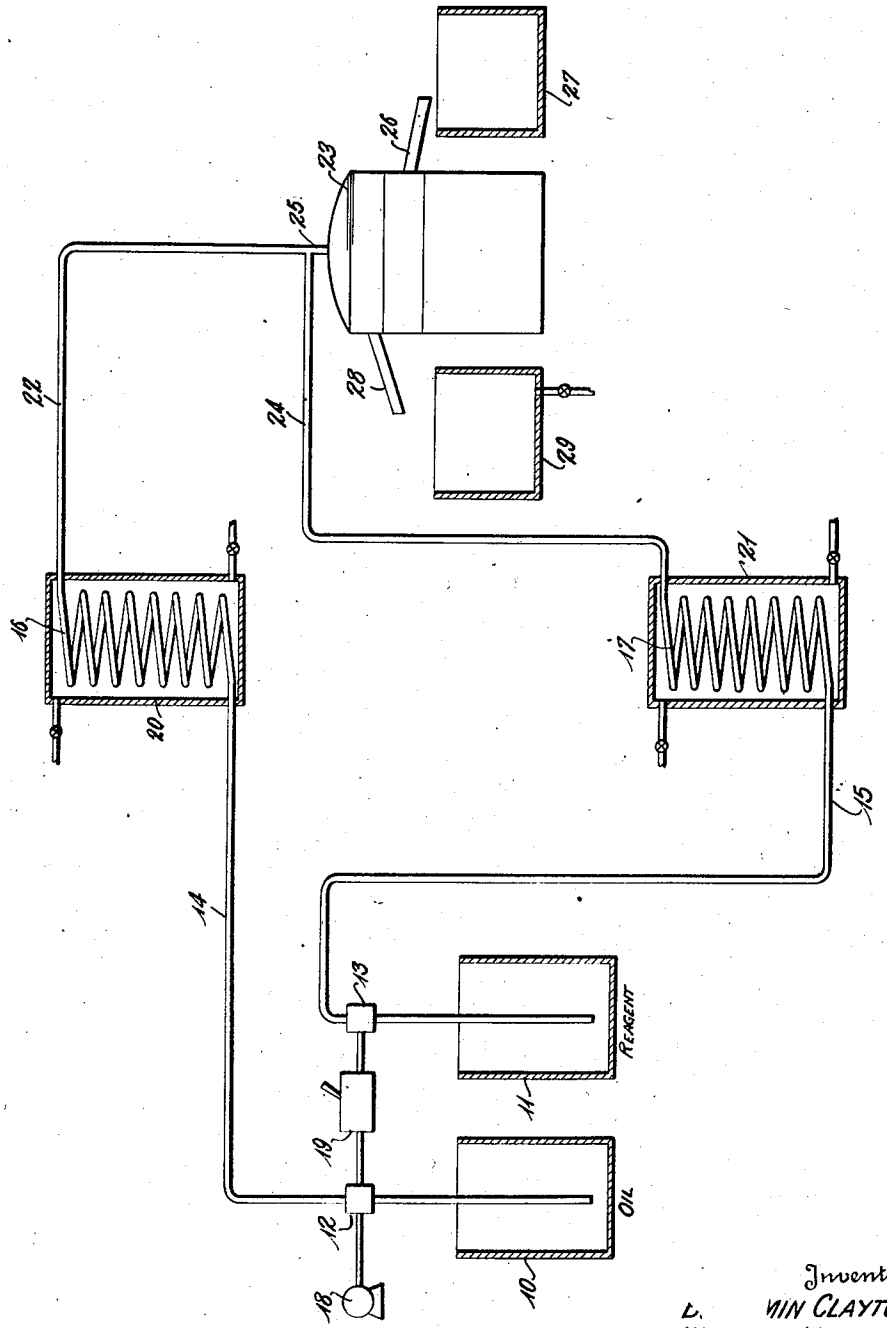
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PROCESS OF REFINING ANIMAL AND VEGETABLE OILS

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Inventors
D. WIN CLAYTON
WA. KERRICK
HENRY M. STADT AND
BENJAMIN H. THURMAN
By Harris, Kirk, Foster & Harris
Attorneys

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PROCESS OF REFINING ANIMAL AND VEGETABLE OILS

Benjamin Clayton, Houston, Tex., Walter B. Kerrick, Los Angeles, and Henry M. Stadt, Glendale, Calif., and Benjamin H. Thurman, Bronxville, N. Y., assignors to Refining, Inc., Reno, Nev., a corporation of Nevada

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This invention relates to a process of refining animal and vegetable oils and more particularly to a rapid process involving preheating of the oil by which refining losses are minimized.

It is an object of the present invention to provide an extremely rapid process of refining animal and vegetable oils in which a refining reagent is contacted with the oil for a very brief period.

Another object of the invention is to provide a rapid process of refining animal and vegetable oils in which a mixture resulting from adding a refining agent to the oil is immediately centrifugally separated.

A further object of the invention is to provide a process of refining animal and vegetable oils in which the oil is heated to an emulsion breaking or opposing temperature, admixed with a refining reagent and immediately centrifugally separated while at the said temperature.

A still further object of the invention is to provide a process of refining animal and vegetable oils by which the oil is mixed with a refining reagent while the oil is at a temperature which will immediately condition the resulting mixture for centrifugal separation of foots from the oil.

The present process will be described in conjunction with an apparatus shown diagrammatically in the annexed drawing. Referring to the drawing, a source of supply of animal and vegetable oils is shown as a tank 10 and a source of supply of refining reagent is shown as a tank 11. Proportioning pumps 12 and 13 may be employed to withdraw oil and reagent from the tanks 10 and 11, respectively, and deliver streams of the same through the pipes 14 and 15, respectively, to heating coils 16 and 17, respectively.

The proportioning pumps 12 and 13 may be driven by a variable speed motor 18 and a variable speed device indicated at 19 may be positioned between the pumps so that the relative proportions of oil and reagent can be varied by adjusting the variable speed devices 19 and the amount of both materials pumped controlled by varying the speed of the motor 18. The proportioning device shown is for example only as any other type of proportioning mechanism capable of delivering accurately proportioned streams of oil and reagent may be employed.

The heating coil 16 for the oil may be enclosed in a casing 20 through which any desired heating medium such as hot water, steam, or heated mineral oil, may be circulated so that the oil passing through the coil 16 may have its temperature raised to the desired degree. Similarly, the heating coil 17 may be enclosed in chamber 21 through which similar heating mediums may be circulated in order to heat the refining reagent to the desired temperature.

The heated oil is delivered through a pipe 22 to a centrifugal separator 23. The reagent is mixed with the oil immediately before it enters the centrifugal, for example, by injecting a stream of the reagent from the pipe 24 at right angles into the flowing stream of oil at the junction 25 of the pipes 22 and 24. While the injection of the stream of one material into the stream of the other has been found to be an effective means of producing substantially instantaneous and substantially complete mixing, any other form of flow mixer, including a continuous mechanical agitator, may be employed in lieu of the type of mixing described. The reagent admixed with the oil reacts with impurities in the oil to form foots which can be centrifugally separated from the oil. By effecting the mixing at a relatively high temperature, the mixture of oil and foots is immediately conditioned for centrifugal separation. The centrifugal shown may be of any conventional type which the art has found effective in separating foots from animal and vegetable oils. In the embodiment shown, the foots along with any residual refining reagent constitute the heavy effluent and are discharged from the centrifugal through a spout 26 into a receiver 27 while the purified oil constitutes the lighter effluent and is discharged through a spout 28 into a receiver 29.

The present process is particularly adapted to the alkali refining of animal and vegetable oil, for example, such oils as cottonseed, soya bean, linseed and fish oils. In such a refining process, the reagent usually employed is an aqueous solution of caustic soda, although other alkaline reagents such as caustic potash, etc., can be employed. The amount and concentration of the refining reagent depends upon the particular oil being treated. Since various oils differ in the amount of free fatty acids and other impurities such as gums and coloring matter contained

therein, no precise concentration and amount of reagent can be stated. In general, sufficient alkaline reagent should be employed to neutralize the free fatty acids in the oil and to provide a considerable excess for reaction with other impurities such as gums and coloring matter in the oil. For example, 5.7% by weight of a 14° Bé. caustic soda solution is suitable for refining cottonseed oil containing 1.4% of free fatty acid.

The process herein described is also applicable to the refining of animal and vegetable oils, particularly the drying oils such as linseed and soya bean oil, with acid reagents. Such acid reagents react with gums and coloring impurities in the oil, probably by dehydration or carbonization reaction, to precipitate the same and render them separable from the oil. The acid reagent generally used is relatively concentrated sulphuric acid, for example, 60° Bé. sulphuric acid in amounts ranging from 1 to 10% although other acids, such as relatively concentrated hydrochloric acid can also be employed.

The process of the present invention can also be employed for so-called "partial refining" or "degumming" operations in which water or very dilute solutions of acids, alkalies or salts are employed in amounts ranging from 1 to 10% of the oil to precipitate the gums contained in the oils probably by hydration thereof. Such degumming operations are not to be confused with the alkali and acid refining operations above described. In alkali refining, sufficient alkali is employed to neutralize all of the free fatty acids and provide an excess for other reactions, and in acid refining the gums, etc., are subjected to drastic treatment with acids, whereas in partial refining with a very dilute solution, sufficient alkali is not employed to react with any substantial portions of the free fatty acids and the acid reagents which may be alternatively employed are of insufficient strength to perform any substantial carbonization or dehydration reaction. Alkali refining, acid refining, and partial refining or degumming are independent operations but present certain common problems as discussed hereinafter. Degumming may be employed before refining and even as a part of the same continuous process. By degumming before refining, less reagent is necessary in the refining operation and refining losses are reduced, particularly with alkali refining.

In all of the types of refining above described, an emulsion between the oil and the aqueous reagent which is apparently of the water in oil type tends to be produced during admixture. If the oil and reagent are mixed cold, i. e., at temperatures in the neighborhood of 75 to 90° F., or lower, an emulsion is usually formed which cannot be effectively separated by centrifugal separation. By preheating either the oil or reagent or both so that the temperature of the resulting mixture is relatively high, the formation of such an emulsion is opposed such that it does not form, or if the emulsion is formed, it is transitory only and is immediately broken to render the mixture separable. The emulsion opposing or breaking temperature which is necessary to provide effective centrifugal separation varies with the particular oil being treated and the nature of the reagent employed. The most stable emulsions are generally produced in alkali refining. Also, a relatively impure oil containing large amounts of free fatty acids and gums tends to form more stable emulsions with refining reagents such that a higher temperature is necessary to oppose or break in the emulsion. Therefore, no precise temperature can be given for every condition but such temperatures will ordinarily range between 100° F. for pure oils up to 200° F for very impure oils. For most oils temperatures from 115 to 140° F. can be satisfactorily employed as emulsion breaking or opposing temperatures.

It is ordinarily sufficient to preheat only the oil as the amount of refining reagent is usually small in comparison with the amount of oil being mixed therewith. In such case, the oil must be preheated to a temperature sufficiently high to produce an emulsion breaking or opposing temperature of the mixture. The preheated oil rapidly heats the reagent in the mixing zone so that a resultant uniform temperature is produced. Although, as indicated, it is generally preferable to preheat the oil, it is within the contemplation of the present invention to preheat only the reagent to a temperature sufficiently high to produce an emulsion breaking or opposing temperature of the mixture.

Since the mixture is produced at a temperature sufficiently high to break or oppose the formation of any emulsion which may tend to form during mixing, the mixture of oil and foots is immediately in condition for centrifugal separation. Thus the mixing can be performed just before the materials enter the centrifugal and in many cases the mixing can be performed directly in the entrance of the centrifugal by delivering separate streams of oil and reagent to the centrifugal as many centrifugals produce considerable agitation of the entering materials.

As indicated above, any desired form of centrifugal which is capable of continuously separating foots from vegetable and animal oils may be employed. It is, however, preferred to employ the heated centrifugal disclosed in the co-pending application of Benjamin Clayton, Serial No. 34,258, filed August 1, 1935, now Patent No. 2,100,277, granted November 23, 1937. Such a centrifugal can be employed to maintain the temperature of the materials in the centrifugal and also promotes the delivery of the heavy effluent as a continuous stream from the centrifugal.

In accordance with the present invention, the entire process may be performed within a relatively few minutes, for example, a stream of oil has been preheated by flowing the same through a heating coil constructed of three-quarter inch pipe approximately 250 feet long at the rate of approximately 16 pounds per minute and the temperature raised from substantially room temperature to 135° F. in approximately 1½ minutes. It is, of course, understood that other types of flow heating devices can be substituted for the coils disclosed. It is desirable to heat the oil as rapidly as practicable and maintain in heated condition for as short a time as practical and in general it is desirable to bring the oil to the desired temperature in a period of less than five minutes. The oil is mixed with the reagent immediately after heating and immediately centrifugally separated. One of the advantages of the present process is that the mixing may be performed in a closed mixing zone so that no substantial amount of air is present in the mixture. In the centrifugal above referred to the oil remains in the centrifuge not more than three minutes such that the oil is in contact with the refining reagent for a period somewhat less. The entire process can ordinarily be performed within less than ten minutes.

By the term "animal and vegetable oils" we mean oils derived from animal and vegetable sources, such as glyceride oils, and intend to embrace the oils having the same general characteristics, for example, fish oils.

While we have described the preferred embodiments of our invention, it is understood that the details thereof may be varied within the scope of the following claims:

Having described our invention, we claim:

1. A process for the quick and continuous refining of animal and vegetable oils containing free fatty acids which comprises the steps of: mixing with said oil a refining reagent capable of acting upon the impurities in said oil to form foots, separating the foots substantially as quickly as they are formed by subjecting the mixture to immediate centrifugal separation with the aid of heat sufficient to facilitate said separation, said heat being supplied by preheating at least one of the admixed materials before admixture with the other, the process being characterized by the avoidance of any substantial period of contact of the refining reagent with the oil after the admixing thereof.

2. The process as defined in claim 1 in which the heat is supplied by preheating the oil prior to its admixture with the refining reagent.

3. The process as defined in claim 1 in which properly proportioned streams of the oil and reagent are contacted substantially as they enter the centrifugal.

4. A process for the substantially simultaneous forming and separation of foots from refined oils which comprises the steps of: colliding streams of a refining reagent capable of acting upon impurities in the oil to form foots and the oils, under super-atmospheric pressure, to effect substantially instantaneous formation of said foots and immediately separating said foots substantially as quickly as the same are formed by immediately subjecting the mixture to centrifugal separation for continuously separating said foots from the oil, conditioning the mixture for said separation by preheating one of said admixed materials before admixture with the other, the process thereby being characterized by the avoidance of any substantial period of contact of the refining reagent with the oil after the admixing thereof.

5. The process as defined in claim 4 in which the oil is preheated to an emulsion breaking temperature.

6. The process as defined in claim 4 in which the oil is preheated to a temperature not substantially less than 100° F.

7. The process as defined in claim 4 in which the foots are further heated to facilitate their discharge, without sticking and clogging, from the centrifugal.

BENJAMIN CLAYTON.
WALTER B. KERRICK.
HENRY M. STADT.
BENJAMIN H. THURMAN.