

UNITED STATES PATENT OFFICE

2,209,904

PROCESS OF REFINING SOYBEAN OIL

Anderson W. Ralston and Victor Conquest, Chicago, Ill., assignors to Armour and Company, Chicago, Ill., a corporation of Illinois

No Drawing. Application September 2, 1938,
Serial No. 228,258

3 Claims. (Cl. 260—425)

This invention relates to processes of refining soybean oil and it comprises processes wherein crude soybean oil prior to refining with caustic alkalis is subjected to a brief heat treatment in an inert atmosphere, and the oil then refined with caustic alkali as usual in the art.

Soybean oil is an oil of increasing economic importance. It has not, however, enjoyed popularity as an edible oil or as an ingredient in food materials such as salad dressing. Soybean oil is objectionable for these purposes because of a characteristic "beany" odor and taste. This property of the oil is very difficult to remove permanently. When refined soybean oil is deodorized by the usual steam treatment under vacuum a bland oil is obtained. With time, however, the "beany" odor and flavor will return. After a few weeks the oil refined by the usual methods reverts to its original undesirable flavor and odor. It is this phenomenon of reversion which has militated against the use of soybean oil in large scale edible uses. Hydrogenation of the oil to a point consistent with practical uses in the edible field does not satisfactorily deodorize it.

In consequence the art has long desired some way by which soybean oil could be refined to give a product which would remain permanently sweet and bland.

We have discovered that if the crude, unrefined soybean oil, prior to caustic refining, is heated in an inert atmosphere for a brief period, not usually exceeding ten minutes, and thereafter refined with caustic alkali in the usual way, the finished oil no longer reverts on standing.

We are not certain as to what happens during the heat treatment. Most probably those oil soluble substances, possibly of protein nature, which cause the development of the beany odor, are polymerized and rendered insoluble. After the heat treatment the oil has a very unpleasant taste and odor. The oil darkens materially in color. During the subsequent alkali refining process the polymerized materials separate with the foots and a light colored, odorless oil is obtained. After the alkali refining we can, of course, bleach the oil with a decolorizing carbon or clay. We can also subject the oil after alkali refining to the usual steam treatment under vacuum should that be found desirable.

In essence then our invention comprises the heat treatment of the soybean oil in an inert atmosphere for a brief time prior to alkali refining. We are aware, however, that others have subjected certain vegetable oils, such as palm oil, to heat treatment for the purpose of decolorizing

the oil. When heat treatment is used for this the time is generally prolonged up to an hour or more as described, for example, in British Patent 327,990. Likewise, it is common to deodorize and bleach oils with heat after the oil has been refined with alkali. In our invention the heat treatment precedes refining. We avoid the use of steam during our preliminary treatment processes.

We shall now give examples of ways of practicing our invention. Since the fundamental gist of our process is in the brief heat treatment of the oil we simply maintain the crude oil in a suitable container into which an inert gas, such as carbon dioxide or nitrogen, can be pumped to replace the air therein. The usual temperature is about 260° C. to 275° C. and it is advantageous to agitate the oil moderately. For example, we charge a steel tank with about 100 gallons of the crude oil and blow in carbon dioxide or nitrogen to replace the normal atmosphere. The oil is then brought to a temperature of 260° C. as rapidly as possible and held at this temperature for ten minutes. Thereafter the oil is allowed to cool and refined with caustic alkali solution. The amount of caustic solution used should be enough to neutralize about one and a half times the amount of free fatty acids present in the oil. After separation of the foots in the usual way the refined oil can then be bleached.

Instead of heating the oil in a closed container we can pump the oil through a heated pipe, such as a pipe still, maintained at the above temperatures and so regulate the flow of the oil that the heating period does not exceed about five to ten minutes. The hot oil can then be cooled in a continuous manner and fed directly to the alkali refining stage. We carefully avoid prolonged heating periods such that the viscosity of the oil would materially change as a result of polymerizing glycerides present. Soybean oil is a semi-drying oil and readily polymerizes or thickens on prolonged heating. Consequently, we heat only long enough to institute changes in those substances in the oil which lead to objectionable odor and flavor.

As stated, the oil after discharge from the heating tank or pipe still is very dark in color and has a pungent odor. Color and odor are removed during the subsequent alkali refining process. We know of no other oil which exhibits the same behaviour as soybean oil on brief heat treatment. Cottonseed oil, for example, if heated for ten minutes at the temperatures stated above darkens in color and subsequent alkali refining will not remove this developed color, nor will

bleaching. In addition, when cottonseed oil is treated by our process the flocs formed as a result of alkali refining will not break. On the other hand, although our heat treatment greatly darkens the soybean oil the color is discharged during alkali refining and the flocs break readily.

Although we find it best to use a heating temperature of between 260° C. and 275° C. we can operate as low as 250° C. and as high as 300° C. At the higher temperature the heating period is somewhat shortened.

The time of heat treatment does not exceed about ten minutes. The time, however, is, of course, correlated with the volume of the oil and the manner of heating, whether it be batch or continuous as in a pipe still. The oil should be heated just long enough to destroy those substances which develop objectionable odor and flavor on reversion but should not exceed the heating time at which more than traces of the glycerides undergo change.

Having thus described our invention, what we claim is:

1. The process of refining soybean oil which comprises subjecting the crude oil to a temperature of about 250° C. to 300° C. in an inert atmosphere for a brief period of time not exceeding about ten minutes, and then subjecting the oil to caustic alkali refining.

2. The process of refining soybean oil which comprises heating the crude oil in an inert atmosphere to a temperature and for a time sufficient to polymerize objectionable odor and flavor-forming substances but without otherwise modifying the oil, and then subjecting the oil to caustic alkali refining.

3. The process of refining the soybean oil which comprises heating the crude oil in an inert atmosphere to a temperature of about 260° C. for not more than about ten minutes and then subjecting the oil to caustic alkali refining.

ANDERSON W. RALSTON.
VICTOR CONQUEST.