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2,415,600

METHOD FOR THE RECOVERY OF FLUIDS

Filed Jan. 24, 1942

2 Sheets-Sheet 1

FIG. 1.

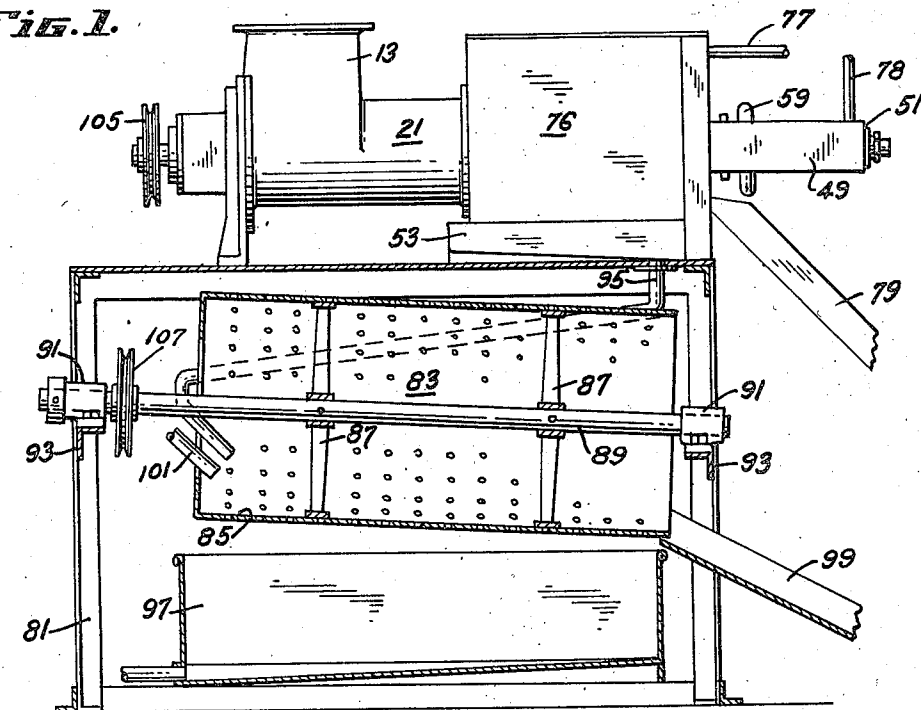
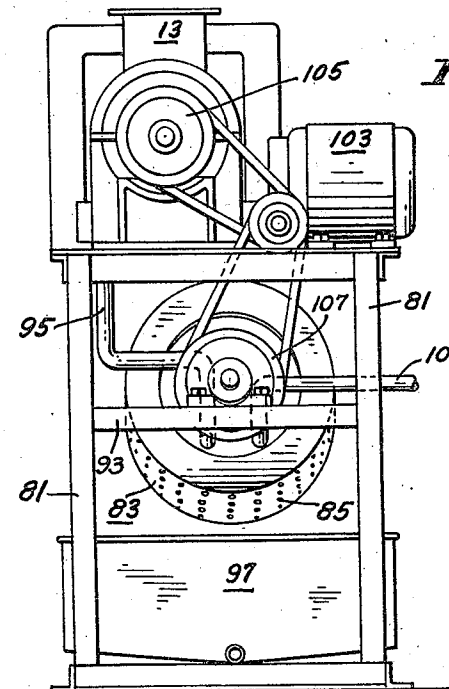


FIG. 2.



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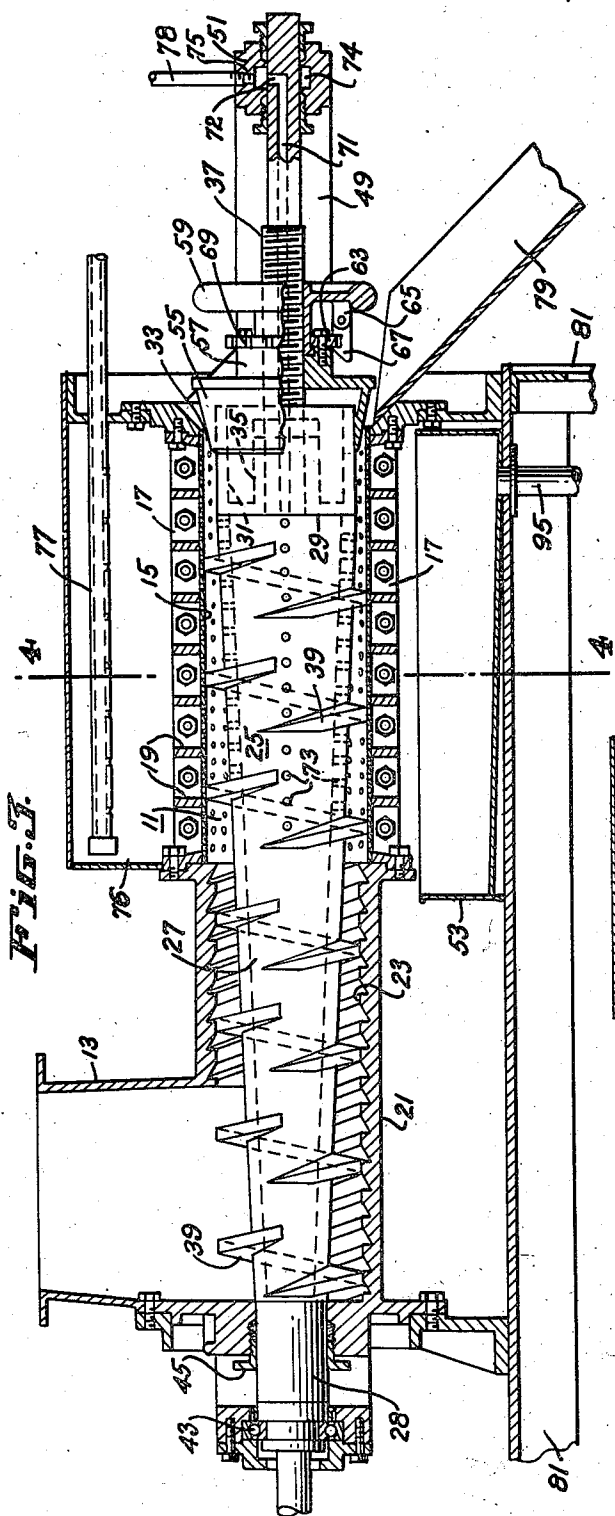
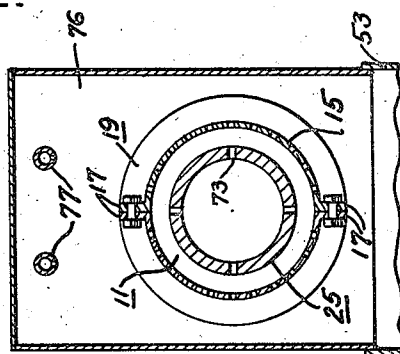
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METHOD FOR THE RECOVERY OF FLUIDS

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2 Sheets-Sheet 2



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METHOD FOR THE RECOVERY OF FLUIDS

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6 Claims. (Cl. 260—236.6)

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My invention relates to the recovery of the fluid ingredients of the growing products of nature, and more particularly to a method and apparatus for the recovery of volatile oils or the like from the skins of citrus fruits, etc.

An object of my invention is to provide a new and improved apparatus and method for the recovery of volatile oils from the skins of citrus fruits or the like.

Another object of my invention is to provide a new and improved apparatus particularly adapted for use in the recovery of volatile oils from the skins of citrus fruits or the like, which apparatus shall effect a high recovery of the available volatile oil contents in the skins of such fruit.

Another object of my invention is to provide a new and improved method for the recovery of volatile oils from the skins of citrus fruits or the like, which method shall be economical and permit of a high recovery of the available volatile oil contents in the skins of such fruit.

Additional objects of my invention will be pointed out in the following description of the same taken in conjunction with the accompanying drawings wherein—

Figure 1 is a side elevational view, partly in section, of the assembled apparatus of my invention;

Figure 2 is an end elevational view of the same apparatus;

Figure 3 is a view in section of the press component of the apparatus of Figure 1; and

Figure 4 is a view in section, taken on the line 4—4 of Figure 3.

In its preferred embodiment, my invention has been applied to a press of the screw type. This type of press in general comprises a compression chamber 11 having at one end, a hopper 13 for the introduction of the material to be pressed, while at the other end, the compression chamber is open for the discharge of the solid waste products remaining after the recovery of the oils therefrom. The oils are extruded through a portion of the compression chamber, provided with a perforated wall formed of heavy screening 15 reinforced by longitudinal ribs 17 and transverse ribs 19, this portion of the chamber being formed from two half sections bolted together.

That portion 21 of the compression chamber which receives the input to the press directly from the hopper 13, has its internal wall provided with a left-hand quadruple thread 23, which terminates at the entrance to the perforated wall section of the compression chamber.

The compression member constitutes a screw 25

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extending axially of the compression chamber. This screw comprises a hollow tapered shaft 27, solid at its small end 28, and closed off at its larger end by a transverse wall 29, having a cylindrical wall extension 31 at its periphery to constitute a cylindrical continuation of the hollow screw shaft 27. The diameter of this cylindrical extension wall 31 is somewhat smaller than the open end of the compression chamber, the space thereby provided between this end of the screw shaft and the compression chamber constituting the discharge opening 33 for the solid waste products of the press.

The closing wall 29 has formed integral therewith, a centrally disposed boss 35 having a central internally threaded opening to receive a shaft extension 37.

The screw is provided throughout substantially its entire length with a plurality of independent and spaced right-hand threads 39, each forming a short spiral of little over one complete convolution, to overlap the preceding spiral. The leading end or terminal of each thread is tapered to form a wedge for facilitating penetration into the material under compression, whereby the accumulative effect of all the threads will be to divide and redivide the material during compression of the same as it passes along the compression chamber from the hopper to the discharge end.

The screw is mounted with its smaller end passing through an opening in the hopper end of the compression chamber, and this end of the screw is journaled in a thrust bearing 43 supported in spaced relationship to the end wall of the chamber. The opening through the hopper end of the compression chamber is sealed about the shaft by a packing gland 45.

The discharge end of the screw is supported by a U-shaped bracket 49 affixed across the open end of the compression chamber and carrying a bearing 51 in which the shaft extension 37 is journaled.

In the operation of a press of this character, the material to be pressed is placed in the hopper 13, and such material is compressed to an increasingly higher degree as it is carried along by the screw toward the discharge end of the compression chamber. Where the material constitutes the skins of citrus fruits, the oil pressed therefrom, passes through the screen of the compression chamber and drops into a suitable pan 53 positioned therebelow.

It has been found that maximum recovery and, accordingly, higher efficiency of operation

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may be expected in a press of this character when operating within a very narrow range of pressures, the particular range depending upon the type or quality of the product to be operated on. Most effective operating pressure conditions may be realized by adjusting the effective size of the discharge passage 33 at the end of the compression chamber.

To this end, on the shaft extension 37 I slidably mount a hollow cone 55 having its small end open and adapted to slide over the cylindrical extension 31 of the screw shaft. The cone is provided with a hub 57 which is preferably keyed to the shaft extension 37, to preclude relative rotation of the cone with respect to the shaft extension, without impairing its ability to slide upon such shaft extension. The movement or adjustment of the cone along the shaft extension, whereby to vary the discharge opening, is manually controllable through manipulation of a hand-wheel 59 which is screw-threaded to the shaft extension. The hub of the hand-wheel is provided with a lateral flange 61 which is adapted to fit into a depression in the hub 57 of the cone and held therein by a split washer 63, the two halves of which fit around the hub of the hand-wheel and are bolted to the hub of the cone. Thus, rotation of the hand-wheel 59 will bring about a sliding movement of the cone toward or away from the compression chamber, depending upon the direction of rotation of the hand-wheel. Once a proper adjustment has been effected, the hand-wheel may be locked in adjustment by means of a key 65 attached to the hand-wheel and provided with a pivoted end 67 which is adapted to engage any one of a series of notches 69 formed in the outer peripheral edge of the split washer 63.

To assure maximum recovery of oil from the material under compression under the conditions of operation described, I provide a liquid carrier for the oil and cause the same to permeate through the material under compression, while the material is being divided and redivided by the screw threads 39, thereby facilitating the flow and removal of such oily contents from the material under compression and through the perforated wall 15 of the compression chamber. For this purpose, I provide for the introduction of some carrier liquid, such as water, and preferably under pressure, into the hollow screw 25, by boring the shaft extension 37 to provide a suitable passage 71 for such liquid, including a lateral portion 72 at the location of the bearing 51, and by providing perforations 73 in the hollow screw, connecting the interior of the screw with the compression side thereof. Such perforations might be countersunk to advantage on the compression side of the screw, and are preferably disposed in four rows displaced 90° about the screw to assure substantially equal distribution of the carrier liquid through the material under compression. Connection from a source of carrier liquid to the passage 71 may be effected through the bearing 51 which is designed to incorporate therein an annular channel 74 adjacent the shaft, and a radial bore 75 to which may be connected a suitable feed-line 78. It will be apparent that as the carrier liquid is forced into the hollow screw, it will pass through the perforations and ultimately find its way throughout the material under compression, thus providing a carrier for any of the oil contents which may be in the process of being pressed from the material.

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The perforated wall portion of the compression chamber is enclosed within a guard casing 76, and within this guard casing, I mount a pair of spray pipes 77, each disposed above one half of the compression chamber, and connected to a source of carrier liquid, to throw a continuous spray of such liquid against the outer surface of the perforated wall 15 of the compression chamber, to wash the same down continually and facilitate the flow of the products of the compression chamber to the pan 53 below.

A discharge chute 79 supported below the discharge opening 33 of the compression chamber, is adapted to catch the waste products and discharge the same to a receptacle or conveyor belt, etc. (not shown).

The apparatus thus far described is mounted upon a frame 81. A drum 83 formed by a perforated cylindrical wall or cylindrical screen 85 carried upon a pair of spaced spiders 87, is mounted for rotation on an inclined shaft 89 journaled in bearings 91 carried on cross-bars 93 of the frame. A discharge pipe 95 connects the pan 53 to the interior of this drum at its elevated end, and carries the contents of the pan 53 to the drum, wherein, upon rotation of the drum, the contents is strained and any fibers or other solid components of the compressed material which may have passed through the perforated wall of the compression chamber, may be separated from the liquid component which is permitted to drop through the drum wall into a tank 97 supported below the same, while the solid matter is discharged to a chute 99 for conveyance to a receptacle or conveyor which may be the same that receives the discharge from the chute 79.

To facilitate the movement and separation of the material discharged into the drum 83, I provide for the introduction of a stream of liquid, preferably a liquid corresponding to that employed as a carrier in the press, such liquid also being introduced at the elevated end of the drum through a pipe 101.

The screw 25 and drum 83 are both preferably, though not necessarily, driven by a single motor 103 supported on the frame 81. The motor may be connected by a belt to a pulley 105 on the small end of the screw and by a similar belt to a pulley 107 on the elevated end of the shaft 89.

The liquid contents of the tank 97 comprises a mixture including the volatile oils obtained from the material compressed in the compression chamber and carrier liquid. This mixture is discharged from the tank, which is preferably formed with an inclined trough-shaped bottom for the purpose, into apparatus (not shown) for separating the volatile oils from the carrier liquid. Many types of apparatus capable of performing such separation function are known, but one type which is highly satisfactory for the purpose, is one which employs the principle of centrifuging. In this manner the volatile oil may be recovered.

Thus, while I have described in detail, a preferred form of my invention, the same is susceptible to change and modification, without departing from the principles involved. I, therefore, do not desire to be limited in my protection to the specific details disclosed, except as I may be limited by the appended claims.

I claim:

1. The method of extracting volatile oils from the skins of citrus fruit or the like, comprising, compressing a mass of said skins and simultaneously therewith dividing and redividing the

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mass while forcing water therethrough to produce a mixture including extruded oils and water, removing solid matter from said mixture and subsequently centrifuging said oils from said mixture.

2. The method of extracting volatile oils from the skins of citrus fruit or the like, comprising, compressing a mass of said skins and simultaneously therewith dividing and redividing the mass while forcing a carrier liquid therethrough to produce a mixture including extruded oils and carrier liquid, removing solid matter from said mixture and subsequently centrifuging said oils from said mixture.

3. The method of extracting volatile oils from the skins of citrus fruit or the like, comprising, compressing a mass of said skins while forcing water in liquid form therethrough to produce a mixture including extruded oils and water, removing solid matter from said mixture and subsequently centrifuging said oils from said mixture.

4. The method of extracting volatile oils from the skins of citrus fruit or the like, comprising, compressing a mass of said skins and simultaneously therewith dividing and redividing the mass while forcing water therethrough to produce a mixture including extruded oils and water, removing solid matter from said mixture while adding additional water thereto and subsequently centrifuging said oils from said mixture and added water.

5. The method of extracting volatile oils from the skins of citrus fruit or the like, which comprises compressing and moving a mass of said skins along a course of progressively increasing pressure to rupture the oil cells therein, dividing and redividing said mass during said course of pressure and simultaneously therewith forcing water through said moving mass to recover a mixture including extruded oils and water, re-

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moving solid matter from said mixture and subsequently separating said oils from said mixture.

6. The continuous method of extracting oils from the skins of citrus fruit or the like, which comprises compressing and moving a mass of said skins along a course of progressively increasing pressure to rupture the oil cells therein, continuously discharging the compressed skins from said mass while adding new skins thereto, dividing and redividing said mass during said course of pressure and simultaneously therewith forcing water through said moving mass to recover a mixture including extruded oils and water, removing solid matter from said mixture and subsequently separating said oils from said mixture.

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