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(54) **Apparatus for separating liquid and solid substances, in particular for extracting juice from fruit and the like.**

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(73) Proprietor: **SIPREM S.r.l.**
Via Lazio 8
I-61100 Pesaro (IT)

(72) Inventor: **Rondina, Paolo**
Via Oriani 67
I-61030 Calcinelli di Saltara (Pesaro) (IT)

(74) Representative: **Forattini, Amelia et al**
c/o Internazionale Brevetti
Ingg. ZINI, MARANESI & C. S.r.l.
Piazza Castello 1
I-20121 Milano (IT)

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Description

The present invention relates to an apparatus for separating liquid and solid substances, in particular for extracting juice from fruit and the like.

Presses for grapes or fruit in general are generally constituted by a usually cylindrical container which is divided by either an elastic or non-elastic diaphragm into a pressing chamber and into a pressure chamber.

The substance to be pressed, for example grape must, is fed into the pressing chamber, and then pressurized fluid, air or water, is fed into the pressure chamber.

The presses are therefore constituted by a pressurized tank and by a device for producing pressurized fluid. These presses, besides having a considerable energy expenditure, must furthermore comply with all the statutory provisions regarding this type of apparatus.

Therefore, known presses not only have a heavy and complicated structure, but must also be provided with all the necessary safety systems prescribed when working in the presence of high-pressure fluids.

The aim of the present invention is to provide an apparatus for pressing fruit in general, and more particularly grapes, which does not have the above described problems and is furthermore more economical from the point of view of production and management.

Within the scope of this aim, an object of the invention is to provide an apparatus which can perform a more accurate pressing as regards grapes in particular.

Another object of the invention is to provide an apparatus which is absolutely safe for the personnel assigned thereto.

This aim, these objects and others which will become apparent hereinafter are achieved by an apparatus for separating liquid and solid substances, in particular for extracting juice from fruit and the like, comprising a pressing container into which the product to be separated is fed, characterized in that said pressing container comprises at least one pressing chamber which is delimited by a flexible diaphragm and by a discharge device, said flexible diaphragm being adjacent to a region which is substantially at atmospheric pressure, said pressing chamber being connected to means suitable for generating negative pressure, so that said diaphragm acts on said product and presses it.

Further characteristics and advantages will become apparent from the description of the apparatus, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Fig. 1 is a schematic side view of the apparatus according to the invention;

Fig. 2 is a schematic side view of a container with a tubular diaphragm, which can be applied to the apparatus according to the invention.

Fig. 3 is an isometric partial view of a discharge channel;

Fig. 4 is a side partial view, in section, of a discharge channel.

With reference to the above figures, the apparatus according to the invention, generally designated by the reference numeral 1, comprises a container 2, into which the material to be separated is fed, and a vacuum device 3, adapted to generate a negative pressure in the container 2.

The container 2 is constituted by a cylindrical structure 5 which is rotatably mounted on supports 7 and comprises a resilient diaphragm 9 which is fixed along two generatrices of the cylinder and to the end walls 11 and 13 of said cylinder, so as to define a first pressing chamber 15 and a second chamber 17.

The pressing chamber 15 comprises a plurality of discharge channels 19 which are perforated in order to drain the liquid part separated during the pressing action.

The discharge channels 19 are connected to a circular manifold 21 which is located at the end wall 11 and is in turn connected to a discharge manifold 23 arranged outside the container 2.

Advantageously, the discharge channels 19 are associated to the tank by means of hinges 49, as illustrated in Fig. 3. The channels 19 can thus be easily open for washing without disassembling them as it happens with conventional constructions.

Also advantageously, sprayer nozzles 51 are provided preferably on the opposite side of the discharge manifold 21, at each channel 19. Nozzles 51, are connected to a high-pressure pump (not illustrated), and allow the internal washing of the channels along their entire length, as illustrated in Fig. 4.

All the nozzles can be connected to a washing manifold 53 outside the container 2 in order to wash the channels simultaneously.

The vacuum generation device 3 comprises a separator tank 25, which is connected to the manifold 23 and is adapted to collect the liquid product, and a vacuum pump 27, which is adapted to generate a negative pressure inside the separator 25.

The vacuum pump 27 is of a per se known type. The separator 25 furthermore comprises a level measurement device 37 which is suitable for controlling an extraction pump 39 in order to discharge the separated product when it reaches a preset level in said separator.

A liter counter 33 is inserted after the pump 39 in order to automatically control the amount of extracted liquid product.

This control is used for the automatic actuation of the press, both during filling and during pressing, optimizing the negative pressure values generated by the device 3.

Finally, a fan 41 is advantageously connected to the second chamber 17 of the container 2 and is suitable for generating a slight overpressure in said second chamber, whereas a valve 35 allows access to ambient pressure.

The operation of the separation apparatus according to the invention is as follows.

The pressing chamber 15 is initially filled with material to be separated, for example crushed or whole grapes; then negative pressure is generated by means of the device 3 in the discharge channels 19. The resilient diaphragm 9 thus presses on the product by virtue of the atmospheric pressure which is present in the second chamber 17. The liquid thus produced is conveyed into the manifold 23 and collected in the separator 25, where the extraction pump 39 periodically discharges it.

The fan 41 may generate a slight overpressure in the second chamber 17 in order to facilitate the depletion of the product, creating a greater pressure difference between the pressing chamber and the second chamber.

The fan 41 is furthermore advantageously used also to move the diaphragm 9 rapidly into its working position, in contact with the must, after filling has occurred.

Another advantageous use of the fan is the generation of a negative pressure in the second chamber in order to move the diaphragm 9 into the position for loading the pressing chamber (as shown in figure 1).

In practice it has been observed that the invention achieves the intended aim and objects by providing a pressing apparatus for fruit and the like which is structurally and functionally much more simplified than known devices and is furthermore advantageous from the point of view of the quality of the product obtained.

The product is in fact subjected to less laceration and to a greater degree of filtration with respect to conventional presses.

The advantages that the absence of high-pressure fluids provides are numerous: first of all, the apparatus does not require the inspections and verifications prescribed by the law and, most of all, there is no danger of explosion or breakage in case of malfunction of valves and automatic systems, with consequent complete safety for the assigned personnel and absence of safety and control devices.

An important advantage is furthermore due to the fact that in case of rupture of the diaphragm, no oil, compressed air or pressurized fluid can pass into the food product, as instead it occurs in con-

ventional presses.

Another great advantage is due to the possibility of keeping the apparatus at negative pressure during the filling of the product, thus facilitating the feeding action, increasing the amount of product loaded for an equal volume, and facilitating the extraction of the juice.

The apparatus according to the invention is furthermore subjected to less mechanical stress and is thus more reliable and has a longer life.

Not least advantage is that it is possible to intervene on the apparatus even during treatment, since there are no pressurized parts.

Fig. 2, for example, illustrates a container 2a which comprises a tubular resilient diaphragm 9a which defines a pressing chamber 15 which is coaxial to the second chamber 17.

In practice, in an apparatus according to the invention it is possible to use any type of pressing container, which may also have shapes differing from the cylindrical one and may also not be rotatable.

The second chamber of the container may furthermore be open toward the outside.

Fig. 1 furthermore illustrates a possible arrangement of the fan 41a, which is connected to the separator 25. In this case, the fan 41a would not serve to generate a slight overpressure in the second chamber, as previously described, but would facilitate a first rapid generation of negative pressure in the pressing chamber, furthermore moving the diaphragm 9 rapidly into its working position. The fan 41a, in this case as well, is able to move the diaphragm 9 rapidly into the loading position, shown in figure 1.

Said fan 41a, which is conveniently connected to an accumulation 29 of inert gas, which also comprises a discharge 31, allows to introduce gas into the pressing chamber in order to avoid the contact of the product with ambient air in order to minimize the oxidation of the product.

The apparatus according to the invention may have several modifications and variations, all within the inventive concept; furthermore, all the details may be substituted with technical equivalent elements.

The materials employed, as well as the dimensions, may naturally be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Apparatus for separating liquid and solid substances, in particular for extracting juice from fruit and the like, comprising a pressing container (2, 2a) into which the product to be separated is fed, characterized in that said pressing container comprises at least one pressing chamber (15) which is delimited by a flexible diaphragm (9, 9a) and by a discharge device (19), said flexible diaphragm being adjacent to a region (17) which is substantially at atmospheric pressure, said pressing chamber being connected to means (3) which are suitable for generating negative pressure, so that said diaphragm acts on said product and presses it. 5
2. Apparatus according to claim 1, characterized in that said means suitable for generating negative pressure are constituted by a vacuum pump (27) which is connected to a separator tank (25). 10
3. Apparatus according to one or more of the preceding claims, characterized in that said pressing container comprises a cylinder (5) which is divided by a flexible diaphragm (9) into said pressing chamber (15) and into a second chamber (17), said pressing chamber comprising discharge channels (19) which are connected to said tank (25) by means of a discharge manifold (23), said second chamber (17) being substantially at atmospheric pressure. 15
4. Apparatus according to one or more of the preceding claims, characterized in that it comprises a fan (41) which is connected to said second chamber (17), said fan being suitable for generating a slight overpressure in said second chamber. 20
5. Apparatus according to one or more of the preceding claims, characterized in that said fan (41) is suitable for generating a slight negative pressure in said second chamber in order to facilitate the feeding of said product into said pressing chamber. 25
6. Apparatus according to one or more of the preceding claims, characterized in that it comprises a second fan (41a) which is connected to said separator tank (25) and is suitable for generating a slight overpressure in said pressing chamber (15) in order to move said diaphragm (9) into a position which facilitates the feeding of said pressing chamber. 30
7. Apparatus according to one or more of the preceding claims, characterized in that said second fan (41a) connected to said separator tank is suitable for generating a first rapid negative pressure in said pressing chamber. 35
8. Apparatus according to one or more of the preceding claims, characterized in that said second fan (41a) connected to said separator tank is suitable for introducing inert gas into said pressing chamber. 40
9. Apparatus according to one or more of the preceding claims, characterized in that said pressing container (2, 2a) is mounted so as to be able to rotate. 45
10. Apparatus according to one or more of the preceding claims, characterized in that said second chamber is open and connected to the outside environment. 50
11. Apparatus according to one or more of the preceding claims, characterized in that it comprises a control means (33) of the extracted liquid product in order to optimize the pressing cycle. 55
12. Apparatus according to one or more of the preceding claims, characterized in that said discharge channels (19) are associated to said container by means of hinges (49).
13. Apparatus according to one or more of the preceding claims, characterized in that said discharge channels (19) comprise nozzle members (51) adapted to wash said channels.
14. Apparatus according to one or more of the preceding claims, characterized in that said each of said nozzle members (51) is arranged at the end of each of said channels opposite to the end which is associated to said manifold (21).

Patentansprüche

1. Vorrichtung zur Trennung flüssiger und fester Substanzen, insbesondere zum Extrahieren von Saft aus Früchten und dgl., mit einem Preßbehälter (2,2a), in den das zu trennende Produkt eingegeben wird, dadurch gekennzeichnet, daß der Preßbehälter mindestens eine Preßkammer (15) aufweist, die durch eine flexible Membran (9,9a) und eine Auslaßeinrichtung (19) begrenzt ist, wobei die flexible Membran an einen Bereich (17) angrenzt, in dem im wesentlichen Atmosphärendruck

- herrscht, und wobei die Preßkammer an Mittel (3) angeschlossen ist, die zur Erzeugung eines Unterdrucks geeignet sind, so daß die Membran auf das Produkt einwirkt und es preßt.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Mittel zur Erzeugung eines Unterdrucks aus einer Vakuumpumpe (27) bestehen, die an einen Abscheidetank (25) angeschlossen ist.
3. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Preßbehälter einen Zylinder (5) aufweist, der durch eine flexible Membran (9) in die Preßkammer (15) und eine zweite Kammer (17) unterteilt ist, wobei die Preßkammer Auslaßkanäle (19) aufweist, die über eine Auslaßleitung (23) mit dem Tank verbunden sind, und in der zweiten Kammer (17) im wesentlichen Atmosphärendruck herrscht.
4. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie ein Gebläse (41) aufweist, welches an die zweite Kammer (17) angeschlossen ist und in dieser zweiten Kammer einen leichten Überdruck erzeugen kann.
5. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Gebläse (41) in der zweiten Kammer einen leichten Unterdruck erzeugen kann, um das Einfüllen des Produkts in die Preßkammer zu erleichtern.
6. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie ein zweites Gebläse (41a) aufweist, welches an den Abscheidetank (25) angeschlossen ist und in der Preßkammer (15) einen leichten Überdruck erzeugen kann, um die Membran (9) in eine Lage zu bewegen, die das Befüllen der Preßkammer erleichtert.
7. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das an den Abscheidetank angeschlossene zweite Gebläse (41a) zur Erzeugung eines ersten, schnellen Unterdrucks in der Preßkammer geeignet ist.
8. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das an den Abscheidetank angeschlossene zweite Gebläse (41a) zur Einleitung eines inerten Gases in die Preßkammer geeignet ist.
9. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Preßbehälter (2,2a) drehbar montiert ist.
10. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die zweite Kammer offen ist und mit der äußeren Umgebung in Verbindung steht.
11. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sie eine Steuereinrichtung (33) für das extrahierte flüssige Produkt aufweist, um den Preßzyklus zu optimieren.
12. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Auslaßkanäle (19) mittels Scharnieren (49) am Behälter angebracht sind.
13. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Auslaßkanäle (19) zum Auswaschen der Kanäle bestimmte Düsenelemente (51) aufweisen.
14. Vorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß jedes der Düsenelemente (51) an demjenigen Ende der Kanäle angeordnet ist, das entgegengesetzt zu demjenigen Ende liegt, das dem Auslaßstutzen (21) zugeordnet ist.

Revendications

1. Appareil pour séparer des substances liquides et solides, en particulier pour extraire le jus de fruits et analogues, comprenant un récipient de pressage (2, 2a) dans lequel le produit à séparer est introduit, caractérisé en ce que ledit récipient de pressage comprend au moins une chambre (15) délimitée par un diaphragme flexible (9, 9a) et par un dispositif d'évacuation (19), ledit diaphragme flexible étant adjacent à une zone (17) qui est substantiellement à la pression atmosphérique, ladite chambre de pressage étant reliée à des moyens (3) qui conviennent pour générer une pression négative, de sorte que ledit diaphragme agit sur le produit et le presse.
2. Appareil selon la revendication 1, caractérisé en ce que lesdits moyens pour générer une pression négative sont constitués d'une pompe à vide (27) qui est reliée à un réservoir de

séparation (25).

3. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que le récipient de pressage comprend un cylindre (5) qui est divisé par un diaphragme flexible (9) pour former ladite chambre de pressage (15) et une deuxième chambre de pressage (17), ladite chambre de pressage comprenant des canaux d'évacuation (19) qui sont reliés audit réservoir (25) au moyen d'un collecteur d'évacuation (23), ladite deuxième chambre (17) étant substantiellement à la pression atmosphérique. 5 10
4. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comprend un ventilateur (41) qui est relié à ladite deuxième chambre (17) et qui est prévu pour générer une légère surpression dans ladite deuxième chambre. 15 20
5. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit ventilateur (41) est destiné à générer une pression légèrement négative dans ladite deuxième chambre afin de faciliter l'introduction dudit produit dans ladite chambre de pressage. 25 30
6. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comprend un deuxième ventilateur (41a) relié audit réservoir de séparation (25) et prévu pour générer une légère surpression dans ladite chambre de pressage (15), afin de déplacer ledit diaphragme (9) dans une position qui facilite l'alimentation de ladite chambre de pressage. 35 40
7. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit deuxième ventilateur (41a) relié audit réservoir de séparation génère une première pression négative rapide dans ladite chambre de pressage. 45
8. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit deuxième ventilateur (41a) relié audit réservoir de séparation introduit du gaz inerte dans ladite chambre de pression. 50
9. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ledit récipient de pressage (2, 2a) est monté de manière à pouvoir tourner. 55
10. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que ladite deuxième chambre est ouverte et en communication avec l'atmosphère ambiante.
11. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce qu'il comprend des moyens de commande (33) du produit liquide extrait afin d'optimiser le cycle de pressage.
12. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que lesdits canaux d'évacuation (19) sont associés audit récipient au moyen d'articulations (49).
13. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que lesdits canaux d'évacuation (19) comprennent des buses (51) conçues pour laver lesdits canaux.
14. Appareil selon l'une ou plusieurs des revendications précédentes, caractérisé en ce que chacune des dites buses (51) est placée à l'extrémité de chacun desdits canaux à l'opposé de l'extrémité qui est associée audit collecteur (21).



