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CONTINUOUS PROCESS AND APPARATUS FOR REFINING GLYCERIDE OILS

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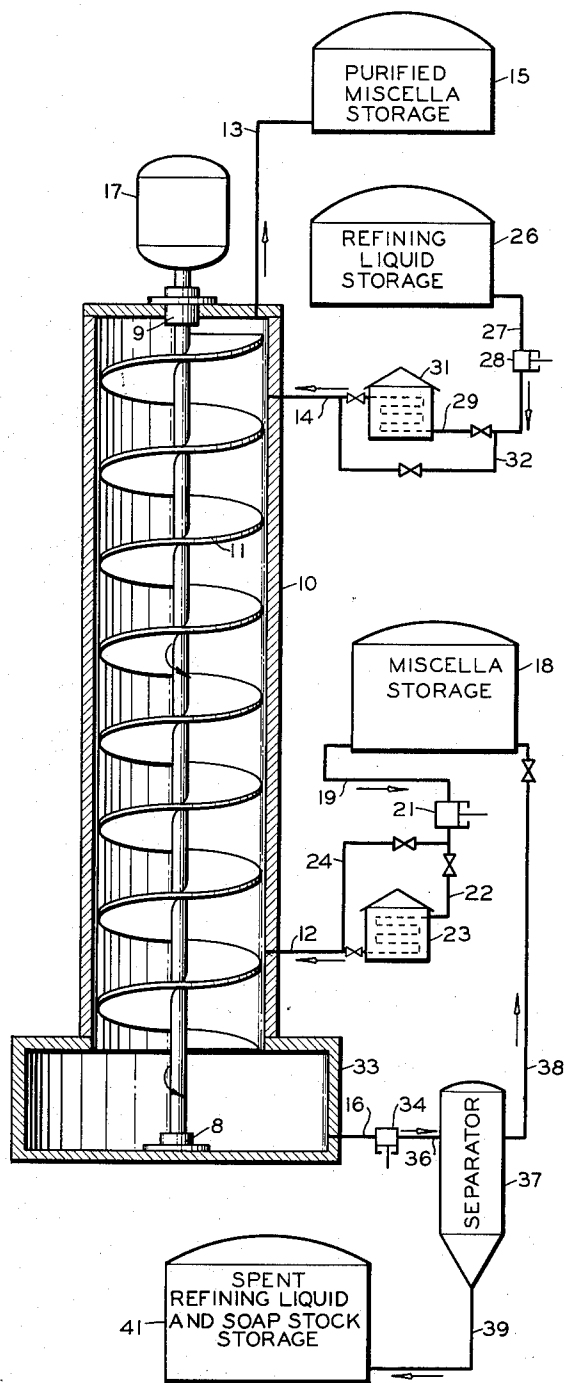


FIG. 1.

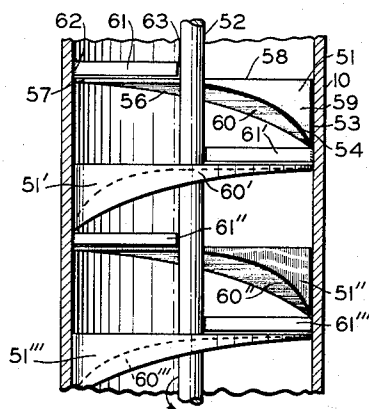


FIG. 2.

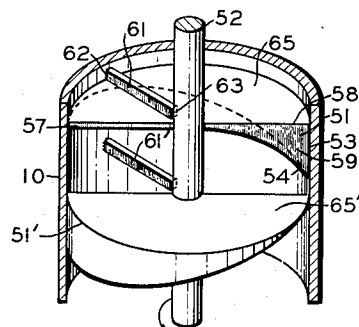


FIG. 3.

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CONTINUOUS PROCESS AND APPARATUS FOR REFINING GLYCERIDE OILS

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10 Claims. (Cl. 260—425)

This invention relates to refining glyceride oils. In one embodiment this invention relates to a process for refining glyceride oils, wherein soapstock is continuously removed from the refining system. In another embodiment this invention relates to apparatus providing for the continuous removal of soapstock from the refining system, in a process for refining glyceride oils.

The glyceride oils with which this invention is concerned, are animal and vegetable oils, the latter of which are obtained from seeds, usually by pressing or by extraction with a suitable solvent. Some of the commonly used glyceride oils are linseed oil, tung oil, soy bean oil, cotton seed oil, corn oil, and peanut oil. These oils have wide utility in the preparation of foods, and as film forming constituents, such as in paints, varnishes, enamels, synthetic resins, soaps, plastics, drug products, and the like.

Ordinarily, glyceride oils, both those obtained by pressing and by extraction with solvents, contain about 0.5 to 2 per cent of phosphatides and 1 to 2 per cent of free fatty acids. In addition, there is a certain content of color bodies, non-drying constituents, and materials which cause "break" or sludge formation upon heating. In preparing oils for such industrial uses it is necessary that these undesirable constituents be removed.

Various methods for refining these oils, involve contacting the oil, either as a raw or crude glyceride oil or as a "miscella," i. e. a solvent-oil mixture, with a refining liquid, such as an aqueous solution of sodium hydroxide, potassium hydroxide, sodium carbonate, sodium phosphate, or aqueous mixtures of such materials. In refining a raw glyceride oil in this manner, impurities of the type above discussed, as phosphatides, fatty acids, color bodies, and mucilaginous materials are removed from the oil, and concomitantly precipitate as a sludge, termed in the art as refining sludge or more commonly, as "soapstock." A glyceride oil substantially free of these impurities, is recovered from the refining system as a product of the process.

In refining glyceride oils in this manner, soapstock deposits and accumulates on the equipment parts in the refining system and is ordinarily removed only by terminating the refining treatment, removing the liquids from the system and manually freeing these accumulated solids from the equipment parts. Accordingly, when attempting to refine a glyceride oil on a continuous flow basis, in the manner above discussed, great operating difficulty is encountered as a result of a rapid accumulation of soapstock and a consequent stoppage or plugging of the flow system. This is particularly true when attempting continuous flow operation wherein an aqueous refining liquid is passed downwardly in countercurrent flow relation with the raw oil, or the miscella, in a packed column, in which case stoppage of the column is rapidly effected by accumulations of soapstock on the packing and on the interior surface of the column.

Successful continuous flow operation of a glyceride oil refining process of the type above discussed, has also been

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difficult to achieve from the standpoint of effecting uniform contact of refining liquid with oil or miscella, since emulsification of refining liquid with oil phase often occurs if agitation is too great, and under-refining results if agitation is too slight; the tolerance inherent in effecting the desired degree of agitation being very limited in numerous instances so that either emulsification or under-refining often accompany the continuous flow refining treatment.

This invention is concerned with refining glyceride oils, on a continuous-flow basis in a manner preventing the accumulation of soapstocks in the refining system, and effecting the necessary degree of agitation of liquids, providing thereby for continuously refining glyceride oils, over long operating periods uninterrupted by stoppage or plugging, of the type above discussed, and for the proper agitation of liquids to effect the desired refining efficiency.

An object of my invention is to provide a continuous-flow process for refining a glyceride oil.

Another object is to provide apparatus for continuously refining glyceride oils.

Another object is to provide for refining a glyceride oil maintained in countercurrent flow relation with an aqueous alkaline refining agent and for continuously removing soapstock concomitantly formed during the refining operation, from the flow system, whereby continuous-flow refining is conducted over prolonged operating periods.

Another object is to provide for controlling the degree of agitation of liquids in a continuous-flow process for refining glyceride oils.

Other objects will be apparent to those skilled in the art from the accompanying disclosure and discussion.

In accordance with my invention a glyceride oil is refined in contact with a liquid refining agent, in a continuous flow-system over prolonged operating periods. Soapstock concomitantly formed during such a refining operation, and ordinarily accumulating on equipment parts to obstruct flow of materials, is continuously removed from the flow system, thus eliminating any need for terminating flow to remove flow-obstructing soapstocks, and providing for operating periods of any desired duration. The agitation of liquids in the flow system is controlled to effect the desired degree of their contact, without obtaining emulsification or under-refining.

In a broad embodiment, my invention provides for refining a raw glyceride oil or miscella, by contacting same in countercurrent flow relation with a liquid refining agent substantially immiscible therewith, such as an aqueous solution of sodium hydroxide, potassium hydroxide, sodium carbonate, sodium phosphate and the like, or an aqueous mixture of such materials, and simultaneously agitating the mixture of flowing liquids and concomitantly removing soapstocks from the flow system.

In one embodiment I maintain the countercurrent flow system in a vertically disposed closed cylindrical chamber containing an axially disposed screw of a selected overall diameter approaching that of the cylindrical chamber, and agitate the countercurrently flowing materials by rotating the screw at a predetermined rate to provide uniform contact of the flowing materials and to produce a downward thrust on the flowing liquids, whereby a predetermined portion of the soapstock accumulating on the walls of the chamber is concomitantly scraped free of the walls by action of the screw threads, and soapstock ordinarily tending to deposit on the screwthreads is displaced therefrom by mechanical action of flowing liquids. The free soapstock is moved downwardly in the vertical chamber, and is discharged therefrom at a point near the bottom.

In another embodiment I can maintain the counter-

current flow system in the same vertically disposed cylindrical chamber, but instead of utilizing a screw or worm, as described above, I employ a plurality of screw segments in the cylindrical chamber, axially disposed therein in close proximity to the other. Each screw segment has a radial dimension in the same range as that of a screw of the type above discussed, a top horizontal surface bound by a sector of a circle and a helical bottom surface, i. e. the surface of a helical screw as its bottom surface. A horizontally extending blade member having a blade side extending downwardly is disposed above the top surface of each screw segment, terminating in close proximity thereto, to scrape free any accumulated soapstock from the top surface, as the screw segment is rotated. The screw segments operate cooperatively to provide substantially the same type agitation of the flowing liquids and the concomitant removal of soapstock from the chamber walls, as provided by the use of the axially disposed screw discussed above. The bottom surface of each axially disposed screw segment is inclined in the same direction about the axis. When employing this embodiment, a very minor proportion of the inner chamber wall surface, commensurate with the vertical dimension of the knife blade is not accessible to scraping action of the screw segment, in order to permit attachment of one end of the blade thereto. However, an accumulation of soapstock on such a relatively small surface is not serious, since such small amounts of material are readily washed free from the chamber walls by the flowing liquids moving in the countercurrent system. Soapstock freed from the chamber walls is moved downward in the cylindrical chamber in a large part along the helical bottom surface of each succeeding screw segment and is withdrawn from the chamber at a point in the bottom portion thereof, along with refining liquid at least partially spent, during the countercurrent flow contact with the impure glyceride oil, and any entrained oil.

In order to more clearly present my invention, reference is made to the diagrammatic drawings, each illustrative of various embodiments of my invention. Figure 1 includes a cross sectional elevation of apparatus comprising a closed cylindrical vertically disposed chamber containing an axially disposed rotatable screw member, wherein raw glyceride oil, or a miscella, is contacted countercurrently with a liquid refining agent, and the soap stock ordinarily accumulating on the chamber wall surfaces is concomitantly removed from the chamber wall. Also included in Figure 1 is a diagrammatic flow sheet associated with the apparatus in cross section, illustrative of one embodiment of the process of my invention. Figure 2 is a cross sectional view of a plurality of screw segments disposed in a vertically disposed cylindrical refining chamber, each in combination with a knife member, and adapted to accomplish much the same purpose accomplished by the screw embodiment of Figure 1, except that an additional positive scraping action is provided for removing soapstock from the screw segment. Figure 3 is a cross sectional view further illustrating the embodiment of Figure 2. It is to be understood that the drawings are diagrammatic and can be altered in many respects by one skilled in the art and yet remain within the intended scope of my invention.

With reference to Figure 1, vessel 10 is a closed vertically disposed cylindrical chamber in which a raw glyceride oil, or a raw miscella, is contacted countercurrently with a substantially immiscible refining liquid such as for example an aqueous alkaline solution, of the type discussed above, to remove such impurity materials therefrom as phosphatides, color bodies, mucilaginous materials, and the like. Rotatable screw 11 is axially disposed in chamber 10, preferably through the entire chamber length, for the purpose of producing agitation of the mixture of liquids in countercurrent flow, and for concomitantly removing soapstocks from chamber 10, as discussed hereafter. End portion 33 is disposed as a sump

to receive materials from chamber 10 for discharge. Screw 11 is rotatably connected to the interior wall of the top of chamber 10 by bearing means 9, and to the interior bottom side of sump 33 by bearing means 8. Inlet conduit 14 and outlet conduit 16 provide respectively for admitting liquid refining agent into chamber 10, and withdrawing refining agent at least partially spent, together with soapstock and any entrained glyceride oil, from the bottom of chamber 10 through sump 33. Inlet conduit 12 and outlet conduit 13 respectively provide for admitting untreated oil or miscella into the lower portion of chamber 10 and for withdrawing treated oil from the upper portion of chamber 10. Line 16 is connected with chamber 10 at a point below line 12, and line 14 is connected with chamber 10 at a point below line 13.

Screw member 11 is preferably disposed through the entire length of chamber 10, has a pitch of from 0.2 to 2 times the diameter of chamber 10, and an overall diameter less than the diameter of chamber 10 but equal to at least 95 per cent of that diameter, and is thereby adapted to maintain its threads in close proximity to the inner walls of chamber 10. Rotating means 17 is connected to rotatable screw 11 to rotate same in a direction to produce a downward thrust on the mixture of countercurrently flowing liquids in chamber 10. Rotating means 17 is usually a motor geared down to rotate screw 11 at a predetermined rate, generally within the limits of from 1 to 1000 R. P. M.

In the operation of the process embodiment illustrated in Figure 1, crude miscella is withdrawn from storage tank 18 through line 19 by pump 21, and discharged from pump 21 through line 22 into preheater 23, heated therein and then passed into a bottom portion of chamber 10 at the requisite temperature for treatment therein, through line 12. If desired, miscella can be passed around heater 23 from line 22, through lines 24 and 12 into chamber 10. While charging miscella to chamber 10, a refining liquid such as aqueous sodium hydroxide, is withdrawn from storage 26 through line 27 by pump 28, and discharged through line 29 into preheater 31, preheated therein to the desired temperature for the use in chamber 10, and discharged from preheater 31 through line 14 into a top portion of chamber 10. When desired, liquid in line 29 can be passed around heater 31 through line 32 and introduced into chamber 10 through line 14. Miscella and aqueous refining liquid are contacted in countercurrent flow relation in chamber 10 at a temperature preferably in the range of from about 0 to 100° C., for a contact time sufficiently long to effect refining of this oil and usually from about 1 to 60 minutes, and at a pressure sufficiently high to maintain the system in liquid phase. The refining solution is generally an aqueous alkaline refining liquid containing from about 3 to 25 weight per cent of an alkali metal hydroxide, an alkali metal carbonate, or an alkali metal phosphate, or the like, and is introduced into chamber 10 in an amount to provide from 0.02 to 5 parts by weight of the alkali metal solute, per 100 parts by weight of oil treated, the exact refining conditions selected for the operation of chamber 10 being dependent on the specific miscella treated. A suitable solvent often employed, i. e. that in the miscella, is preferably a hydrocarbon containing from 5 to 7 carbon atoms in the molecule such as normal pentane, normal hexane, normal heptane, isohexanes, isopentane, or the like. The concentration of oil in the miscella may range from as low as 5 per cent by weight or lower to as high a value as desired, or, a raw undiluted crude glyceride oil can be treated. Preferably, however, the miscella contains from about 1 part of raw glyceride oil to about 1 to 6 parts by weight of a hydrocarbon solvent of the type above mentioned. A typical commercial miscella of the type refined herein, contains from about 15 to 30 weight per cent crude glyceride oil. When requiring cooling of either or both feed

streams to chamber 10, units 23 and 31 can be employed as coolers.

During the treatment above described, it is important to agitate the mixture of countercurrently flowing liquids to provide their sufficient contact in order to efficiently refine the oil. However, the more extensive the refining of crude glyceride oil, the greater the amount of soapstock deposited during that treatment, and consequently the greater the accumulation of such materials on the equipment parts in contact with the countercurrently flowing liquids. These difficulties are overcome by rotating screw member 11 in a direction to produce a downward thrust on the mixture of countercurrently flowing liquids in chamber 10. Screw 11 when being thus rotated, at a rate within the limits preferably of 1 to 200 R. P. M., causes soapstock to be removed from the system and to be passed downwardly therein for discharge. When screw member 11 is rotated as above described, the threads moving in close proximity to the chamber walls scrape soapstock free from the wall of chamber 10, forcing the freed soapstock downward in chamber 10, in a large part along the bottom thread surfaces. Screw member 11 when rotated at the predetermined rate, agitates the countercurrently flowing liquid mixture to the extent that intermingling of miscella and refining agent is complete to the requisite degree for completely refining the oil. The miscella passes around the threads of the screw and up through the column against the downflowing refining liquid and it is withdrawn in purified form from the top of chamber 10 through line 13, and passed into storage 15. During the refining treatment in chamber 10, soapstock may tend to settle on the thread surfaces of screw member 11. However, by virtue of the helical contour of threads on screw 11, any soapstock tending to accumulate thereon is washed substantially free by the force of the agitated countercurrently flowing liquids, and is urged downwards toward the bottom of chamber 10. The total refining liquid, at least partially spent, together with a soapstock and any entrained miscella is passed from the bottom part of chamber 10 into sump 33, withdrawn from sump 33 through line 16 by means of pump 34, and discharged through line 36 into separator 37, where any entrained miscella therein is separated, and forms a separate layer. Miscella in zone 37 is passed from separator 37 through line 38 to miscella storage zone 18. Soapstock and at least partially spent refining liquid, are withdrawn from separator 37 through line 39 and passed into storage 41.

The rate of rotation of screw 11 is adjusted to provide maximum refining efficiency, and is sufficiently high to cause soapstock to be moved from chamber 11 as it is formed. As above stated, speeds in the range of from 1 to 1000 R. P. M. will usually be employed, although more generally, a rate of from 1 to 200 R. P. M. will be utilized. In any event the rate of rotation of screw 11 will be maintained within a limit such that emulsification of the oil and water phases is prevented.

In the practice of the process of my invention it is not at all necessary that the accumulation of soapstock be completely removed from the inner walls of chamber 10. It is important that a predetermined portion of such an accumulation be removed so that the accumulation will not exceed a certain predetermined amount. Accordingly I can adjust the over-all diameter of screw 11, so that although it is less than the diameter of chamber 10 it may be very nearly equal to said chamber diameter or it can be as low as 95 per cent of that chamber diameter. In the latter instance it is obvious that a layer of a maximum thickness, of 5 per cent of the radius of chamber 10, will be maintained on the inner chamber wall. I have found in some instances that it is advantageous to operate with a small accumulation of soapstock on the chamber walls, and that the selection of a screw 11 having an over-all diameter within the limits above described, provides for maintaining such a suitable soapstock accumulation.

As I have already stated, soapstock tending to accumulate on the thread surfaces of screw member 11 is washed substantially free therefrom by force resulting from the contact of the thread surfaces with the highly agitated flowing liquids in chamber 10. However, in some instances it is possible that a minimum accumulation may build up on the top thread surfaces of screw 11. In Figure 2 I have illustrated an embodiment employing a plurality of screw segments in combination with knife means for scraping any deposited soapstocks free from each screw segment top surface.

Figure 2 is illustrative of the use of a plurality of screw segments each axially attached to a shaft running through chamber 10 and axially disposed therein. Each screw member has a horizontal top surface bound by a sector of a circle, a bottom helical surface, a maximum element of from 0.3 to 3 times the diameter of chamber 10, a minimum element of from 0.005 to 0.2 times the diameter of chamber 10, and a radius less than the radius of the cross section of chamber 10 but equal to at least 95 per cent thereof. Each screw member is axially attached to the shaft at a predetermined vertical distance from the other, and has its bottom surface inclined in the same direction about the shaft as the other, so that when the shaft is rotated in a predetermined direction, each of the screw segments produces a downward thrust on the mixture of countercurrently flowing liquids.

With reference to Figure 2, screw segment 51 in chamber 10 is axially attached to rotatable shaft 52, said shaft being axially disposed in chamber 10, and preferably extending through the length of chamber 10. Screw segment 51 has a top horizontal surface 65 (65 shown in Figure 3) bound by a sector of a circle illustrated in this case, as a semi-circle. Maximum element 53, minimum element 57, horizontal top line 58 and helix 54 define the front surface 59 of screw segment 51, and helices 54 and 56 bound the bottom helical surface 60 thereof. Horizontally disposed knife member 61 is secured to the inner wall of chamber 10 at 62 and extends radially toward shaft 52. If desired, member 61 can be operatively attached to shaft 52 at 63, as for example by a slip ring. The blade edge of member 61 is disposed in a direction toward top surface 65 and is terminated out of contact therewith, but within a distance not exceeding 5 per cent of the radius of chamber 10. As shaft 52 is rotated by rotating means 17, a predetermined portion of any accumulated soapstock on top surface 58 is scraped free therefrom and moved in a downward direction in chamber 10. Front surface 59 diminishes in depth in a direction toward minimum element 57, providing thereby a relatively sharp edge for effectively severing any suspended solids from knife 61 and causing them to pass downwardly along bottom surface 60 of screw segment 51 toward the bottom of chamber 10. Disposed vertically below screw segment 51 is another axially disposed screw segment 51', identical in design to screw segment 51, and preferably having corresponding parts of the same dimensions, although if desired, the dimensions of those corresponding parts can be varied within the limits described in the discussion above of screw element 51. The minimum vertical distance between screw segments 51 and 51' is equal to the vertical dimension of knife member 61' and it is that vertical portion of the inner wall of chamber 10 that is not scraped. Similarly, screw segments 51'' and 51''', each identical in design to segment 51 are disposed in chamber 10 to continue a series of such segments throughout chamber 10.

Although screw elements 51 and 51' can be disposed in any relative angular position about the shaft, I prefer generally that each be disposed with respect to the other at an angle of from 30 to 180°, and when each horizontal top surface is bound by a semi-circle as illustrated herein, I prefer that they be disposed with relation to the other at an angle of 180°.

As illustrated in Figure 2, when a series of screw seg-

ments is disposed throughout chamber 10 as illustrated by the relative positions of segments 51, 51', 51'', and 51''', together with corresponding knife members 61 and 61', 61'' and 61''' a similar agitating action and scraping action is obtained in the removal of soapstock from the walls of chamber 10, as is obtained with screw member 11, illustrated in Figure 1, except that in addition to the benefits accruing from the operation of the embodiment of Figure 1, a positive scraping action is provided for removing soapstock tending to accumulate on the screw segment member.

Screw segments 51, 51', 51'' and 51''' together with other screw segments of the same design axially disposed in chamber 10 therewith, provide for moving solids downwardly through chamber 10 along the plurality of bottom surfaces 60, 60', 60'', 60''' etc., so that the overall effect in removing soapstocks from the chamber walls and passing same downwardly through chamber 10, is the same as that illustrated in the embodiment of Figure 1.

With reference to Figure 3 a perspective view of a plurality of screw segments 51, 51', etc. and knife members 61, 61' etc. in chamber 10, is shown, to more clearly illustrate a preferred manner in which a plurality of such screw segments and knife members can be disposed in a refining chamber 10.

Obviously any desired number of such a plurality of screw segments and knife members can be employed to complete the system illustrated. In many instances as many as from 2 to 20 such screw segment-knife member units, or more, can be advantageously employed.

My invention is illustrated by the following example. The reactants, their proportions, and other specific ingredients are presented as being typical and should not be construed to limit the invention unduly.

Example I

A raw cottonseed oil miscella, containing 20 per cent oil and 80 per cent n-hexane by volume, was refined while maintained in counter-current flow relation at 78° F. with an 8 weight per cent aqueous solution of sodium hydroxide, in a vertically disposed glass tube 6 ft. in length and 1.75 inches in diameter, containing an axially disposed rotatable screw having an overall diameter of 1.70 inches and being revolved at 50 R. P. M. to produce a downward thrust on the mixture of counter-currently flowing liquids. The screw was composed of a metal tube approximately 0.5 inch in diameter around which was attached a fin approximately 0.030 inch thick. The fin was attached to the body of the screw in the form of a helix, having a pitch of 0.5 inch.

Subjacently connected to the vertical glass tube was a sump tank to which aqueous refining liquid, previously employed in the counter-current flow system together with other materials as soapstock, entrained oil, etc., was passed from the glass tube for ultimate discharge for further utilization.

In initiating the refining operation, the sump tank was filled with water and the glass column was charged with 2 liters of the miscella described above. Aqueous 12° Baumé sodium hydroxide solution was then introduced into the upper portion of the column. About 15 minutes after the aqueous sodium hydroxide was added, the flow of miscella into the column was resumed. Raw miscella admitted into the lower part of the column was very dark in color, and the oil therein contained from 1.5 to 2.0 weight per cent free fatty acids. Refined miscella was withdrawn from the top of the column, and refining solution, at least partially spent, together with other materials as described above, was withdrawn from the sump tank below the column. Miscella withdrawn from the column was pale straw yellow in color. Substantially all of the free fatty acids were removed from the oil in this counter-current flow operation.

At the end of this run the glass column and rotatable screw were substantially free of soapstock.

Example II

A run was made in accordance with the procedure of Example I except that the screw was not employed and a glass column about 1/2 inch in diameter, packed with 1/4" helices, was used. Countercurrent flow was initiated at the same rate and in the same manner as described in Example I. Only a slight refining effect was obtained until the helices were coated with soapstock. Operation was maintained at a temperature of 125 to 150° F. and proceeded uninterrupted for about 30 minutes. However, after about 45 minutes of operation accumulation of soapstock on the packing surfaces and on the chamber walls was as great as to completely obstruct flow of liquid through the packing at which time operation was necessarily discontinued.

Although this process has been described and exemplified in terms of its preferred modifications, it is to be understood that various minor changes may be made without departing from the spirit and scope of the disclosure and of the claims.

I claim:

1. An apparatus for refining a glyceride oil in counter-current flow relation with a heavier liquid refining agent and providing for continuous removal of soapstock from the flow system, comprising a closed vertically disposed cylindrical chamber; oil inlet means in a bottom portion of said chamber for admitting untreated oil thereinto; oil outlet means in a top portion of said chamber for discharging treated oil therefrom; inlet means in a top portion of said chamber for admitting liquid refining agent into said chamber and disposed at a point below said oil outlet means; outlet means in a bottom portion of said chamber for discharging liquid refining agent therefrom at least partially spent together with soapstock, and disposed at a point below said oil inlet means; an axially disposed rotatable shaft in said cylindrical chamber; a first screw segment, having a bottom helical surface, axially attached to said shaft, and having a radius less than the cross sectional radius of said chamber but not less than 95 per cent of said chamber radius; a first horizontally disposed plate member bound by a sector of a circle, and positioned above said screw segment and affixed to said screw segment; said first screw segment and said first plate member being spaced apart by a maximum element of from 0.3 to 3 times the diameter of said chamber and by a minimum element not exceeding from 0.005 to 0.2 times the diameter of said chamber; a horizontally extending blade member above said first plate member fastened at one end to the wall of said chamber, and having its blade side disposed in a direction toward the top surface of said first plate member and terminating out of contact therewith but within a vertical distance thereof not exceeding 5 per cent of said chamber radius; a second screw segment having a bottom helical surface, axially attached to said shaft, and having a radius less than the cross sectional radius of said chamber but equal to at least 95 per cent of said chamber radius, a second horizontally disposed plate member bound by a sector of a circle, and positioned above said second screw segment and affixed to said screw segment; said second screw segment and said second plate member being spaced apart by a maximum element not exceeding from 0.3 to 3 times the diameter of said chamber and by a minimum element not exceeding from 0.005 to 0.2 times said chamber diameter; said second screw segment and said second plate member together being spaced a predetermined vertical distance from said first screw segment and said first plate member and said second screw segment having its bottom surface inclined in the same direction about said axis as that of said first screw segment; a second horizontally extending blade member above said second plate member fastened at one end to

the wall of said chamber and at the other end to said shaft, and having its blade side disposed in a direction toward said top surface of said second plate member and terminating out of contact therewith but within a distance thereof not exceeding 5 per cent of said chamber radius; drive means for rotating said shaft in a predetermined direction to produce a downward thrust from one of said screw segments, whereby the other of said screw segments is also rotated to produce a downward thrust, and each said screw segment and associated plate member when rotated scrapes free a predetermined portion of any soapstock accumulated on the walls of said chamber, and on the top surface of its horizontal plate, and moves the freed soapstock in a downward direction in said chamber.

2. The apparatus of claim 1 wherein said first screw segment is disposed with respect to said second screw segment at an angle within the range of from 30-180°.

3. The apparatus of claim 1 wherein the said horizontal plate associated with each said screw segment is bound by a semicircle and said first screw segment is disposed with respect to said second screw segment at an angle of 180°.

4. In a process for refining a glyceride oil, wherein an aqueous alkaline-oil treating agent is passed in countercurrent flow relation in an upright contacting chamber with said glyceride oil and solid soap stock is formed and obstructs flow of countercurrently flowing liquids, the improvement comprising agitating the mixture of countercurrently flowing liquids so as to impose a thrust in a downwardly spiral direction through said mixture of liquids and simultaneously scraping solid soap stock from the walls of said chamber, whereby soap stock tending to obstruct said countercurrent flow is concomitantly passed continuously downward in said chamber together with aqueous alkaline treating agent at least partially spent and is prevented from accumulating and obstructing the flow of countercurrently flowing liquids in said chamber.

5. In a process for refining a glyceride oil, wherein an aqueous alkaline oil treating agent is passed in countercurrent flow relation in an upright contacting chamber with the glyceride oil to remove fatty acids therefrom, the improvement providing for continuous agitation of said countercurrently flowing liquids to effect said removal of fatty acids without forming an emulsion of said oil and treating agent, and for the continuous removal from the treating zone of solid soap stock concomitantly formed and adhering to the walls of said zone, comprising imposing a continuous thrust in a downwardly spiral direction through said countercurrently flowing liquids and simultaneously scraping solid soap stock from the walls of said chamber while completing each 360° of said thrust at the rate of from 1 to 200 times per minute to convert said fatty acids to soaps and to prevent emulsification of said treating liquid to said oil, whereby said oil is refined without emulsification with said aqueous agent, and soap stock concomitantly formed and adhering on the walls of said zone to obstruct said countercurrent flow is concomitantly passed continuously downward in said chamber together with aqueous alkaline treating agent at least partially spent, continuously withdrawing soap stock and partially spent aqueous treating solution from a lower portion of said treating zone, and continuously withdrawing oil free from fatty acids and unemulsified with water, from an upper portion of the zone of said countercurrent contacting.

6. The improvement of claim 5 wherein said alkaline treating agent is an aqueous alkali metal hydroxide.

7. A countercurrent flow process for refining a glyceride oil, comprising introducing untreated oil into a lower portion of a cylindrical chamber, introducing aqueous alkaline oil-treating agent into an upper portion of said chamber, passing said aqueous agent in downward countercurrent flow relation with said oil in said chamber, whereby soapstock is concomitantly formed and deposits on the walls of said chamber, agitating the mixture of countercurrently flowing liquids and concomitantly passing soapstock downwardly in said chamber by continuously scraping said walls, withdrawing at least partially spent refining agent and soapstock from the lower portion of said chamber, and withdrawing refined oil from an upper portion of said chamber.

8. In a countercurrent flow-type process for refining a glyceride oil by contacting such an oil with an aqueous alkaline treating agent, wherein soapstock is concomitantly formed and deposits on the walls of a chamber forming the zone of said contacting, the improvement comprising agitating the resulting mixture of countercurrently flowing liquids and concomitantly passing soapstock from said chamber by scraping the said chamber walls, and removing the said soapstock from the zone of said contacting.

9. A countercurrent flow process for refining a glyceride oil, comprising introducing untreated oil into a lower portion of a cylindrical chamber; introducing aqueous alkaline oil-treating agent into an upper portion of said chamber; passing said aqueous agent in downward countercurrent flow relation with said oil in said chamber, whereby soapstock is concomitantly formed and deposits on the walls of said chamber; agitating the mixture of countercurrently flowing liquids and concomitantly passing soapstock downwardly in said chamber by continuously scraping said walls; withdrawing at least partially spent refining agent and soapstock from the lower portion of said chamber; withdrawing refined oil from an upper portion of said chamber; and effecting said agitating by rotating at least one axially disposed helical screw segment in said chamber, having a radius equal to at least 95 per cent of the radius of said chamber, to produce a downward thrust.

10. Apparatus comprising an upright cylindrical chamber; an axially disposed rotatable shaft in said chamber; a screw segment in said chamber, having a bottom helical surface, and axially attached to said rotatable shaft; a horizontally disposed plate member bound by a sector of a circle, positioned in said chamber above said screw segment, and affixed to said screw segment.

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