

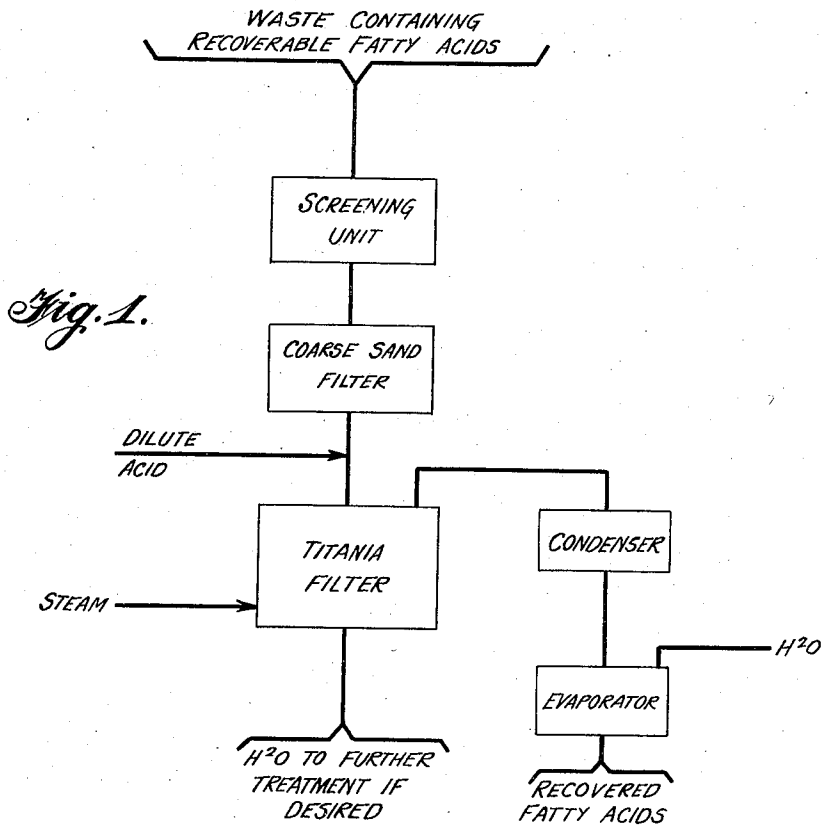
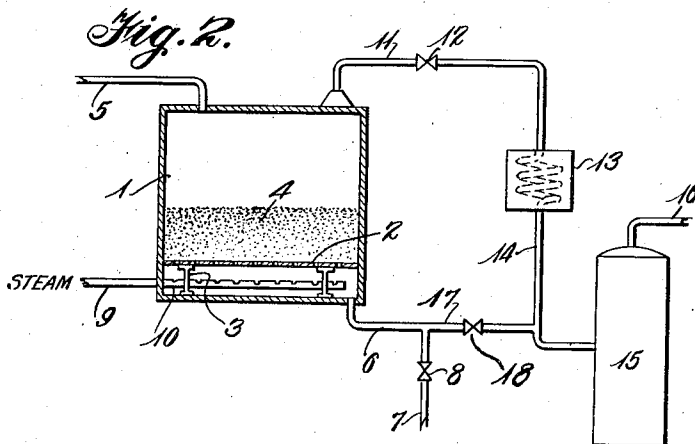
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2,171,202

METHOD OF RECOVERING FATTY ACIDS

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METHOD OF RECOVERING FATTY ACIDS

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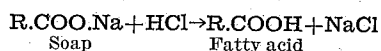
8 Claims. (Cl. 260—412)

This invention relates to a process for recovering fatty acids from solutions containing the same. In its more specific aspect, the invention contemplates the recovery of the fatty acids present in the soaps discharged in waste waters from laundries and the like.

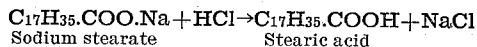
It is well-known that the wash waters or suds employed in laundering operations contain from 0.25 gram to 5.0 grams of fatty acids per liter. These fatty acids are, of course, present in the form of sodium and potassium salts, that is, in the form of soaps. In addition to soaps, the laundry wastes contain so-called soap builders, free alkali, dirt, dyes, greases, starch, carbohydrates, lint, and other cellulosic materials as well as various forms of bacteria.

The present process is primarily concerned with the steps of freeing the fatty acids from the soaps and recovering the same from the waste solution. The fatty acids may be released from the soap by effecting hydrolysis thereof through the addition of a dilute acid such as dilute hydrochloric to the waste.

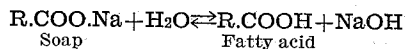
When dilute hydrochloric acid is added to laundry waste or the like, the fatty acids are released from the soaps according to the following general reaction:



A specific example of the general reaction above is given as follows:

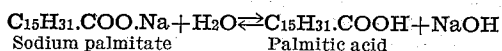


The above reactions take place at all pH's below pH 7.0, but even at pH's above pH 7.0 the soaps hydrolyze according to the following general reaction:



It should be noted that this reaction is of the reversible type. If the fatty acid formed on the right is removed, the hydrolysis of the soap will proceed to completion. In other words, as long as the pressure is eliminated from the right side of the reaction, it will continue to move to the right.

A specific example of the hydrolysis of a soap is given in the following reaction:



Coming now to a description of the present process, reference will be had to the accompanying drawing for clarification, wherein:

Figure 1 is a diagrammatic flow chart representing the various steps in the process; and

Figure 2 is a more or less diagrammatic illustration of a suitable filter structure for employment in removing the fatty acids.

Referring to the drawing, the waste containing the recoverable fatty acids is first passed through a screening unit to free the same of entrained solids and thence preferably passed through a coarse sand filter to remove such solids as might otherwise foul the subsequent chemical filter unit. There is added to the waste a dilute acid, such as hydrochloric acid, to induce hydrolysis of the contained soaps. The solution is then passed into a filter for removing fatty acids.

The nature of the filtering medium employed for removing the fatty acids constitutes an important feature of the present invention. In the present process, the filtering medium for effecting removal of the fatty acids released from the soaps as a result of hydrolysis due to the addition of the dilute acid comprises a material, the active reagent of which is titania (TiO_2). The term "titania" as herein employed is intended to be used in a generic sense and to be inclusive of the three minerals in which titania occurs in nature, namely, rutile, brookite, and anatase, as well as inclusive of an inert granular carrier impregnated with TiO_2 .

The minerals rutile, brookite, and anatase are very insoluble and are all suitable, after being granulated to the proper mesh, for use as a filtering medium. Where one of these minerals as such is used, it should be reduced to a size such that it will pass through a five-mesh screen and be retained on a twenty-mesh screen. When a carrier impregnated with TiO_2 is employed in lieu of the mineral, we may use as the carrier either hard coke or magnesia silicate brick reduced to granules which likewise pass a five-mesh screen and are retained on a twenty-mesh screen.

If a filtering medium composed of an inert carrier impregnated with TiO_2 is to be prepared, we can use any of the soluble salts of titania for the purpose of impregnating the carrier. For example, the granulated carrier material is pickled in a concentrated solution of the titanium salt, such, for instance, as TiCl_4 . The excess solution is drawn off, and the granulated mass is then treated by passing therethrough a warm current of moist air. After the material is dried, it is ignited at a temperature ranging from 600° C. to 900° C. By following this procedure, the relatively inert carrier is thoroughly impregnated

with titania (TiO_2), and the material is ready for use.

It will thus be observed that the filtering agent employed is made up of a granular mass comprising either a mineral carrying titania or a granular carrying agent impregnated with titania. We are not certain as to the precise manner in which the titania filtering medium effects removal of fatty acids from the waste containing the same. The reagent carries no ions for effecting an anion exchange and is furthermore relatively unreactive. The reagent, that is, titania, nevertheless does effectively remove fatty acids with great rapidity. We additionally are able to regenerate the titania carrying filter medium by passing therethrough superheated steam which acts to free the fatty acids from the filtering medium so that they are carried over with the steam. We are of the opinion that the fatty acids are removed through the medium of titania purely by sorption. We do know that the titania has an enormous capacity for the fatty acids. In our view, this is a phenomenon of physical chemistry, namely selective adsorption.

The release of the fatty acids from the filtering medium by the application of steam is done without impairing the capacity of the titania for further use. In fact it is possible to reuse the titania filtering medium for several months without substantial loss or impairment of the effectiveness of this reagent.

The apparatus instrumentalities employed in carrying out the process of the present invention are more or less conventional and relatively unimportant to the process. It is accordingly not believed necessary that they be specifically illustrated. The screening unit is employed to remove the heavy suspended matter from the waste. Such screens are self-discharging, and the solids removed by the screens may be flushed directly into a suitable sewer or the like.

The mechanical sand filter is employed to remove such suspended matter as passes the screens and to insure that no suspended matter will pass into and foul the fatty acid recovery unit. The sand filter can, of course, be equipped with a conventional back-wash through the medium of which it may be back-washed with clear water after each day's run. The back-wash water will, of course, carry the solids from the sand filter and may be likewise discharged into a suitable sewer or the like.

A suitable construction for the fatty acid recovery unit is illustrated in Figure 2 wherein the filtering chamber is designated generally at 1 and constitutes a suitable sheet metal container since it is not required to withstand excessive pressure or temperature conditions. The chamber 1 is provided with a filtering medium carrying grate 2 suitably supported on members 3, the filtering agent diagrammatically illustrated at 4, and the line 5 through which the solution containing the fatty acids to be recovered is introduced to the filtering chamber.

The filtrate leaves the bottom of the chamber through the line 6 and may be discharged through branch line 7 controlled by the valve 8 for further treatment or into a sewer as may be desired. A steam line 9 extends into the bottom of the chamber 1 and is provided with a perforated extension 10 for delivering steam below the filtering medium for the purpose of driving off the fatty acids from the filter. The steam carrying its fatty acid content leaves the top of

the filter through line 11 controlled by valve 12 and passes to the condenser 13. The condensate is then delivered through line 14 to a suitable evaporating unit 15 wherein the water is driven off through the line 16 and the fatty acids are recovered.

Oftentimes during the introduction of steam to the filtering chamber 1, condensation occurs in the filtering medium, and the condensate carrying some of the fatty acids passes out through the line 6. In this case the valve can be closed and this condensate passed through the by-pass line 17 controlled by the valve 18 and introduced to the line 14 to flow with the condensate from the condenser 13 to the evaporator 15.

It will be understood that the process is not dependent upon this particular form of apparatus, nor is the invention to be limited by the foregoing description beyond the scope of the subjoined claims.

Having thus described our invention, what we claim is:

1. In a process for recovering fatty acids from solutions containing the same, the steps comprising effecting chemical removal of fatty acids by passing such solution through a filter containing a substantial quantity of titania (TiO_2) and thereafter effecting recovery of said fatty acids by treatment of the titania filter.

2. In a process for recovering fatty acids from solutions containing the same, the steps comprising effecting chemical removal of fatty acids by passing such solution through a filter containing a substantial quantity of the mineral rutile and thereafter effecting recovery of said fatty acids by treatment of the rutile filter.

3. In a process for recovering fatty acids from solutions containing the same, the steps comprising effecting chemical removal of fatty acids by passing such solution through a filter containing a substantial quantity of the mineral brookite and thereafter effecting recovery of said fatty acids by treatment of the brookite filter.

4. In a process for recovering fatty acids from solutions containing the same, the steps comprising effecting chemical removal of fatty acids by passing such solution through a filter containing a substantial quantity of the mineral anatase and thereafter effecting recovery of said fatty acids by treatment of the anatase filter.

5. A process for the recovery of fatty acids from solutions containing the same, comprising effecting chemical removal of fatty acids by passing the solution through a filter charged with titania (TiO_2), thereafter passing steam through the filter to free the fatty acids from the filter and carry them over to a condenser, and finally evaporating the water from the resulting condensate and recovering the fatty acids as a product of the process.

6. A process for recovering fatty acids from soap solutions comprising adding a dilute acid to the soap solution to release the fatty acids from the soap by hydrolysis, passing the solution through a filter charged with titania (TiO_2) to chemically remove the fatty acid product of the hydrolysis reaction, and finally recovering the fatty acids from the filter.

7. A process for recovering fatty acids from laundry waste comprising adding to the waste a quantity of HCl to effect hydrolysis of the soap solution and release of the fatty acids, removing the fatty acids as released by effecting the hy-

drolysis in the presence of a titania (TiO_2) carrying reagent which chemically effects removal of said acids, and finally recovering the fatty acids from said titania (TiO_2) carrying reagent.

5 8. In a process for recovering fatty acids from solutions containing the same, the steps comprising effecting chemical removal of fatty acids

by passing the fatty acid solution through a filter composed of substantially inert granular material impregnated with titania (TiO_2) and thereafter effecting recovery of said fatty acids by treatment of the titania filter.

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