent to said mixture and heating it to a temperature between 250° F. and 300° F., periodically adding water to the agitated heated mass until the fats are saponified into a neutral soap, discontinuing the heating while continuing the agitating step until the mass reaches a temperature in the vicinity of 250° F., then adding a predetermined quantity of water to the hot mass and confining the same in the mixing zone, removing vapors from the confined mixing zone, condensing the vapors, returning the condensate to the mixing zone and continuing said condensing and returning steps until the mass cools to a temperature at which water is no longer vaporized, then opening the mixing zone and repeatedly adding quantities of mineral oil until the batch reaches the desired predetermined weight.

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