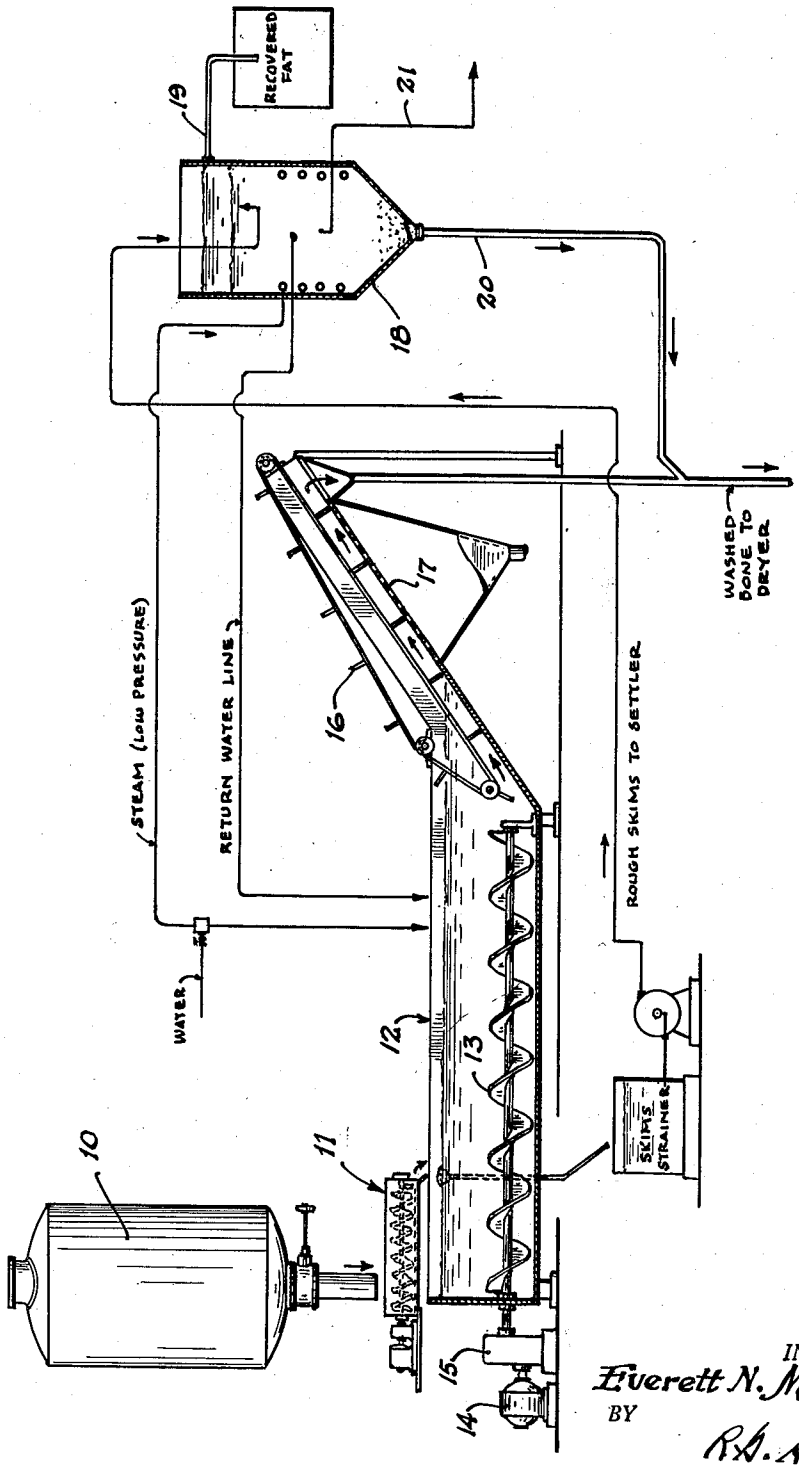
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GLUE BONE TANKAGE TREATMENT

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GLUE BONE TANKAGE TREATMENT

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The present invention relates generally to the treatment of the residue from bone glue manufacture and more particularly to an improved process for the removal and recovery of grease contained in such residue.

In normal bone glue manufacture, green or fresh bones from slaughtering operations are subjected to a repeated series of steam cooks and hot water soaks to obtain the glue in the form of light liquors which are subsequently concentrated by evaporation to heavy liquors and then dried to a solid material. As by-products from bone glue manufacture, there are recovered tallow, grease and bone tankage. The fats are rendered out of the bone and adhering meaty tissue in the course of the steam cooks and are drawn off from the glue extraction vessel at intervals during the course of the glue extraction operation. More fat is also skimmed from the top of the light liquors while they are held in receiving tanks prior to evaporation. Following the glue extraction procedure, and after the final light liquors have been drained off, the bone glue extraction tanks contain a wet, greasy bone tankage representing a residue from the original fresh bone minus the available glue materials and some of the grease.

The primary purpose of the glue extraction operation is to obtain a maximum yield of glue solids with a high gel strength and viscosity. In order to attain these results, the cooking and soaking procedure must be carried out within well-defined limits as to time, temperature and pressure for various classifications of fresh bone. As a consequence, when carried out under these limitations, the bone glue production is not necessarily an efficient fat rendering operation for fat recovery per se. Consequently the resulting residue of wet bone tankage contains normally on a dry basis from 10 to 15 per cent grease. A representative analysis of dry bone meal resulting from bone glue manufacture shows the following composition:

Dry Bone Meal Analysis	Percent
Moisture	3.00
Protein	12.00
Total P_2O_5	28.00
Fat	12.5
Residue	44.5

When the bone tankage is removed from the glue extraction tanks it comprises a wet product containing 50 per cent or more water and a conglomerate mixture of cooked bone and meaty tissue with considerable fat as is apparent from the foregoing analysis. This mixture of water-soaked material consists of both large and small particles, varying in size from extremely small bone fines and meaty materials to pieces of both, several inches long and one to two inches in diameter. Because of the prolonged cooking procedure required to obtain maximum glue yields, the resulting bone is quite soft and can be easily crushed to a powder by hand or at most by the pressure applied by stepping on the hardest pieces when placed on a concrete floor. As can be seen from the foregoing, the wet tankage is somewhat of a heterogeneous mass and not at all the clean bare pieces of bone particles which it is normally imagined result from such a cooking operation.

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It is, of course, desirable that the occluded fat in the bone tankage be removed prior to drying. The bone meal prepared from degreased tankage is of a higher quality, and in addition the fat removed and recovered in a degreasing operation is of itself quite valuable.

It is therefore an object of the present invention to provide a simple and efficient method for the degreasing of glue bone tankage.

A further object of this invention is to provide a method for the degreasing of glue bone tankage which does not require the use of surface active agents or detergents.

Additional objects if not specifically pointed out herein will be readily apparent to one skilled in the art from the following detailed description of the invention:

The drawing is a diagrammatical representation of one type of apparatus which may be used to carry out the method of the present invention.

It has now been found that a simple and efficient removal of occluded grease and fat from glue bone tankage results when the wet tankage from the glue extraction tanks is treated with hot water within a specific temperature range and under a critical degree of agitation. More specifically, the tankage is passed through a hot water bath held at a temperature between about 180° and 200° F. and, while passing through said bath, is agitated by any suitable means to a relatively small degree.

The following description of the process is illustrative only, and it is not intended to restrict the same to the apparatus disclosed. Referring to the drawing, the tankage is fed from the bone glue extraction tank 10 at a more-or-less uniform rate into tank 12 via a feeder conveyor such as illustrated at 11. This tank 12 should be of sufficient depth so that the supernatant hot water

over the bone is appreciable, i. e., from a minimum of 6 inches to a maximum of 2 to 4 feet. The amount of submergence is not critical except in so far as it relates to minimizing surface turbulence, a factor which will be further discussed below.

Within tank 12 there is mounted a suitable agitator 13. This may be a rotating worm or screw conveyor, as illustrated, either of the usual smooth, helicoid type or one with notches cut into it to give more lifting action on the solid particles. A ribbon-type screw conveyor would also be very suitable. The agitator 13 performs a double duty, i. e., it conveys the bone tankage through the tank and also agitates the tankage to permit good circulation of water therethrough. The degree of agitation is important to the success of the present invention. If the bone mass is too greatly agitated there will be an undue amount of attrition. If too many fine bone particles are produced by the agitation they will soak up the fat as soon as it is freed and retain it in the tankage. It has also been found that with too great an agitation, the fat which is freed from the bone will be re-emulsified in the dilute protein solution and will not rise to the surface where it may be recovered. Likewise, if insufficient agitation and turbulence is imparted to the bone and water respectively, not enough laundering action is produced to give good fat removal. It is therefore important that the velocity of the agitation-producing means in the water be carefully controlled. A suitable velocity has been found to range from 0.5 to 2.0 feet per second (peripheral velocity of the agitator screw). The exact velocity will be dependent upon the depth of supernatant water, since by operating with an appreciable depth of water over the actual agitated mass of bone the turbulence effect on the floating fat is less pronounced. The degree of agitation therefore must be sufficient to liberate occluded fat from the voids of the tankage, but must also be controlled to minimize surface turbulence of the water. Therefore, with a minimum of 6 inches supernatant water, the velocity should also be at the minimum of 0.5 foot per second and with 4 feet of supernatant water, the velocity should approach the maximum of 2.0 feet per second.

To provide the desired speed for the agitator screw, any suitable control and driving means may be used. These are indicated in the drawing as a motor 14 and gear reducer 15.

The bone tankage after passing through the tank 12 (wherein it should require approximately 10 minutes under the conditions given) is removed from the tank by any suitable means such as the inclined conveyor 16 illustrated in the drawing. Provision should be made for draining of the washed tankage by using perforated flights on the conveyor and providing a perforated drain section as indicated at 17. Following the draining, the tankage is transferred to conventional drying equipment (employing, for example, horizontal, jacketed tanks with internal agitators), and there dried for further processing into bone meal or the like.

The water used in the degreasing tank can circulate continuously at a more or less constant rate overflow to a suitable settling tank 18 where the fats can be skimmed off through line 19, settled sludge withdrawn intermittently through line 20 to be dried wit the degreased bone or, if preferred, dried with higher potein-content tankages, and the excess recirculated water drawn off through line 21 to the stick water evaporators. It is not imperative that a separate fat-settling basin such as 18 be provided, but for preferred operation, such a setup will give a smoother continuity to the process.

The temperature of the water in tank 12 must, like the degree of agitation, be maintained within well-defined limits. It should be within the range of about 180° to 200° F. at all times. If a lower temperature is used the fat will not be removed satisfactorily from the voids of the tankage; e. g., water at 150° F. removes only 25–30 per cent of the grease that water at about 180°–200° F. will release, while with a higher temperature there is danger that the temperature level at the point of heat application will be sufficiently high for simmering or boiling to take place with its consequent excessive agitation due to ebullition. The higher temperatures will cause excessive emulsification of the released fat with consequent poor recovery of fat. It has been found that within the temperature range disclosed tallow and most fats in general have the least cohesive action towards solid surfaces.

The following examples are given for the purpose of illustration only and are not to be construed as a limitation on the scope of the present invention:

Example I

A glue bone extraction tank such as illustrated by 10 in the drawing is charged with 12,000 pounds of fresh cattle bone and subjected to the usual series of cooks and washes with steam and hot water to remove the major portion of the glue substance, plus a portion of the grease, from the bone material. Following the conventional glue recovery steps recited above, the wet tankage is fed at the rate of about 1800 pounds per hour to the grease recovery apparatus illustrated in the drawing. The water in washer tank 12 is held at about 180° F. (the lower limit of the preferred temperature range), the depth of supernatant hot water above the tankage in tank 12 is about 6 inches, and the peripheral velocity of the agitator screw 13 is maintained at about 0.5 foot per second. Under these conditions, an hourly grease recovery of about 43 pounds per hour is obtained, or approximately 40 per cent recovery of the total grease contained in the tankage (i. e., based on feeding wet bone tankage containing 12 per cent fat on the dry basis).

Example II

Following the general procedure outlined in Example I and the preceding description of the apparatus in the drawing, but changing the temperature of the water in tank 12 to about 200° F., increasing the depth of submergence of the tankage in said tank from about 6 inches to about 4 feet, and increasing the peripheral velocity of the agitator screw to approximately 2 feet per second, an improvement in the amount of grease recovery is noted. Under these conditions, and based on an 1800 pound per hour feed of wet bone tankage containing 12 per cent fat on the dry basis, the grease recovery is approximately 50 per cent of total grease contained in the tankage, or about 54 pounds of grease per hour.

This method of degreasing may be modified slightly so as to apply to grease removal from other fat-bearing materials where the fat is more or less mechanically entrapped in voids and inverted crevices of the solid phase. The method

is not limited to the apparatus disclosed but may be carried out by any suitable means.

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 claims.

I claim:

1. A method for degreasing glue bone tankage having fat particles occluded therein, which comprises: conveying said tankage in a submerged state through a hot water zone maintained at atmospheric pressure and a temperature within the range of about 180° to 200° F.; agitating said tankage passing through said zone to a degree equivalent to that produced by an agitator having a peripheral velocity between 0.5 and 2.0 feet per second; removing the floating fat particles liberated from said tankage by said agitation; and then removing the degreased tankage from said zone.

2. A method for degreasing glue bone tankage and the like having fat particles occluded

therein comprising: submerging said tankage within a container maintained at atmospheric pressure and beneath the surface of water having a temperature within the range of about 180° F. to about 200° F.; gently agitating said tankage beneath said water to liberate particles of fat occluded in the voids of said tankage, said agitation being insufficient to cause substantial surface turbulence of said water; removing the liberated fat particles from the surface of said water; and removing the degreased tankage from said container.

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