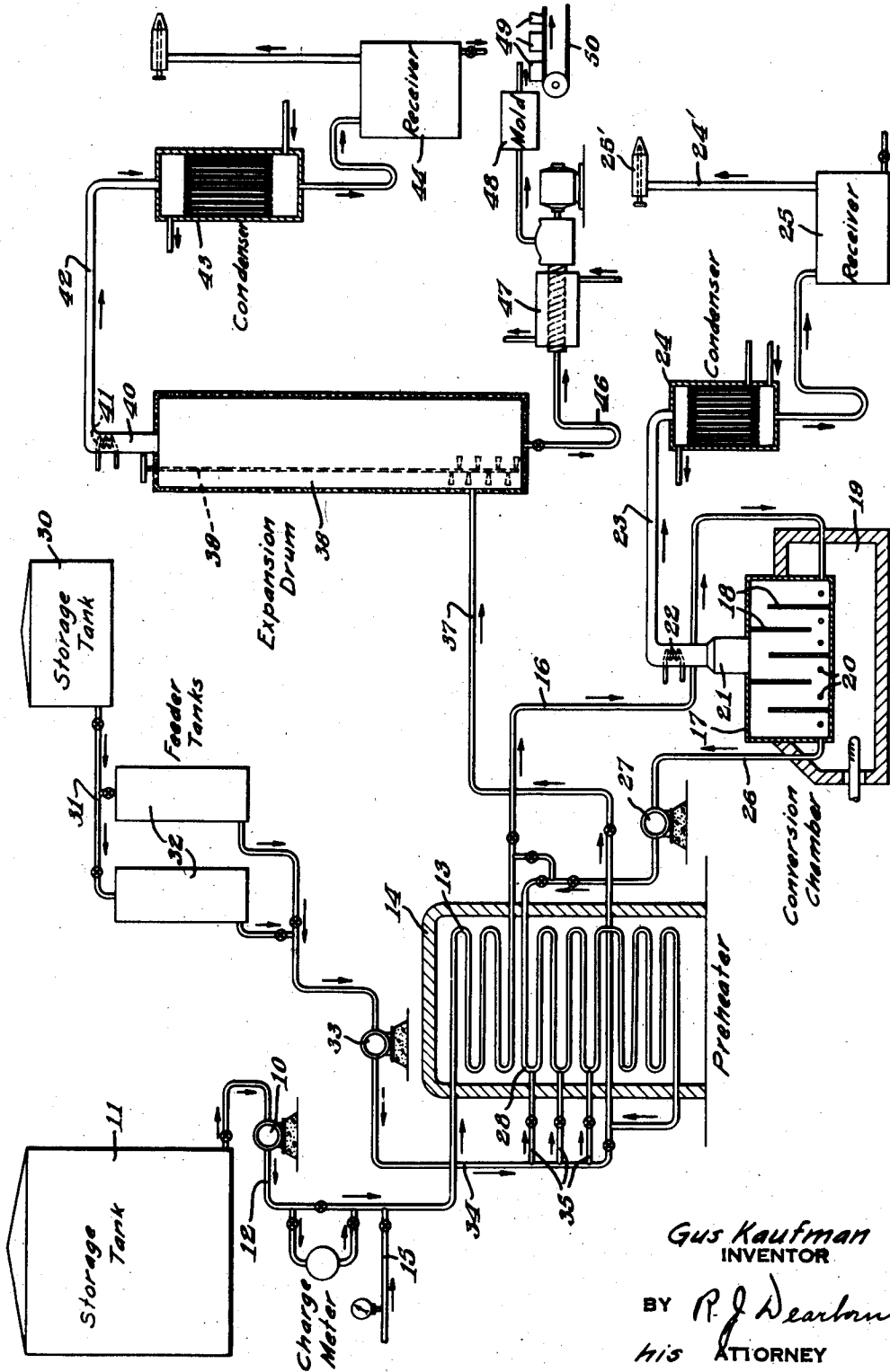


2,084,974

Filed June 15, 1935



Gus Kaufman
INVENTOR

BY *R. J. Dearborn*
His ATTORNEY

UNITED STATES PATENT OFFICE

2,084,974

GREASE MANUFACTURE

Gus Kaufman, Beacon, N. Y., assignor to The
Texas Company, New York, N. Y., a corporation
of Delaware

Application June 15, 1935, Serial No. 26,716

1 Claim. (Cl. 87—9)

This invention relates to the continuous manufacture of grease, and particularly a grease of the substantially dehydrated soda base type adapted for the lubrication of locomotive driving journals.

The patent to Lauer No. 1,912,001 discloses a continuous process of manufacturing grease, wherein a mixture of mineral oil and fatty oil is passed through a preheating section of a coil heater, then alkaline or saponifying material is introduced into the preheated mixture and the latter is flowed through a further section of the heating coil for saponification, followed by introducing the heated mass into a chamber where water vapors and other undesirable vapors may be removed to produce a desired final product.

The present invention constitutes an improvement on the method of the above mentioned Lauer patent, which is particularly adaptable to the manufacture of a substantially dehydrated high melting point soda base grease of the character of driving journal compound. It has been heretofore considered that a satisfactory grease of this type could not be effectively produced by such a continuous process.

I have discovered that when a blend of the mineral oil-fatty oil is heated in the presence of air, or with the addition of air to the closed system or heating coil, and the oil-fat blend is preheated for an appreciable time to produce certain chemical and physical changes in the material, as evidenced by a predetermined increase in viscosity, before the addition of the saponifying material, a satisfactory product can be produced in a continuous process of this character.

In accordance with the present invention, a mixture of mineral oil and fatty oil is flowed together with air in a confined stream, such as through a pipe still heating coil, wherein it is heated to a high temperature above the melting point of the final product. The heating in the presence of air is then continued; for example, in an enlarged conversion chamber, until a predetermined increase in viscosity of the mineral oil-fatty oil blend occurs. Then the blend is flowed together with saponifying material through a further heating coil and finally flashed into an enlarged zone from where vapors are withdrawn to produce the final product.

The invention may be clearly understood from the following detailed description, taken with reference to the accompanying drawing which illustrates diagrammatically a preferred embodiment of apparatus for practicing the method of this invention:

A charge pump 10 withdraws a blend of mineral oil and fatty oil from a storage tank 11, and delivers the same through line 12 to a heating coil 13 within a pipe still heater 14. Air under pressure is introduced into line 12 by the branch line 15, so as to pass along with the oil-fat blend. Where a grease of the character of driving journal compound is being manufactured, the petroleum or hydrocarbon lubricating oil may be of the nature of a cylinder stock and may embrace either a distillate or a residual product derived from either a paraffin or naphthene base, or mixed paraffin and naphthene base crudes, or may be of the nature of a pale oil or a fraction of lower boiling range than cylinder oil derived from any of the foregoing crude sources. The fatty oil or fatty acid may be derived from either animal or vegetable origin, such as hard tallow, tallow oil, fleshing grease, stearin, elaine oil, castor oil, cottonseed oil, residual pitchy material resulting from the destructive distillation of fatty oils and fatty acids, and may also embrace hydrogenated fats. A blend of cylinder stock and hard tallow is preferred for this purpose. The proportions of the mineral oil and fatty oil may vary within considerable limits, although it is generally preferred to provide a soap content in the finished grease of around 40 to 50%. However, the soap content may be considerably reduced, for example, to as low as 20 to 25%, and by a conversion process as described in my Patent No. 1,966,821, a satisfactory hard grease of the proper penetration still obtained.

The mixture flowing through the heating coil 13 is preferably raised to a temperature in excess of the melting point of the final product; for example, in excess of 400° F. Thus, very satisfactory results may be secured by employing temperatures of the order of 400–500° F., although higher temperatures up to around 750° F. may be used. It is found desirable to produce a predetermined increase in viscosity of the mineral oil-fatty oil blend prior to saponification. While the desired conversion as indicated by a predetermined increase in viscosity can be secured by passing through the heating coil, the length of the coil can be materially reduced by means of an auxiliary heated conversion chamber. In accordance with the present process, the preheated mixture is discharged from the coil 13 by line 16 into an enlarged conversion chamber 17 provided with staggered baffles 18, and equipped with a fire box 19 so as to maintain the temperature of the heated mix during a reasonably prolonged storage therein. The conversion chamber

may be provided with an additional air coil 20 for blowing the heated mixture with air during its storage therein to attain a more rapid viscosity increase. It is generally desirable to produce a viscosity increase in excess of 20%, generally an increase of about 20-60% being attained. The time of heating in the coil 13 and conversion chamber 17 will, of course, vary with the temperature employed, higher temperatures requiring less time for a predetermined viscosity increase and vice versa. Also, the conversion chamber may be omitted when the coil heater gives the desired conversion. Ordinarily, a total heating time of the order of about 4-8 hours in the presence of air is satisfactory. The conversion chamber may be provided with a vapor off-take 21 equipped with a cooling coil 22 for refluxing back to the chamber, uncondensed vapors passing through vapor line 23 to a water cooled condenser 24 and thence to a receiver 25. The receiver is provided with a vent line 24' leading to a steam jet 25' to provide suction to withdraw the vapors through the condensing apparatus. These condensed products may be returned to the system, or may be employed in the manufacture of other greases.

The conversion chamber 17 is preferably of such size, and is so coordinated with the charge rate, that the desired conversion time for the mineral oil-fatty oil blend is attained as the latter flows through the tortuous or baffled passage within this chamber to the discharge line 26. A booster pump 27 is preferably positioned within this line 26, and delivers the heated material to an additional heating coil 28 within the furnace 14, although it is obvious that a separate furnace can be employed.

Saponifying material, such as caustic soda solution, is supplied from a tank 30 through line 31 to calibrated feeder tanks 32, from where it is withdrawn by a proportioning pump 33 and delivered by line 34 to one or more pipe lines 35 discharging into coil 28 at different positions along the length of this coil. The caustic soda solution so supplied is proportioned in accordance with the charge rate so as to just supply sufficient caustic soda for saponification of the saponifiable content of the fatty oil, and preferably to provide a slight excess of free alkali. The coil 28 is heated to a temperature in excess of 400° F. and below 800° F., preferably a range of around 500-750° F. being employed. While caustic soda is generally preferred, other saponifying materials, such as lime, litharge, magnesia, etc., may be employed.

The heated mixture is then discharged by line 37 into an expansion drum 38 equipped with an agitator 39 where vapors including water, glycerine and any volatile decomposition products flash off. These vapors are withdrawn through vapor outlet 40 equipped with reflux coil 41, the non-condensed vapors passing by vapor line 42 to water cooled condenser 43, from where the condensate is discharged into receiver 44.

The final product from expansion chamber 38 is discharged by line 46 to a water or steam cooled screw pump 47, which discharges the cooled grease through a mold 48, which forms it into cakes of predetermined size. These cakes may be discharged into individual containers 49 carried by a traveling belt conveyor 50 to a point of discharge.

While air is preferably introduced by the line 15 into coil 13, it is to be understood that under some conditions the introduction of air may be

delayed until the preheated mineral oil-fatty oil blend has been discharged into the conversion chamber 17. It is also possible to by-pass the coil 13 and carry out the conversion and heating of the fatty oil-mineral oil blend entirely in the conversion chamber 17. The system may be operated at atmospheric or superatmospheric pressures, or under vacuum.

As a specific example of the present invention, a blend of 55% by weight of cylinder stock and 45% by weight of tallow was passed through the heating coil 13 together with an excess of air at substantially atmospheric pressure, with a heater outlet temperature of 480-520° F. and a conversion chamber temperature of around 400-440° F. The tests on the charge or blend before and after treatment were as follows:

	Charge before treatment	Charge after treatment
Gravity, °A. P. I. -----	23.6	21.8
Flash, °F. -----	485	505
Fire, °F. -----	585	605
Say. visc./130° F. -----	318	488
Say. visc./210° F. -----	83	108
Pour, °F. -----	70	70
Saponification number -----	93	86.9
Acid number -----	8.7	6.4

The conversion product was then passed through coil 28 together with caustic soda solution employing a heater outlet temperature of 680° F., with a bottom temperature in expansion drum 38 of 525° F. and a vapor outlet temperature of 490° F. A hard uniform dehydrated grease was secured having the following tests:

Penetration—Modified A. S. T. M. ----- 77
 Melting point—Dropping point method. 419° F.
 Soda soap ----- 43.5%

In the above specific example, the penetration or hardness of the resulting grease is expressed in terms of tenths of a mm. penetration of an average sample as determined by the standard A. S. T. M. penetrometer and method for greases (see test D-217-27-T), except that the same apparatus is modified to the extent of having an extra weight of 475 g. placed within the penetrometer cone. Such reading is termed "penetration, modified A. S. T. M." This modified penetration test has been used on samples of relatively hard products to penetrate more deeply and give a higher and more accurate reading than that obtained with the same apparatus without the added weight.

Melting points referred to herein are comparable to those taken by the method described on pages 105-107 of the article entitled "Lubrication and Lubricants" by G. R. Roland, Journal of the American Society of Naval Engineers, vol. 31, 1919. This method or slight modifications thereof has been widely used with success for many years by grease chemists, and is frequently referred to as the "dropping point method."

It is pointed out that the present method of continuous manufacture possesses certain advantages over the customary batch manufacture. For example, loss of fat due to volatilization during heating is avoided in the closed system, so that a smaller quantity of fat for the same soap content may be employed. Furthermore, a shorter treating time with greater output is generally attained in the continuous manufacture. In addition, greater uniformity due to better control of manufacture is obtained; also, less space

is required for such a continuous grease manufacturing unit.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claim.

I claim:

10 A continuous process for manufacturing grease which comprises flowing a mixture of mineral oil and fatty oil through a heating coil wherein the mixture is heated to a high temperature above the melting point of the final product, introducing air into the heating coil so as to pass

through the coil along with the mineral oil-fatty oil blend, discharging the mixture into an enlarged reaction zone where it is further blown with air while the high temperature thereof is maintained until a predetermined increase in viscosity of the mineral oil-fatty oil blend occurs, then further flowing the mineral oil-fatty oil blend together with saponifying material through a heating coil wherein it is heated to a high temperature, finally flashing the heated material into an enlarged zone, withdrawing from the zone vapors evolved therein, and removing from the zone the desired final product.

GUS KAUFMAN. 15