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APPARATUS FOR TREATING CITRUS FRUIT FOR REMOVING RIND OIL

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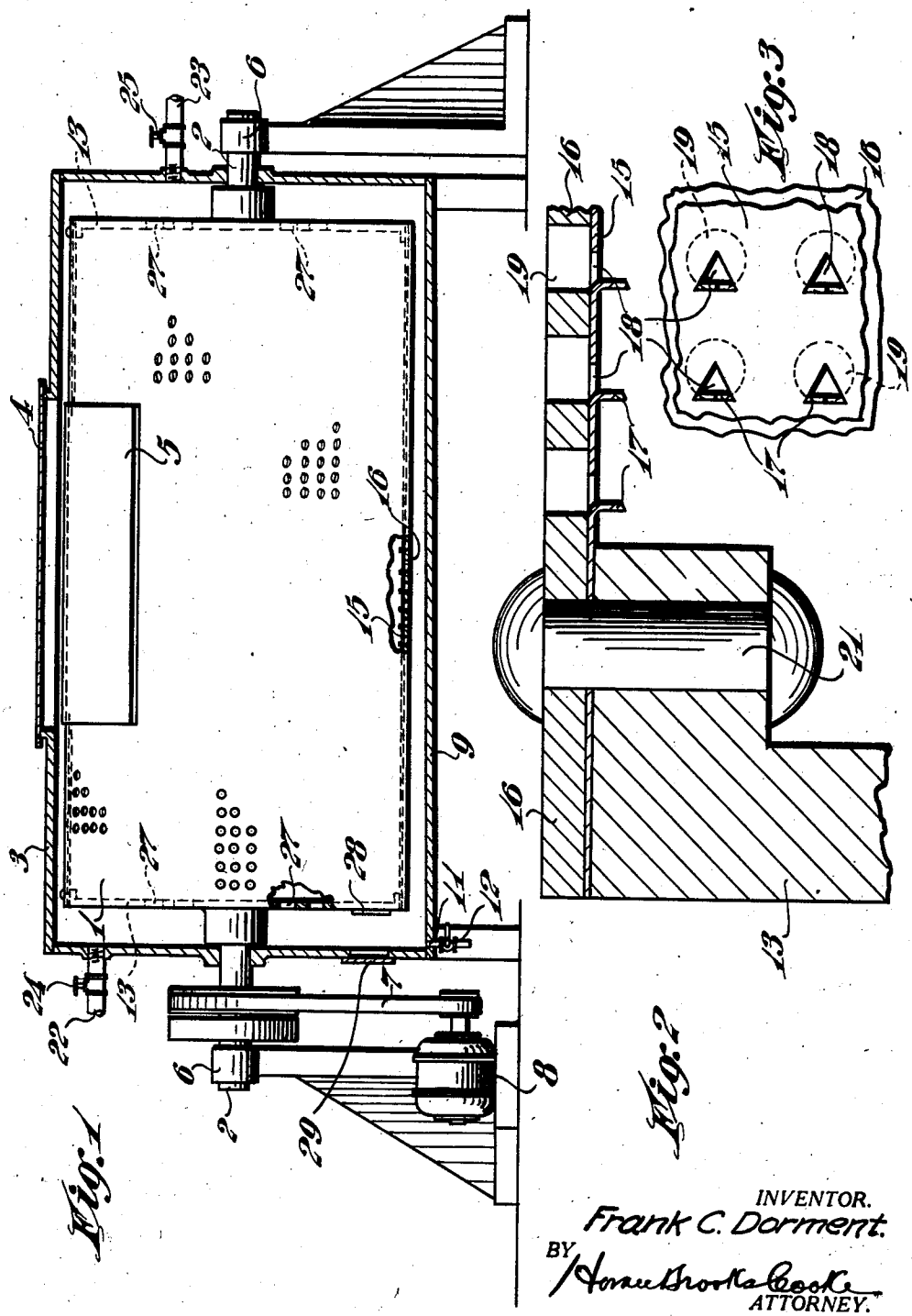

Fig. 1

Fig. 3

Fig. 2

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APPARATUS FOR TREATING CITRUS FRUIT FOR REMOVING RIND OIL

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3 Claims. (Cl. 87—28)

This application is a refile of my abandoned application Serial No. 501,767, filed December 12, 1930.

My invention relates to the treatment of citrus fruits such as oranges, lemons, grapefruit, and the like, and more particularly to apparatus for the removal of oil or oils from the rinds of such fruit.

In the past, such oils have been extracted largely by hand, by various methods such as the "sponge" method. Attempts to recover rind oils by mechanical means have failed or resulted in inferior products, largely because the means and methods employed have required the use of extraneous solvents, steam distillation or the like, or have involved the employment of means so designed that the fruit was so injured in the course of recovery of the oils that the oils were not recovered in pure form but were contaminated by admixture with the juices of the fruit.

An object of my invention is to provide apparatus for the recovery of oil or oils from the rinds of citrus fruit, that shall be capable of effecting the recovery of such oil or oils without requiring the use of extraneous solvents, and without having a harmful effect upon the oil during the recovery, and that shall be generally of improved design and utility.

My invention also has for an object the provision of various improved details of construction, as will appear from the descriptive matter given hereinbelow and the drawing accompanying this specification.

My invention contemplates the provision of apparatus wherein the fruit is placed in a rotating vessel forced by centrifugal force against an outer wall having multiplicity of prickers or ribs, of such length as not to enter the fruit within the rind, but sufficient to puncture the rind to release the oil contained therein, the centrifugal action being sufficient to cause the oil to leave the rind.

In order that the oil may be recovered rapidly and without harmful access of air thereto, I prefer to provide for a plurality of openings or holes in the outer wall of the rotating vessel, and to locate the vessel in a closed chamber, the vessel and chamber being provided with separate means for removing the rind oil and the treated fruit.

Preferably, I also provide that the outer wall of the rotating vessel is comprised of two adjacent shells. The inner shell is preferably constituted of very light and thin metal, having portions thereof upset to provide a multiplicity of inwardly projecting prickers or ribs of suitable size and shape, and the outer shell, which surrounds and supports the inner wall, being constituted of relatively heavy or at least substantially rigid metal, having a plurality of openings or foraminations therein to permit the free flow of the oil outward.

I also provide, where desired, means for introducing an inert gas, such as carbon dioxide, nitrogen, helium or the like, to the interior of the enclosing chamber, to eliminate oxidation of the oil during recovery thereof or any other undesirable effect which might be caused if the operation were conducted in the presence of air.

In order that my invention may be fully set forth and understood, I now describe, with reference to the accompanying drawing, a preferred form in which it may be embodied, but without limiting myself to such illustrative example. In the drawing,

Figure 1 is a view partly in vertical section and partly in elevation, of apparatus for removing oil from the rinds of citrus fruit in accordance with my invention;

Fig. 2 is an enlarged sectional view of a portion of the apparatus shown in Fig. 1; and

Fig. 3 is an enlarged elevational view of a portion of the apparatus shown in Figs. 1 and 2.

Similar reference numerals designate similar parts in each of the several views of the drawing.

Referring to the drawing, the apparatus consists principally of a vessel 1, preferably of cylindrical shape, supported by shafting 2 and adapted for rotation within an enclosed chamber 3. The latter is provided with a removable cover plate 4 for the introduction of fruit into the device, and the cover plate 4 corresponds to a similar, although preferably somewhat smaller cover plate 5 in the vessel 1.

The shafting 2 is supported by bearings 6 at either end thereof, and is connected by a belt 7 or other suitable connection to a motor 8 or other prime mover. The enclosed chamber 3 is preferably provided with a sloped bottom 9 and drain 11 having a valve 12 at the lower end thereof.

The vessel 1 is comprised in part of a pair of spaced flanges 13 mounted upon the shafting 2, and preferably of circular configuration although not necessarily so. In the preferred form of my invention illustrated in the drawing, the flanges 13 are attached at their peripheries to a cylindrical wall structure comprising an inner shell 15 and an outer shell 16.

The inner shell 15 is constituted of thin metal,

for example, 24 gauge sheet metal, and is provided with a multiplicity of inwardly extending prickers or ribs 17, of a length not greater than the thickness of the rind of the fruit to be treated and a multiplicity of openings or holes 18. The prickers 17 and holes 18 are most conveniently made by upsetting portions of the shell 15, preferably in triangular segments, as is shown to advantage in Figs. 2 and 3. In this manner, the prickers 17 and holes 18 are provided in a single operation.

The length or height of the prickers 17 is, as recited hereinabove, regulated according to the thickness of the rind of the fruit treated, for example from one-sixteenth to three-sixteenths of an inch, and it should be noted that the thickness of the rinds of various species of a single type of fruit varies considerably. Navel oranges, for example, have remarkably thick rinds.

The object of thus limiting the height or length of the prickers is to prevent the oil removed from the rinds from being contaminated with the aqueous juices of the fruit, which would be released if the prickers passed entirely through the rinds and into the inner portions of the fruit. Such contamination would not only lessen the purity of the product by the inclusion of foreign material but the presence of the aqueous material would tend to cause hydrolysis and decomposition of the oil, greatly injuring its flavor, aroma and value.

The outer shell 16 is provided for the purpose of supporting the inner shell 15, and is therefore of strong and rigid construction and contiguous to the inner shell 15. In the present instance it is shown as comprising a foraminous cylinder of relatively heavy metal. The foraminations or holes 19 may be and in this instance preferably are located correspondingly to the openings 18 of the inner shell 15. As an alternate mode of construction, I may employ an outer wall 16 that is comprised of heavy and coarsely woven "wire cloth". Such wire cloth must of course have strands of quite large diameter in order to have sufficient rigidity for the purpose.

By means of suitable fastening means 21, the inner shell 15 and outer shell 16 of the vessel 1 are attached to the peripheries of the flanges 13. Removable fastenings may be used where it may be desired to replace the inner shell 15 with others of differently sized prickers, as for example where the nature of the fruit treated varies considerably.

The chamber 2 may be and preferably is provided as shown with conduits 22 and 23 having valves 24 and 25 respectively. By means of these conduits and valves, a current of inert gas such as carbon dioxide, nitrogen or helium, may be led through the apparatus. To assist in the passage of the gas through the apparatus and in the removal of air, a plurality of holes 27 may be provided in the flanges 13. These should be of such size and so placed as not to permit the escape of fruit or oil therethrough.

One of the flanges 13 is also provided with one or more handholes 28, located near the periphery thereof and corresponding to a correspondingly located handhole 29 in one end wall of the chamber 3. These permit the removal of the treated fruit separately from the removal of the oil.

The entire apparatus, or at least those portions thereof with which the fruit or oil comes into contact, may be constructed of or lined with suitable non-corrosive metal, that is to say, metal which is not affected by, nor affects, the delicate oil. Monel metal may ordinarily be employed.

In the operation of the device described, a quantity of whole fruit, which has previously been washed and dried to remove foreign matter, and water, respectively, is charged into the vessel, through the doors 4 and 5, which are then replaced. The amount of fruit should be such that considerable freedom of movement is possible.

After the lids 4 and 5 have been replaced and before the vessel 1 is put into rotation by the motor 8, the valves 24 and 25 are opened, and a current of inert gas, such for example as carbon dioxide, nitrogen or even helium, is passed through the chamber 3, until substantially all air has been displaced. The valves 24 and 25 are then closed, as are the handhole 29 and the valve 12, and the motor 8 is started, thus causing the vessel 1 to rotate about the shafting 2.

The rotation of the vessel 1 causes the fruit to be pressed against the multiplicity of prickers 17, which pierce the rinds of the fruit and cause the rind oils to be liberated or to "bleed". It may sometimes be desirable to start and stop, or to reverse the direction of rotation at intervals in order to cause a "tumbling" of the fruit within the vessel 1, although ordinarily this is not necessary.

The oil thus liberated or "bled" from the fruit is, by the centrifugal force of rotation, caused to pass through the openings 18 and 19 of the shells 15 and 16, respectively, and collects in the bottom of the chamber 3, from which it may be removed from time to time by means of the valve 12, for bottling or the like. In any event, the removal, storage or bottling operation should be conducted as rapidly as possible and in such manner as to eliminate contact of the oil with air as completely as possible.

After the maximum amount of oil has been removed from the fruit in this manner, the motor 8 is stopped, and the treated fruit is then removed through the handhole 29 or otherwise. The apparatus is then ready for use once more.

It will be apparent from the above that my invention provides apparatus for removing oil from the rinds of citrus fruit in a rapid and efficacious manner, and without necessitating the employment of solvents, permitting the access of air, or causing contamination of the delicate rind oil with foreign or aqueous material.

It will, of course, be obvious to those skilled in the art that the apparatus described is capable of modification as to the details thereof without departing from the true inventive scope thereof, and, therefore, I do not limit myself to the specific example or examples hereinabove set forth or described by way of illustration, except as I may do in the claims hereinafter made.

I claim as my invention:

1. Apparatus for removing oil from the rinds of citrus fruit which comprises an enclosed chamber, a vessel mounted therein, adapted to receive a quantity of whole fruit and having an outer wall comprised of an inner shell of thin metal, portions of which have been upset to provide a plurality of inwardly extending single sharp-pointed prongs of a length not greater than the rinds of the fruit and a corresponding plurality of holes, said shell being free from projections having a scraping effect, and a relatively thick outer shell enclosing and supporting said inner shell and contiguous thereto having perforations in alignment with the holes in the inner shell, means for rotating the vessel whereby the fruit is pressed by centrifugal force against said outer wall.

2. Apparatus for removing oil from the rinds of citrus fruit which comprises a pair of spaced

flanges mounted upon coaxial shafting, a thin metal cylinder having its ends fastened to the peripheries of said flanges and having portions thereof upset to provide a plurality of inwardly extending single sharp-pointed prongs of length not greater than the thickness of the rinds of the fruit and a corresponding plurality of holes, said shell being free from projections having a scraping effect and a relatively thick and rigid shell surrounding and supporting said thin metal cylinder and contiguous thereto having perforations in alignment with the holes in the inner shell, the whole being mounted for rotation within an enclosed chamber.

3. Apparatus for removing oil from the rinds of citrus fruit which comprises a pair of spaced flanges mounted upon coaxial shafting, a thin metal cylinder having its ends fastened to the peripheries of said flanges and having portions thereof upset to provide a plurality of inwardly extending prickers of length not greater than the thickness of the rinds of the fruit and a corresponding plurality of holes, and a rigid outer shell surrounding and supporting said cylinder and contiguous thereto and having openings in alignment with the holes in said cylinder, the whole being mounted for rotation in an enclosed chamber, and means for passing a current of inert gas through said chamber.

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