

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 October 2008 (02.10.2008)

PCT

(10) International Publication Number
WO 2008/117325 A2

(51) International Patent Classification:

C11B 1/10 (2006.01) *B08B 3/02* (2006.01)
B07B 1/55 (2006.01) *B01D 41/04* (2006.01)

(21) International Application Number:

PCT/IT2008/000165

(22) International Filing Date: 12 March 2008 (12.03.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

RM2007A000164 28 March 2007 (28.03.2007) IT

(71) Applicant (for all designated States except US): **RAPANELLI FIORAVANTE S.P.A.** [IT/IT]; Viale Umbria 14, I-06034 Foligno (PG) (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **RAPANELLI, Paolo** [IT/IT]; Viale Umbria 14, I-06034 Foligno (PG) (IT).

(74) Agents: **FIAMMENGHI, Carlo** et al.; c/o Fiammenghi Fiammenghi, Via Quattro Fontane, 31, I-00184 Roma (IT).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

- without international search report and to be republished upon receipt of that report

(54) Title: AN EXTRACTION DEVICE PROVIDED WITH AN OVERTURNING AND WASHING SYSTEM, AND RELATIVE MACHINE

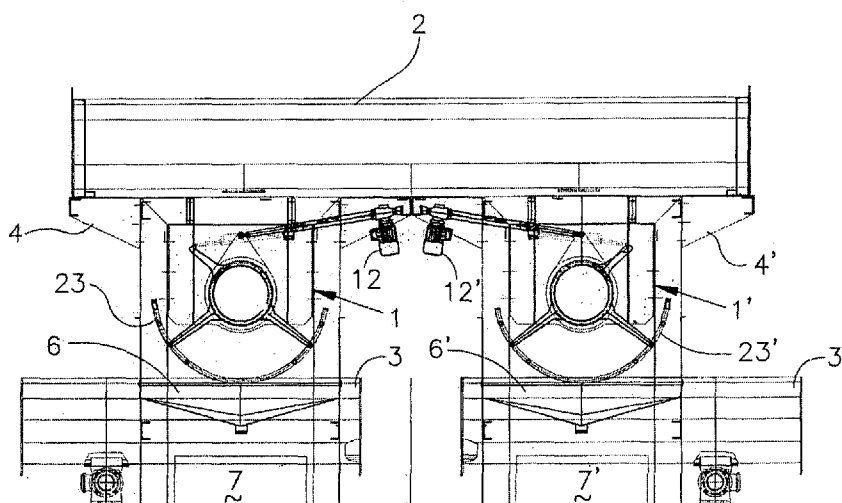


FIG. 7

(57) Abstract: An extraction device (1) and a respective modular machine, for the extraction of olive oil from an olive paste by means of percolation, wherein, the improvement consists, in the first place, in the fact that the extraction device (1) has been equipped with an overturning/tilting and washing system for washing the same, to facilitate its maintenance and washing, and in that the machine is conceived in a way that its various components-modules may be arranged/distributed in the most convenient manner in one or more installation rooms by virtue of the modularity of this machine.

WO 2008/117325 A2

Description

An extraction device provided with an overturning and washing system, and relative machine

Technical Field

The present invention generally relates to technologies for machines and devices used by the oil-producing industry, in order to process the olive drupes and to extract optimum quality oil, those technologies aiming in the first place at
5 preserving - during the processing - the features of the aromatic substances contained in the olives.

More particularly, the present invention concerns a system for overturning/tilting and cleaning an oil extraction device based on a percolation principle like the extraction device described for instance in the patent “Macchina di estrazione
10 dell’olio da una pasta di olive e di altri frutti oleosi” of the same Applicant, filed on July, 31, 2002 (RM2002A000406).

Therefore, the invention relates in the first place to an improvement to already known oil extraction devices operating according to the percolation principle (reference being made to the patent RM2002A000406 for any clarification of
15 details not directly relevant to the present innovation), and secondly, it relates also to a machine including this improved extraction device together with other devices/components which are already known and are assembled in a specific manner.

20 Background Art

The abovementioned patent RM2002A000406 discloses an oil extraction device with a housing or frame into which the olive paste/slurry is loaded, this housing having a plurality of apertures which are periodically crossed to the inside and

outside by the extraction blades. Moreover, an equipped shaft is also provided, which is rotatably mounted inside the housing and which supports a respective comb used to clean the blades. As compared with another known extraction device operating according to the same principle of oil percolation, the patent

- 5 RM2002A000406 proposes an improvement allowing to enhance the oil extraction efficiency. However, at the end of the extraction cycle, the extraction device still contains a paste with still a certain oil percentage, and for this reason these extraction devices of the percolation kind are equipped with a discharge screw (unloading auger) for discharging the residual oily paste, whereby the latter is
- 10 passed to a water-dilution tank in order to facilitate a later further processing inside a separator, or inside a horizontal centrifuge, etc. Notwithstanding the noticeable benefits and usefulness of these known extraction devices allowing to extract a noticeable amount of oil without increasing the olive paste temperature during extraction (thereby without impairing the features of temperature-sensitive
- 15 aromatic substances contained in the olive drupes), they have some drawbacks which considerably limit their convenience.

For instance, the known extraction device is fixedly mounted on a machine bed or machine structure, so that during routine maintenance or cleaning operations of the extraction device an operator has problems in reaching the most hidden and hardly

20 accessible points. The consequences, for example with respect to hygienic aspects which are of utmost importance for the food product industry, were that the extraction device could not be adequately cleaned and/or could not insure a sufficiently high quality of the final product. Moreover, since the time required for a cleaning operation and for the maintenance increases, manpower costs also

25 increase as a consequence.

On the other hand, known extraction devices also have another problem. To clean/wash the outer side of the extraction device, the automatic washing set of known extraction devices is moved by a plurality of linkages, including cranks and

connecting rods, which are actuated by a ratio-motor fixed to the stationary support structure or machine bed of the extractor. This system would however hinder the movements of the extraction set (extraction assembly), by the very fact that it is fixed to the stationary structural part of the machine, and for this reason
5 nobody has ever thought, till now, to realise a “non-stationary” extraction device. An object of the present invention is to provide an extraction device overcoming the abovementioned disadvantages.

A further object of the present invention is to provide a machine with modular structure, comprising at least one extraction device of the kind suggested by the
10 present invention.

Disclosure of Invention

According to a first aspect of the present invention there is provided an oil extraction device for extracting oil by the percolation principle, the extraction
15 device being mounted on a support structure and having a longitudinal axis (X-X), wherein, the characterising feature is that means are provided to permit a rotation of the extraction device relative to the support structure, around said longitudinal axis (X-X), and a first actuation system is also provided in order to rotate the extraction device relative to the support structure.

20 In a preferred embodiment, said longitudinal axis (X-X) is the central longitudinal axis (X-X) of the extraction device and it coincides with the geometric rotation axis of the equipped shaft of the extraction device.

Preferably, the first actuation system is automatic. In a further advantageous, alternative embodiment, the first actuation system is manual.

25 Advantageously, the first actuation system may be a linear actuator. This insures a simple structure of the actuation system that is easy to construct. Obviously, an end of the linear actuator will be fixed to the (stationary) support structure, while the opposite end of the linear actuator will be connected to the extraction device.

Preferably, the rotation of the extraction device may occur with both positive and negative rotational angles measured with respect to the rest position of the extraction device, in which position the end-of-cycle discharge screw of the extraction device assumes its lowest position.

- 5 In a further, advantageous embodiment, the first actuation system is adjustable, to allow the adjustment of the tilt angle of the extraction device with respect to the rest position of this extraction device, in which its discharge screw assumes its lowest position.

- In the preferred embodiment of extraction device according to the present
- 10 invention, a liquid-jet washing system is provided for washing a lower part of the extraction device, which washing system is entirely mounted on the extraction device in order to not hinder the overturning/tilting movement of the extraction device generated by said first actuation system; said liquid-jet washing system including a second actuation system for the movable washing means, which is also
- 15 entirely mounted on the extraction device. Preferably, said liquid-jet washing system of the extraction device includes a second actuation system which is of an automatic kind.

In an alternative embodiment, the liquid-jet washing system of the extraction device comprises a second actuation system which is manually operable.

- 20 In a specific, preferred embodiment of the extraction device, the liquid-jet washing system is actuated by said second actuation system in such a way to impart a preferably continuous, rotational movement, to its liquid-jet washing means, around said lower part of the extraction device.

- In the embodiment of the washing system which is preferred, since it is easier to
- 25 realise, the second actuation system is a linear actuator.

According to a second aspect of the present invention, a modular machine is provided which includes at least a support structure and one or more extraction devices according to the present invention.

In a preferred configuration/arrangement the extraction devices are arranged in parallel positions.

The various other parts of the modular machine (in the first place the homogenisation basins or tanks (“malaxers”) and the dilution basins or tanks) will
5 be distributed and assembled according to the requirements/needs of the installation room(s).

In particular, in a possible configuration, the homogenisation basins or tanks will be mounted on the upper side of the support structure, above one or more extraction devices.

10 In an advantageous embodiment, the dilution basins will be disposed at the base of the support structure.

If the installation room allows a compact configuration of the machine, the latter may have a substantially vertical extension, with lateral uprights that enclose all machine components (extraction device, oil collection basin for collecting already
15 extracted oil, tank etc.) with the exception of the homogenisation basins and the dilution basins.

Further embodiments, advantages and practical aspects of the present invention, will result from the remaining dependent claims, as well as from the description and/or drawings, and when the same invention will be put into practice.

20

Brief Description of Drawings

The present invention and its aspects and/or advantages will be described with reference to the figures, which should be intended as non-limitative and/or non-binding, with respect to the inventive concept on which the present invention is
25 based, wherein:

FIGURE 1 schematically shows a possible embodiment of a machine according to the invention, in two orthogonal views;

FIGURE 2 shows only the support frame/structure of the machine of Fig. 1, according to two views analogous to those of Fig. 1;

FIGURES 3a to 3c illustrate the rotation of the only extraction device, around a substantially horizontal axis (longitudinal central axis of the extraction device), effected by means of the extraction device rotation system in accordance with the present invention;

FIGURES 4a and 4b are schematic views of an automatic washing system of the invention, which is mounted completely on the movable extraction device, these views being taken in a plane orthogonal and respectively longitudinal with respect to the longitudinal axis of the extraction device;

FIGURE 5 shows again a possible embodiment of a machine of the present invention;

FIGURES 6a to 6e relate to some details of the extraction device rotation, the support means realising the connection to the fixed structure and allowing this rotation, and the linear actuator used to perform this rotation around the central longitudinal axis of the extraction device;

FIGURE 7 illustrates the “modularity aspect” of a machine according to the present invention, for an embodiment including two extractors according to the invention, which are mounted in parallel arrangement and receive the olive paste from a single set of upperly mounted homogenisation basins (malaxers).

Preferred Embodiments

The figures of the present patent application are very schematic since the aim is

not to put in evidence those parts already known since long time to the skilled person, but to highlight only those components - and their features - which allow to understand and put into practice the present inventive concept. In this way a person skilled in this field will be conceptually and practically ready to realize the
5 invention in the most diversified manners, based on this teaching.

To simplify the description, the same (or analogous) components are systematically denoted in all figures by the same reference numbers with or without apices.

It is emphasised once more that with regard to all general technical details related to known extraction devices based on the percolation principle and operating with
10 a system of extraction blades (extraction lamellae), reference is made explicitly to the documents of the background art and particularly to the patent RM2002A000406 of the same applicant, which is considered incorporated by reference in the present document.

As already discussed, the crucial point of the present invention is an oil extraction
15 device extracting oil from an olive paste, which is provided with a manually operable or an automatically actuated (overturning) system, and preferably also with an automatic washing set which is mounted on the extraction device so as to be driven/dragged in rotation during the rotational, overturning movement of the extraction device itself, and so that it does not hinder the movements of the
20 extraction device. Therefore, to facilitate maintenance and cleaning operations (of the device interior), the extraction device can be tilted/overturned by a predetermined angle, without interfering with a possible automatic washing set which - according to the invention - is mounted totally on the extractor itself.

An extractor (extraction device) can be mounted alone, or together with other
25 extraction devices, in a machine for use in an olive processing plant.

A machine of this type, according to some of its specific embodiments, which are neither binding nor limitative, is generally shown in Fig.1 and in Fig. 7. The details of the overturning/tilting and washing systems and of other components are

illustrated in the remaining figures.

The embodiment shown in Fig. 1 of the machine according to the present invention essentially comprises six basic elements, that is:

- 1) a steel-made bolted structure that supports and/or lodges the machine
- 5 components;
- 2) an extractor (extraction device) 1;
- 3) an overturning or tilting system of the extractor, which preferably is actuated automatically;
- 4) a preferably automatic washing system/set;
- 10 5) one or more homogenisation basins ("malaxers") 2, 2', ...;
- 6) dilution basins 3.

The systems or sets of points (3) and (4) will be described in detail later.

- The homogenisation basins 2, 2', etc., already known to a skilled person, supply the olive paste (which has been processed and prepared by them for the following
- 15 extraction process) to the interior of an extractor 1.

The dilution basins 3 serve to dilute - by adding water thereto - the olive paste remaining in the extractor 1 at the end of the extraction cycle (and which is discharged out of the extractor), in order to facilitate a later extraction of an additional amount of oil inside horizontal centrifuges and/or inside oil separators.

- 20 The dilution basins or tanks 3 are already known to a skilled person, so that their constructional details will not be given.

- The support structure of the machine is illustrated in Fig. 2. This structure is preferably made of stainless steel. The structure confers rigidity to the entire machine in all of its operative conditions, including the lifting and transportation
- 25 steps, as well as the step of its installation inside apposite rooms. The support structure (like the whole machine) is of a modular kind, that is, its parts may be assembled so as to assume, e.g., two possible final configurations:

in one of these configurations, lateral support components 4 are present and are

mounted for plants requiring the homogenisation basins 2 to be arranged above the machine; in another configuration, lateral support components 4 are not provided (since in this case the homogenisation basins or tanks 2 are mounted instead e.g. on the ground and the olive paste is supplied to the extractor 1 by means of appropriate pumps).

The main components of the support structure are:

- the already mentioned (optional) lateral support components 4 of the homogenisation basins 2;
- lateral uprights 5;
- 10 - a basin/tank 6 for collecting the oil already extracted by the extraction device 1;
- a storage tank 7;
- coupling flanges 8 for the connection with the extractor 1.

(note that these flanges 8 may also be considered part of the overturning/rotation system described below).

15 The extractor 1 of the present machine is substantially identical to that described in the patent RM2002A000406, being practically unchanged with regard to its internal functionality and constituent parts. The innovation, with respect to this repeatedly cited patent, consists above all in the manner in which this extraction device, or extractor 1, is connected to the support structure.

20 In fact, in the present innovative realisation, the extractor 1 is mounted at its two ends (only one of which is shown in Fig. 6c) to the coupling flanges 8, which in turn are bolted to the support structure (not shown in Fig. 6c). To do this, at each of its ends the extractor 1 has a respective cylindrical sleeve 9 rigidly connected to it but rotatably inserted into the corresponding coupling flange 8. This type of connection allows the extractor 1 - and all parts connected thereto (see also the following description) - to rotate around its central longitudinal rotation axis X-X, which is clearly indicated in Fig. 6b. The arrows of Fig. 6a indicate the rotational/ overturning motion performed by the extractor 1. Reference number 10 generally

indicates the assembly of the “extraction lamellae” while reference 11 denotes the seat of the screw (auger) for the extraction of the olive paste remaining at the cycle end (to be passed to the dilution tanks 3).

The rotation and support means 8-9 could possibly include any kind of bearing
5 (ball bearings, roller bearings, needle bearings, etc.) according to the state of the art, or they could be replaced by any other means (for instance a shaft and a cylindrical seat) having the same function of allowing the rotation of the extractor (under reduced friction) in accordance with prescribed static and dynamic loads. Referring now to Figs. 5, 6d and 6e, a description will be given of the true
10 overturning/tilting system, that is, of the actual actuation means permitting to overturn/rotate the extractor 1 around its central longitudinal axis X-X, in the coupling flanges 8 of the support structure (or possibly on these flanges if the configuration 8-9 is inverted).

In the specific embodiment shown, the extraction device 1 is rotated by an
15 adequately sized linear actuator 12.

The actuator 12 is linked at one end 13 to a support 14, which is rigidly connected to the extractor 1 but is omitted from figures 6c and 6d, while at the opposite end, it is fixed to the machine structure (see Fig. 6d).

It should be noted that the present invention is not limited to any particular kind of
20 linear actuator. Alternatively, any other kind of actuation system could be used, provided it gives rise to a rotation, for instance a reducer, a reducer with a transmission chain, a manual system provided with a reducer-crank and a transmission chain, a pneumatic, hydraulic, or electric system, an oil-dynamic system, etc., and generally any type of actuation system, either manual or
25 automatic, already known in the art, or equivalent, one part of which is connected to the fixed structure and the other to the extractor 1.

The previously described rotation system allows a rotation of the extractor with respect to the support structure of the machine.

Figs. 6e and 3a to 3c are schematic, kinematical illustrations of the motion and of the respective covered angles/arcs.

In Figs. 3a to 3c these arcs are 45° in one direction as well as in the opposite direction, but obviously they may vary according to the requirements and/or

5 according to appropriate adjustments of this overturning system. Similarly, even a possible manual system (with levers, cranks, or the like) could include an adjustment mechanism in order to “adjust” the motion, that is, adequate stops adaptable for discrete or continuous angles of rotations.

The automatic washing system will now be described, which preferably is
10 included in an improved extraction device according to the present invention.

However, it should be noted that one of the advantages of the present invention (easy cleaning and maintenance work due to the overturning system), can be obtained independently of the automatic washing system according to the present invention, the latter system being suited to wash the outside of the extraction
15 device. The two improvements are not, therefore, necessarily bound up with each other, since it would be possible to use another washing system of the outside of the extractor, possibly even a manual washing. Nevertheless, the preferred embodiment of extractor according to the present invention will include both these systems (the overturning or tilting system and the automatic washing system) in
20 order to optimise the results/benefits obtainable from a combination of these systems.

The automatic washing system forms a set or “kit” rigidly connected with the extractor 1. It is schematically shown in Figs. 4a and 4b and comprises two support collars 15 - one for each side or end of the extraction device 1 - which
25 cooperate to support an assembly 16 of washing tubes located outside the extractor 1; this assembly 16 comprises a plurality of longitudinal tubes (that are parallel to each other and to the central longitudinal axis X- X of the extractor), which tubes, at their ends, are fixed and connected to each other by way of a respective arcuate

tube 23, which is concentric with the corresponding collar 15 and is rigidly connected to the latter by means of spokes 21. Each of the arcuate tubes 23 has a corresponding internal cavity in fluid communication with all longitudinal tubes belonging to the assembly 16 of washing tubes. Moreover, the collars 15 are
5 mounted on the extraction device 1 in such a way that they can rotate around the same axis X-X of the extraction device 1, but since they are rigidly connected to the extraction device 1 by means of a further linear actuator 17 (see Fig. 4a), they rotate integrally with the extraction device 1 during the latter's rotation. Specifically, an end (or support) 18 of this second linear actuator 17 is fixed to the
10 body of the extraction device 1, while its other end 19 is fixed to an arm 20 forming an extension of the respective collar 15; thus, the entire assembly 16 of washing tubes will cover the path of a circular arc 22 (or part of it) at the time of actuation of the second linear actuator 17. This means that, due to the manner in which this mechanism has been designed, the movement of this further linear
15 actuator 17 permits a rotation of the assembly 16 of washing tubes relative to the extractor 1. The washing tubes 16 have nozzles 25 pointing towards the lower outer part of the extractor 1.

From the above description it can be seen that the relative rotation movements between the fixed structure and the extractor 1, on the one hand, and of the
20 extractor 1 with respect to the components 15-21-16, on the other, are not a hindrance to each other, and moreover, these movements are totally independent and not interconnected to each other, since they are due to the respective actuators 12 and 17.

Turning the attention now in particular to Fig. 4a, an end 24 of one of the two
25 arcuate tubes 23 is open and forms a sort of gasket type union, or coupling, for connecting a hose (not shown) used to let in a washing liquid. The washing liquid is thus supplied under pressure into one arcuate tube 23 and exits from the nozzles 25 (Fig. 4b) in a direction perpendicular to the longitudinal axes of the longitudinal

washing tubes of the washing tube assembly 16. Preferably, the various nozzles 25 are equidistantly distributed along each of the longitudinal washing tubes.

The relative movement caused by the actuator 17, between the components 15-20-21-24-23-16-25 of the automatic washing system, on the one hand, and the

- 5 extractor 1, on the other, allows to wash and to clean - by means of the nozzles 25 - the whole lower (outer) side of the extractor 1.

Although the washing system has been described with regard to its preferred embodiment, which includes a linear actuator 17, it may be understood that another actuation/drive system, or rotation system, employing any kind of known
10 technical means, could be advantageously used to attain the same objects (compare the preceding analogous considerations in the description of the actuation system used for tilting/overturning the extractor 1).

What really matters is that the actuation/drive system, causing the rotation of the assembly of washing tubes 16 with respect to the extractor 1, should be mounted
15 completely on the latter.

In particular, also the rotation of the washing tube assembly 16 could be performed manually. However, it is preferable to use an automatic system.

Moreover, also the actuation system for moving the washing tubes assembly 16 could include adjustment means for setting the rotational angle of the washing
20 tubes assembly 16.

Turning the attention again to the machine considered as a whole, reference is made in particular to Figs. 1 and 7.

The homogenisation basins or tanks ("malaxers") 2, 2' and the dilution basins or tanks 3 are components already known in this technical field, so that it is useless to
25 dwell on their details. The addition of water to the dilution basins 3 is necessary, since in the previous step (loading of the olive paste/slurry into the extraction device 1) some of the liquid phase (oil and water) has been removed from the olive paste or slurry, and for this reason this olive paste would be too dense for the

following processing to be carried out inside a so-called “decanter” (horizontal centrifuge).

Depending on the size of the rooms available for hosting the machine of the present invention, these types of basins/tanks may be arranged in a way different
5 from the embodiment of Fig. 1 (e.g. the homogenisation basins may be installed on the ground, instead of on the upper part of the machine, and in that case the lateral supports 4 are not required); in any case, a possible change of position, with respect to the machine embodiment schematically shown in Fig. 1, does not imply at all a modification of the function performed by these basins 2, 3 in the
10 production process.

The aspect of the invention which relates to the modularity of the machine may be best illustrated by referring - for instance - to Fig. 7.

This aspect of the inventive concept of the present invention consists in the possibility to satisfy various needs with regard to the size of the plants (output per
15 hour) and to the rooms where to install the machine.

Depending on circumstances, the machine of the invention can be used in different configurations, that is, as a single-type machine or in the “double configuration”.

Fig. 7 shows only one among several examples of “doubled or duplicated” machine. The functions of the machine, in its doubled/duplicated configurations
20 remain the same as before, and all that has been previously described for the machine of the single type holds also for the doubled machine, the only difference being that the doubled machine will insure a greater productivity provided the size of the single modules is unchanged.

For instance, the machine of Fig. 7 comprises - as can be immediately recognised -
25 two parallel extractors 1, 1' which receive the olive paste or slurry from a single, common assembly of homogenisation basins 2.

The assembly of homogenisation basins 2 is supported by both sections of the support structure and is arranged in a “bridge-like arrangement” between these two

distinct support structures, each of which includes the lateral supports 4. It can be seen that essentially the machine is formed by the same modules, or elemental components, though disposed in a different manner than in Fig. 1.

In general, the machine may be formed by a number of "n" extractors, mounted in
5 an array and united by apposite basins/tanks, which may be appropriately constructed and adapted.

A person skilled in the art may easily vary the arrangement and/or the number of modular components by using for instance one or more improved extractors according to the present invention.

10 The features of the machine according to the present invention could be summarised as follows:

- fixing system for connecting the extraction device assembly to the support structure and respective actuation/drive system for overturning/tilting this extractor assembly, this being extremely important for the machine functionality in
15 particular in relation to routine maintenance and cleaning operations. The possibility of rotating the extraction device during cleaning operations allows an operator to reach even hardly accessible points, thereby insuring a better standard under hygienic aspects and of the final product quality;
- the extractor assembly can rotate around its own symmetry axis X-X, and this
20 motion can be achieved either manually, with adequate linkages, or automatically, by means of a linear actuator or the like;
- all parts of the washing system are fixed/connected to the extractor, and as actuation system the latter utilises preferably a linear actuator; since the washing system is integral with the extractor and not with the support structure of the
25 extractor, or of the machine, during any motion of the extraction device the washing system will be simply dragged, that is, rotated integrally with the latter; moreover, the operation/control of the actuation system (linear actuator) of the washing system generates relative movements between the extraction device and

the washing means (longitudinal tubes with nozzles).

Claims

1. An extraction device (1), for extracting by the percolation principle olive oil from an olive paste or slurry, the extraction device (1) being mounted on a support structure and having a longitudinal axis (X-X), characterised in that means (8, 9) are provided to permit a rotation of the extraction device (1) relative to the support structure, around said longitudinal axis (X-X), and a first actuation system (12) being also provided in order to rotate the extraction device (1) relative to the support structure.
2. An extraction device (1) according to claim 1, characterised in that said longitudinal axis (X-X) corresponds to the central longitudinal axis (X-X) of the extraction device (1), and it coincides with the geometric rotation axis of the equipped shaft of the extraction device (1).
3. An extraction device (1) according to claim 1 or 2, characterised in that said first actuation system (12) is automatic and may include a ratio-motor with a respective transmission mechanism.
4. An extraction device (1) according to claim 1 or 2, characterised in that said first actuation system (12) is manually operable and may include a reduction mechanism and a respective transmission mechanism.
5. An extraction device (1) according to claim 3, characterised in that said first actuation system (12) is a linear actuator (12).
6. An extraction device (1) according to any of the preceding claims, characterised in that the rotation of the extraction device (1) occurs with both positive and

negative rotational angles measured with respect to the rest position of the extraction device (1), in which a discharge screw (11) of the latter assumes its lowest position.

- 5 7. An extraction device (1) according to any of the preceding claims, characterised in that said first actuation system (12) is adjustable to allow the adjustment of the tilt angle of the extraction device (1) with respect to the rest position of this extraction device (1), in which its discharge screw (11) assumes its lowest position.
- 10 8. An extraction device (1) according to any of the preceding claims, characterised in that a liquid-jet washing system (17-18-19-20-15-21-23-24-16-25) is provided, for washing a lower part of the extraction device (1), which system is entirely mounted on the extraction device (1) to not hinder the overturning/tilting movement of the extraction device (1) generated by said first actuation system
- 15 (12); said liquid-jet washing system (17-18-19-20-15-21-23-24-16-25) including a second actuation system (17) which is also entirely mounted on the extraction device (1).
9. An extraction device (1) according to claim 8, characterised in that said liquid-jet washing system (17-18-19-20-15-21-23-24-16-25) of the extraction device (1)
- 20 includes a second actuation system (17) of an automatic kind.
10. An extraction device (1) according to claim 8, characterised in that said liquid-jet washing system (17-18-19-20-15-21-23-24-16-25) of the extraction device (1)
- 25 includes a second actuation system which is manually operable.
11. An extraction device (1) according to any of the preceding claims 8 to 10, characterised in that the liquid-jet washing system (17-18-19-20-15-21-23-24-16-

25) is actuated by said second actuation system (17) in such a way to impart a preferably continuous, rotational movement to its liquid-jet washing means (16, 25) around said lower part of the extraction device (1).

5 12. An extraction device (1) according to claim 11 considered to depend on claim 9, characterised in that said second actuation system (17) is a linear actuator (17).

13. An extraction device (1) according to claim 2 and claim 11 or 12, characterised in that said liquid-jet washing means (16, 25) form an assembly of washing tubes
10 (16), with liquid-ejecting nozzles (25) directed towards said lower part of the extraction device (1), said washing tubes (16) extending at a predetermined distance from said lower part, and parallel to said central longitudinal axis (X-X) which coincides with the geometric axis of the equipped shaft.

15 14. An extraction device (1) according to claim 13, characterised in that at the two opposite longitudinal ends of the extraction device (1) there are respective collars (15), which are movable relative to the extraction device (1) and are concentric with said central longitudinal axis (X-X) of the extraction device, wherein, at least one of said collars (15) is connected (20) to an end (19) of the second actuation
20 system (17); said collars (15) being connected to respective radial arms or spokes (21) which are connected in turn to respective arcuate tubes (23) concentric with said collars (15); said longitudinal washing tubes (16) being in fluid communication at their ends with said arcuate tubes (23), and the washing liquid being injected into one of said arcuate tubes (23) through an end opening (24) of
25 the arcuate tube (23).

15. A machine of a modular kind, for extracting olive oil from an olive paste, characterised in that it comprises at least a support structure and at least an

extraction device (1) for extracting olive oil from the olive paste, said extraction device (1) being of the kind defined in anyone of the preceding claims.

16. A machine of a modular kind, according to claim 15, characterised in that it
5 comprises one or more homogenisation basins (2) which are preferably mounted at the upper end of the support structure of the machine.

17. A machine of a modular kind, according to claim 15 or 16, characterised in that it comprises one or more dilution basins (3), preferably arranged in the base of
10 said support structure.

18. A machine of a modular kind according to at least one of the preceding claims 15-17, characterised in that it comprises one or more collection basins (6) for collecting the oil that has been extracted from said extraction device(s) (1).
15

19. A machine of a modular kind according to claims 15 to 18, characterised in that it comprises lateral vertical uprights (5) and lateral supports (4) for the homogenisation basins (2) which are mounted at the upper end of the machine, wherein, said extraction device (1) in its rest position, and the other machine
20 components with the exception of the homogenisation basins (2) and of the dilution basins (3), do not project or extend beyond the outer contour of the machine.

20. A machine of a modular kind according to anyone of the preceding claims 15
25 to 18, characterised in that it comprises a plurality of parallel extraction devices (1).

21. A machine of a modular kind according to claim 20, characterised in that the

homogenisation basins (2) are installed on the ground or above the extraction devices (1) so as to form a bridge-like configuration.

1/4

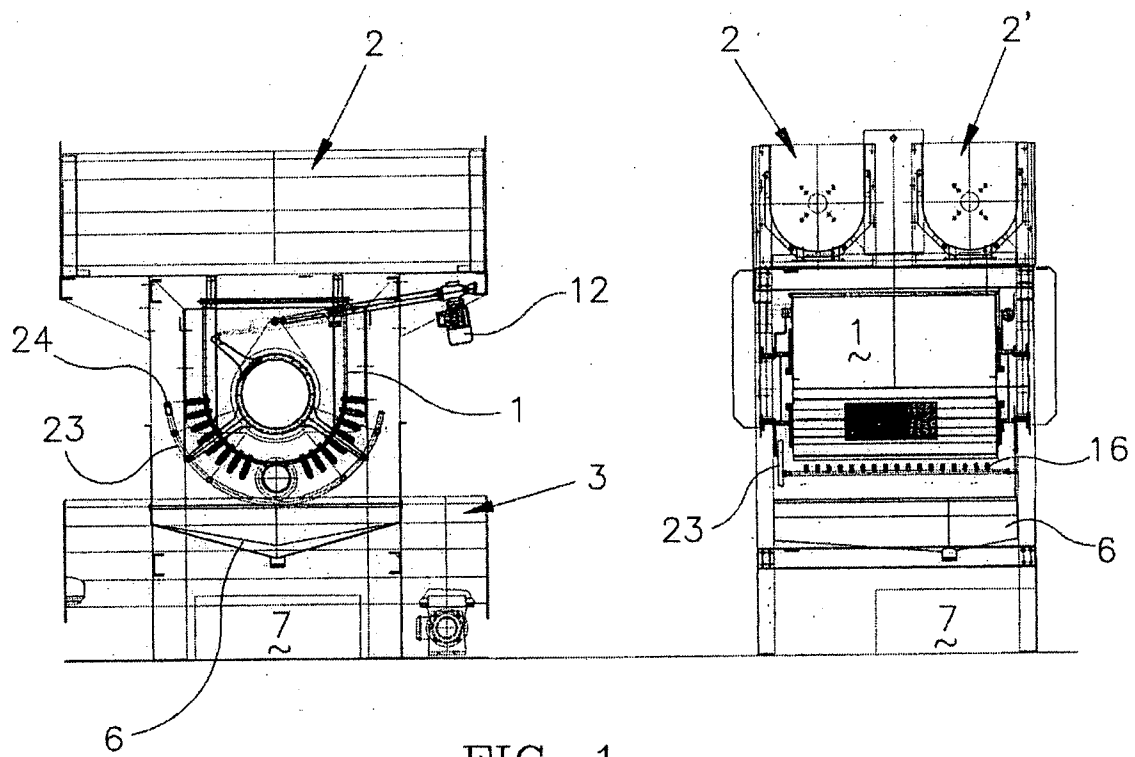


FIG. 1

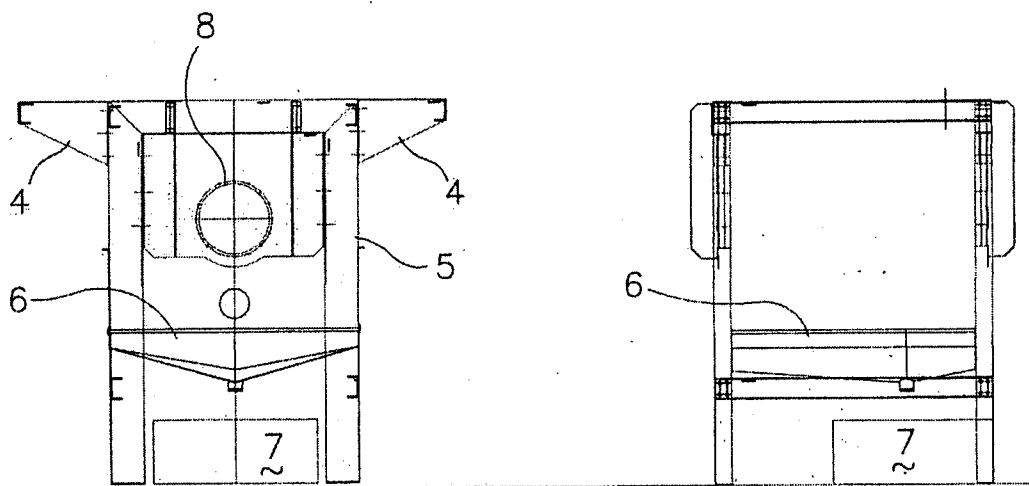
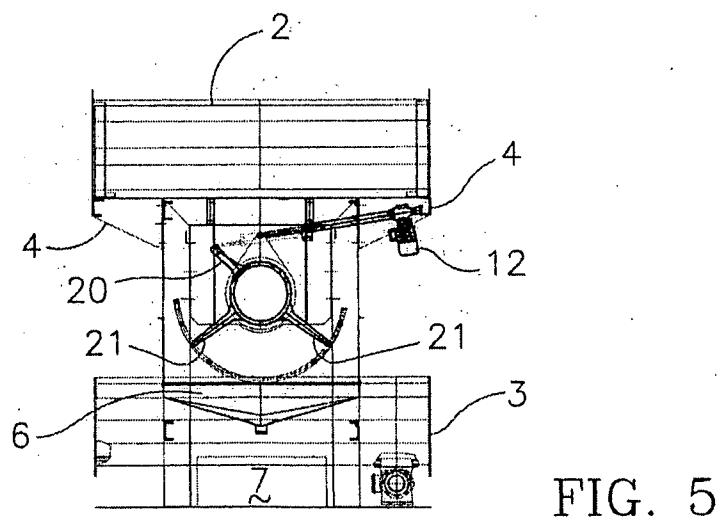
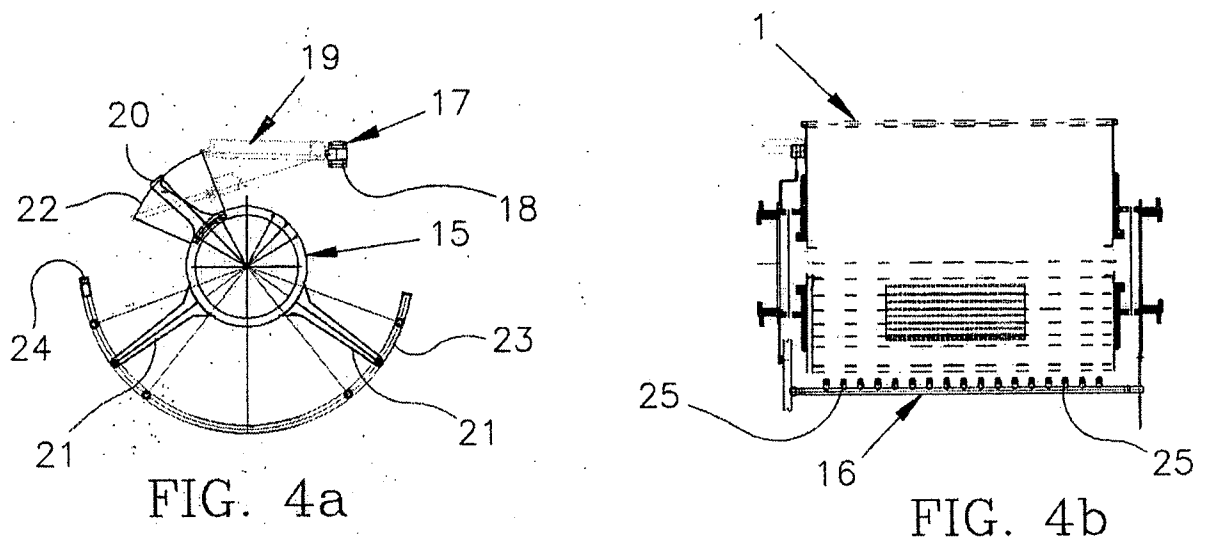
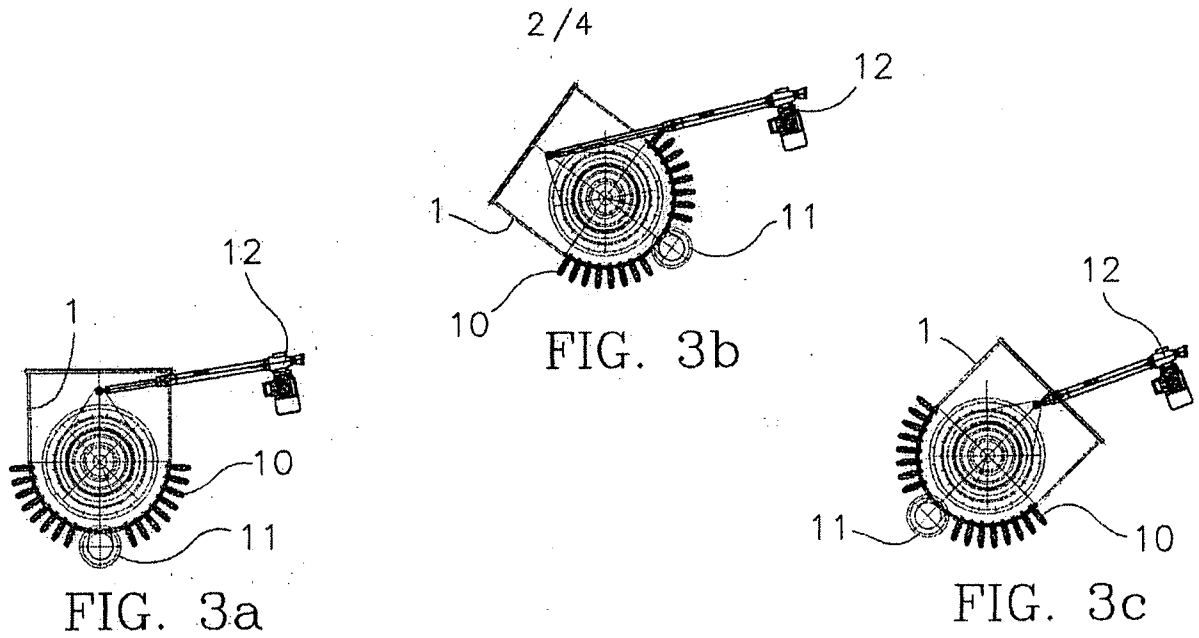


FIG. 2



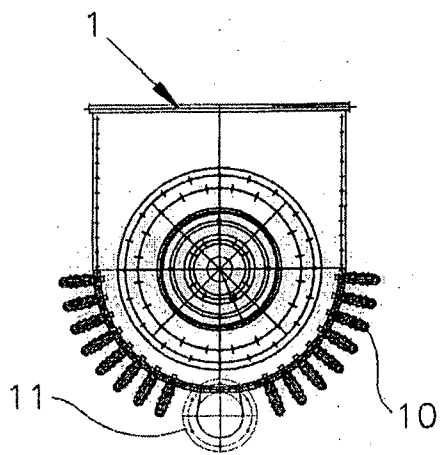


FIG. 6a

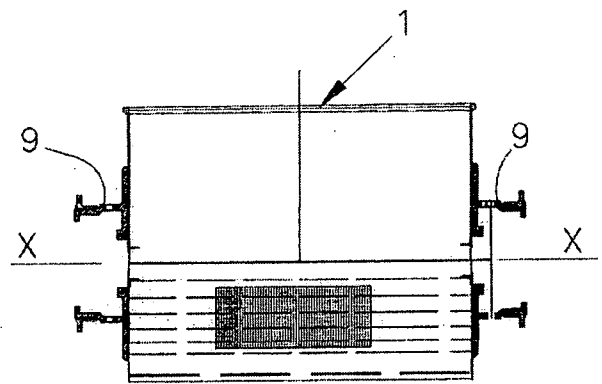


FIG. 6b

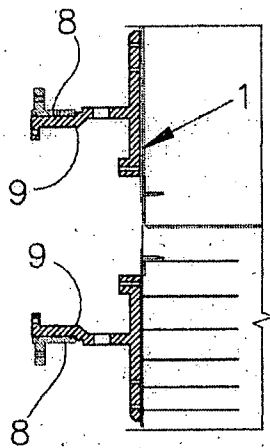


FIG. 6c

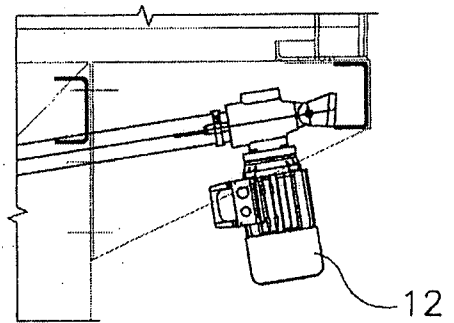


FIG. 6d

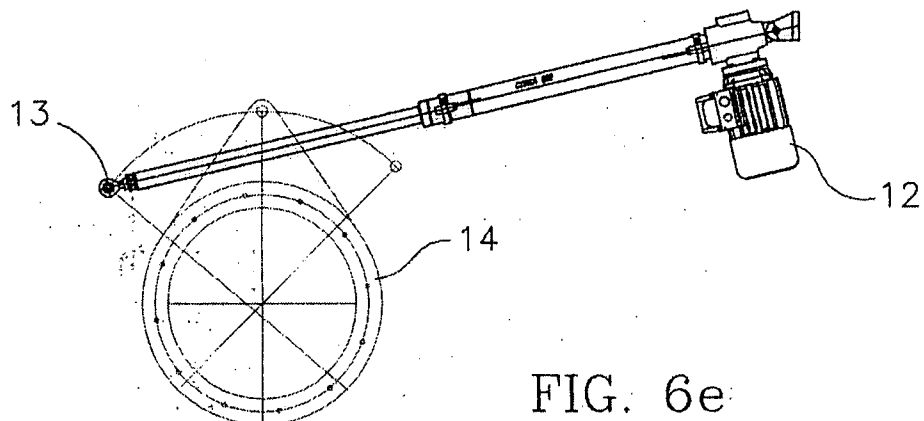


FIG. 6e

4/4

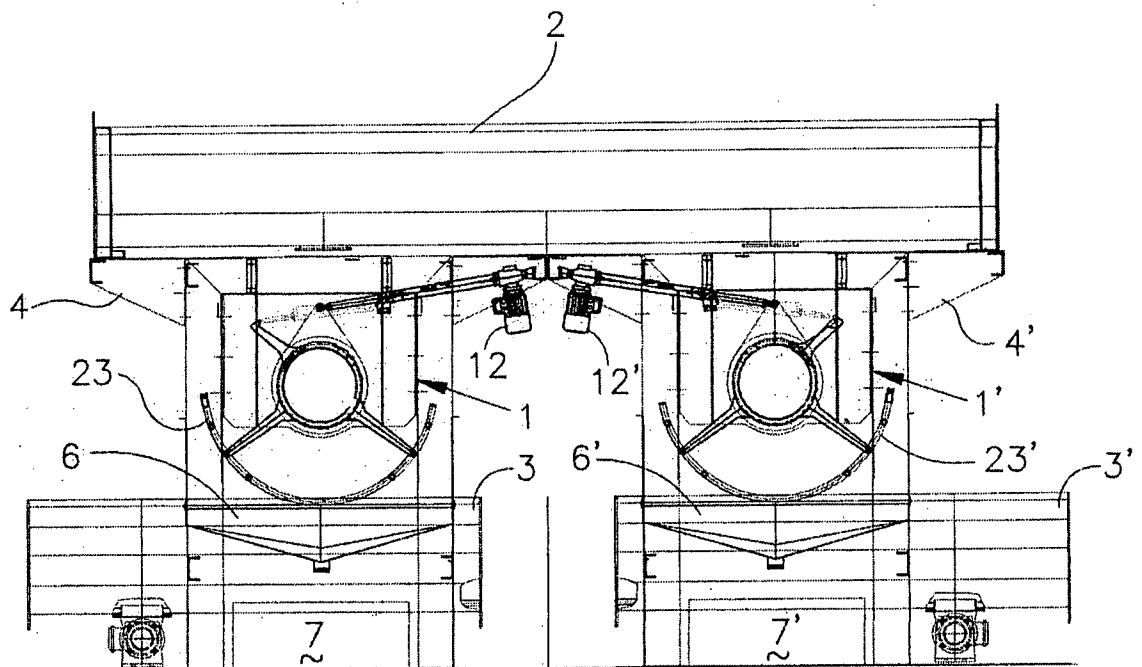


FIG. 7