APPARATUS FOR EXTRACTION BY CENTRIFUGATION OF THE OIL
CONTAINED IN AN OLIVE CAKE

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APPARATUS FOR EXTRACTION BY CENTRIFUGATION OF THE OIL CONTAINED IN AN OLIVE CAKE

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7 Claims

ABSTRACT OF THE DISCLOSURE

A centrifugal extractor for the extraction by centrifugation of the oil contained in an homogenized cake of ground olives having two coaxial conical cylinder bowls. An annular ring is formed between the inner wall of the outer bowl and the outer wall of the inner bowl. The two bowls are rotated in the same direction but at a variable speed. A feeding device is provided at the inlet of the extractor for introducing into the annular ring small quantities of a cake of ground olives having means for combing and radially orienting the fibres of the cake of ground olives. An annular collecting groove is provided on the inner bowl and the evacuation of the oil from the groove takes place to a receiving trough. A heating fluid enters inside the inner bowl and a heated liquid into the annular ring. Means are provided for the evacuation of the aqueous juices and the residues. Various channels, helical grooves and evacuating tubes are associated with the feeding device, bowls and evacuation means.

This invention relates to a process for extraction of the oil contained in a cake of ground olives. It also aims at providing an improved centrifugal extractor serving for putting the said process into operation.

A process of extraction of olive oil is already known which consists of treating a cake of ground olives in a vertical or horizontal centrifugal extractor. It is known that in such a process the cake of ground olives is separated into its constituents, namely, oil, residues and aqueous juices.

Devices serving for putting such a process into operation are also known, said devices being constituted by horizontal centrifugal extractors with double conical cylinder bowls effecting directly the separation of the constituents of the olive cake.

It has been found that such devices show several drawbacks and, in particular, that the vegetal fibres entangled in the olive cake prevent a perfect centrifugal extraction of the oil contained in the olive cake.

It has been found in addition that evacuation of the individual constituents of the centrifugal cake was imperfect in these devices and that there was produced in particular, as a consequence of the accumulation of sediments in the separation of the oil and the aqueous juices in the said devices, a mixture of oil and aqueous juices occurring after prolonged operation.

It has been found in addition that in the case of too rapid feeding with olive cake of these centrifugal extractors the cake could even simply pass through the extractor without being substantially modified in its composition.

One object of the invention is to obviate these drawbacks and provide an extraction process for the oil contained in a cake of ground olives which gives increased oil output and reduction of the frequency of the cleaning of the extractor serving for putting the said process into operation.

Another object of the invention is to provide, for carrying out the extraction process above stated, an improved horizontal centrifugal extractor with double conical cylinder bowls which compared with known extractors of this category supplies with a better output a purer, clearer oil as well as perfect residues capable of being, without practically submitting to previous drying, submitted directly to the extraction with solvents with a view to releasing the last fatty fractures which they still contain.

Other objects, features and advantages of the invention will be apparent from the following description with reference to the accompanying drawings which show, diagrammatically and simply by way of example, one embodiment of a centrifugal extractor serving to put into operation the process for extraction of the oil contained in a cake of ground olives.

In these drawings:

FIG. 1 is a view in longitudinal section of a centrifugal extractor of known type which is modified according to the invention certain members being omitted for greater clarity.

FIG. 2 is a view in longitudinal section of the cake feeding device.

FIG. 3 is an elevation being a view on the right hand side of FIG. 2.

FIG. 4 is a view in longitudinal section of the cylindrical part of the centrifugal extractor showing the helical evacuation channels of the oil and aqueous juices.

FIG. 5 is an end view corresponding to FIG. 4 and showing the outlet of the different tubes, and

FIG. 6 is a view in section, on a larger scale, of the part of the extractor framed in dot and dash lines in FIG. 1 and showing the evacuation device of the aqueous juices and oil.

The process according to the invention has for first object the product to be centrifuged, namely an homogenized cake of ground olives, does not cause, at the inlet of a horizontal centrifugal extractor with double conical cylinder bowls, accumulation adversely affecting the separation of its constituents and for other object that the residues evacuated at the end of the conical part of the centrifugal extractor are dried to the point of having a minimum degree of humidity.

In view of retaining such objects and according to the invention, it is provided, at the inlet of the centrifugal extractor, to feed the product to be centrifuged into small quantities, each of these quantities, in order to combat the harmful entanglement of the fatty fibres, an entanglement which resists their forced evacuation at the time of the centrifugation, being treated so as the fibres of the olive cake to be centrifuged are combed and directed radially into a centrifuge area adjusted preferably between 340 and 420 "gravities." Furthermore each quantity combed and directed is set radially in a liquid ring in rotation.

On other hand, during the prosecution of the process the fibres are brought by direct or indirect heating to a temperature between 30°C. and 37°C., at a maximum, such heating being obtained by means of a heating fluid, for example water vapour, which is brought into the actual zone of the conical bowls of the extractor where the drying of the residues is carried out.

The result thus obtained is that the residues evacuated at the end of the conical part of the centrifugal extractor are dried to the point of having a minimum degree of humidity.

As regards the centrifugal extractor for carrying out the process which has been just described, it comprises (see FIG. 1) in known manner a frame 1 supporting a differential driving device 2 mounted in a casing 3 and driving in rotation in the same direction with an adjustable speed an outer bowl 4 on the inside of which is placed an inner bowl 5 provided with helices 6. The
assembly is surrounded by a partitioned casing 7 provided with three orifices 8, 9, 10 serving to evacuate the residues, the aqueous juices and the oil obtained after dissociation of the olive cake introduced through the nozzle 11 leading into a coaxial conduit 12 to the vapour supply tube 13 which terminates in a perforated nozzle 14. On its arrival at the end of the conduit 12, the olive paste is deviated radially in grooves provided in the plate 15 at the inner bowl 5 and comes into an annular cavity located between the commencement of the helices 6 and the smaller spirals 16 below which a conduit 17 leads serving on starting the extractor to inject a liquid ring between the spirals 6 in this case water. In known manner the inner bowl 5 is of cylinder conical shape, the cylindrical part extending as far as an annular groove 18 forming a threshold the height of which is determined by a decantation disc or plate 19. The object of this disc 19 is to prevent the oil separated in the cylindrical part of the bowl 5 from mixing with the aqueous juices, these latter passing in known manner above the said disc 19 in which the evacuation channels of the said aqueous juices lead.

The annular groove 18 collecting the oil is connected, by tubes, not shown in FIG. 1, to an oil collecting trough 20 which will be considered in detail later.

As seen in FIG. 2 the crushed olive cake arriving through the conduit 12 proceeds, after a conical widened portion 21 facilitating its deviation into radial grooves 22 of special construction. The number of these grooves or channels is variable and four have been provided in the embodiment shown. In fact, to ensure a combing and a directing of the fibres contained in the olive cake, the radial grooves 22 are provided with fluting 23 giving rise in some way to prismatic teeth. These flutings 23 only exist on one side of the grooves 22 as can be seen in particular in FIG. 3. The quantity injected slides in the grooves and the fatty fibres are then directed in the direction of the centrifugal extractor.

These grooves 22 lead between the helices 6 provided on the periphery of the inner bowl 5 of the centrifugal extractor where they penetrate into a liquid ring previously prepared by filling with water, for example, the space between the bowls 4 and 5 this filling being effected through conduits 17, 13 or 12.

At the time of centrifugation in the cylindrical part of the centrifugal extractor the oil and the aqueous juices are dissociated from the olive cake and they are placed in two layers between the spirals 6 of the inner bowl 5. In order to facilitate the evacuation of this oil the invention provides for arranging under the spirals 6 two grooves 24 serving for the drainage of the oil separates from the olive cake and leading it into the annular groove 18. In order to ensure a pumping effect of the oil these two grooves 24 wind helically around the periphery of the inner bowl 5 in the direction opposite to the rotation of the said inner bowl. The outlet from one of these grooves 24 in the proximity of the disc screen 19 separating the annular grooves 18 from the conical part of the bowl 5 can be seen in FIG. 4.

From the helical grooves 24 the oil flows into the groove 18.

In the centrifugal extractor of known type illustrated in FIG. 1, the oil was evacuated through longitudinal channels parallel to the axis of rotation of the extractor as well as the aqueous juices. The system operated well for some time but in time as a result of the effect of centrifugal deposition of sediments besides aqueous juices occurred which cancelled the height of the separation threshold of the oil and caused a mixture of oil and aqueous juices.

That is why in the extractor according to the invention and as illustrated in FIGS. 4 and 5 there is provided for the evacuation of the oil and aqueous juices each four helical tubes winding in a direction contrary to the direction of rotation of the bowl 5. The oil evacuation tubes 25 lead into the annular groove 18 before the disc screen 19 whilst the tubes 26 for the aqueous juices pass through the disc 19 and lead from the other side of the disc between the spiral 6 and the first spiral 6 of the conical part of the inner bowl 5.

A pumping effect is thus ensured which assists the evacuation of the products in the direction of the receiving troughs concerned which will now be considered.

As regards the aqueous juices they pass through the tubes 26 into a constriction 27 made in the plate 15' of the outer bowl. This constriction 27 is provided with oblong perforations 28 cut whistle-stop like which avoid any stoppage. In passing through these oblong perforations 28 under the action of centrifugal force the aqueous juices come into the annular collecting trough 29 from where they are evacuated through the hose 9 (FIG. 1), for example, into a decantation vat in the oil installation described in the specification of the copending patent application of even date filed by the applicants.

As regards the oil arriving through the helical tubes 25 it passes into an annular constriction 30 also provided like the aqueous juices transfer constriction 27 with oblong orifices 31 cut whistle-stop like and leading not directly into the collecting trough 20 for the oil but in front of an anti-emulsion deflector device which is made in the following manner:

The oil collected under the action of the centrifugal force through the oblong holes 31 (FIG. 6) comes onto a deflector 32 in the form of a beak which deflects onto a second parabolic deflector 33 playing the role of deflector and preventing the oil from becoming cloudy by air emission before being evacuated from the trough 20 through the evacuation tube 10 (FIG. 1).

The centrifugal extractor is completed in the usual manner through a vapour adductor tube 13 coaxial with the supply tube 12 of the olive cake (FIG. 1).

This tube has however a special structure in the sense that compared with devices known hitherto it is extended as far as into the residues drying zone, that is to say, as far as into the narrowest part of the cone of the extractor.

This tube 13 terminates in a kind of perforated nozzle 14 distributing radially the heating fluid in this case hot water or steam, the condensated water being capable of being rejetected if needed through the tube 17 in order to render fluid if desired the quantities of too consistent cake and to reheat them.

It is to be observed that the extractor may be provided additionally with an emptying device which in operation is coupled to a decantation vat receiving also the aqueous juices and permitting a recirculation of the product with a view to increasing the output of oil from the extractor.

We claim:

1. A horizontal centrifugal extractor for the extraction by centrifugation of the oil contained in an homogenized cake of ground olives, said extractor comprising two coaxial conical cylinder bowls, an annular ring formed between the inner wall of the outer bowl and the outer wall of the inner bowl, means driving in rotation the two bowls in the same direction but at a variable speed, a feeding device at the inlet of said extractor for introducing into said annular ring small quantities of a cake of ground olives, said feeding device being provided with means for combing and radially orienting the fibres of said cake of ground olives, an annular collecting groove provided on said inner bowl, means for the evacuation of the oil from said annular collecting groove to a receiving trough, means for the introduction of a heating fluid inside said inner bowl, means for the introduction of a heated liquid into said annular ring and means for the evacuation of the aqueous juices and the residues.

2. In a horizontal centrifugal extractor according to claim 1 a feeding device comprising several channels with toothed surfaces, said channels being disposed radi-
ally star like around the central inlet tube of said feeding device.

3. In a horizontal centrifugal extractor according to claim 1 two symmetrical helical grooves formed at the periphery of said inner bowl and which wind in the direction opposite to the direction of rotation of the bowls and pass under spirals carried by the outer wall of said inner bowl and protruding inside said annular ring.

4. In a horizontal centrifugal extractor according to claim 1 four oil evacuating tubes cleaned and polished internally connecting said annular collecting groove to said receiving trough, each of said tubes being disposed along a helix extending in direction opposite to the direction of rotation of said bowls.

5. In a horizontal centrifugal extractor according to claim 1 four helical tubes for the evacuation of the aqueous juices, said helical tubes being distributed uniformly between said helical oil evacuating tubes.

6. In a horizontal centrifugal extractor according to claim 1 a parabolic surface in said receiving trough which is provided with inlet oblong holes cut as whistle stops.

7. In a horizontal centrifugal according to claim 1 a steam adductor tube showing an end provided with a nozzle provided with radial perforations leading inside the inner bowl at the vicinity of the residues drying zone and directing the steam on to the inner wall of said inner bowl, two tubes sending the condensed water in said annular ring.

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