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(54) **PNEUMATIC PRESS**

(57) A press (MC) for a vegetable product, e.g. pressed grapes, comprises a pressing chamber (10) which extends along and around a longitudinal axis (X) and is provided on the internal surface with a draining sieve (12) for separating the vegetable product into solid and liquid part, a membrane (50) which is mounted inside the chamber

and is inflatable for pressing the vegetable product against the draining sieve, wherein the draining sieve comprises a portion (60) which, seen from said axis (X), is convex with respect to a remaining concave inner surface of the chamber, in particular said portion extends radially from the concave inner surface of the chamber towards the axis.

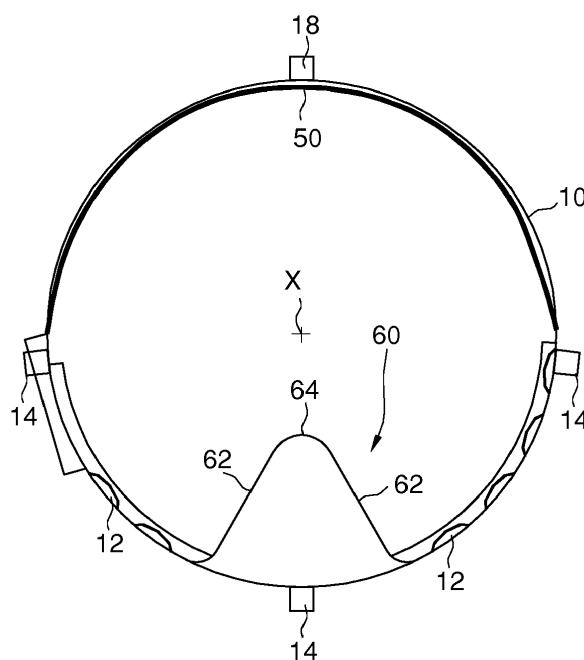


Fig. 2

Description

[0001] The invention concerns a pneumatic press to press a vegetable product. The following description will refer by way of example to winemaking, a field in which the invention has proved particularly effective.

[0002] Pneumatic presses are known for pressing a vegetable product, e.g. as in EP2342071. In a horizontal-axis rotating drum, crushed material is loaded and then pressed by an inflatable membrane which separates the liquid part from the peel through perforated draining channels placed on the internal surface of the drum. The inflatable membrane has the edges fixed at the ends of a drum's diameter, and is designed to adhere, during loading, to half of the internal surface of the drum, while when inflated it presses the vegetable product against the opposite half.

[0003] The main disadvantage is that the maximum draining surface (or the maximum surface within which drainage channels can be applied) is only half of the internal surface of the drum. Since the draining holes or channels are made in the half-shell of the drum not occupied by the membrane, it follows that the distance between the draining surface and the pressing membrane is very disadvantageous.

[0004] The present invention has as its main object to improve this state of the art. In particular, the present invention has the object of producing a press that alleviates the aforementioned problems.

[0005] A first aspect of the invention is a press for vegetable product, e.g. crushed grapes, comprising:

a pressing chamber that extends along and around a longitudinal axis and is equipped on the inner surface with a draining sieve to separate the vegetable product into a solid part and a liquid part, a membrane which is mounted inside the chamber and is inflatable to press the vegetable product against the draining sieve, wherein the draining sieve comprises a portion which, seen from said axis, is convex with respect to a remaining inner concave surface of the chamber, in particular said portion extends radially from the concave inner surface of the chamber toward the axis.

[0006] In particular, and not necessarily, the pressing chamber may comprise or consist of a hollow drum rotatable about a horizontal axis and provided on the inner lateral surface with a draining sieve for separating the vegetable product in solid and liquid part, wherein a membrane is mounted inside the drum and inflatable to press the vegetable product against the draining sieve. In this case the draining sieve comprises a portion which, seen from the axis of the drum, is convex with respect to the inner concave surface of the drum, in particular said portion extends radially from the internal concave surface of the drum towards the axis of the drum.

[0007] The pressing chamber may coincide for example with one of several volumes with which the press is equipped and in which a pressing is performed through an inflatable membrane to press the vegetable product against the draining sieve.

[0008] The convex portion in each case brings advantages to the press, that is:

1. it increases the drainage surface of the drum or of the pressing chamber, and such increase occurs in the inner part of the drum, i.e. where it is more difficult to filter the product;
2. it considerably reduces the distance between the membrane and the drainage surface, thus considerably reducing the thickness of the mass to be filtered. This also applies to a situation of continuous loading and filtration of crushed grapes. In the press loading phases, the convex portion gives maximum efficiency in the initial phases, and then decreases. As the thickness of the mass is reduced, the efficiency of the convex sieve increases;
3. it can be made entirely of perforated metal sheet, which is inexpensive;
4. it favors the crumbling of the mass during the rotation of the same, and therefore damages less the membrane during the work cycles.

[0009] Said convex portion is applicable to the rotatable drum in two variants: both when the drainage sieve comprises - or consists of - a perforated wall of the drum communicating directly with the outside of the drum (the inner volume of the drum communicates with the outside through the openings of the perforated wall), and when the drainage sieve comprises or consists of one or more drainage channels (the drum is closed) from which the liquid part is conveyed towards the outside of the drum through a liquid collector.

[0010] Said portion and/or draining sieve preferably comprises or consists of a perforated grid or mesh.

[0011] Preferably, said portion comprises or is constituted by filtering walls shaped as a V- or U-shaped wedge, the wedge having a base at the inner lateral surface of the drum or of the pressing chamber, and a tapered part facing towards the axis of the drum or of the pressing chamber. Thanks to this "wedge" the semicylindrical concave draining surface of the drum or of the pressing chamber increases and becomes a concave-convex surface.

[0012] Preferably, the tapered part comprises or is constituted by a rounded vertex.

[0013] Preferably the wedge-shaped walls form between each other an angle comprised between 30 degrees and 90 degrees. Preferably said portion has such a convexity that between the part of the portion closest to the axis of the drum, or of the pressing chamber, and the inner lateral surface of the drum, or of the pressing chamber, there is a distance of 15% to 50% of the drum's diameter or pressing chamber's diameter (or of the actual

volume pressed in the case of a different type of press). In particular, experimental tests have identified as optimal a distance comprised between 30-35% of the diameter of the drum or of the pressing chamber and an angle between the two filtering walls equal to 60 degrees.

[0014] Preferably, said portion and the inner lateral surface of the drum or of the pressing chamber are joined by rounded or curved sections, to avoid product stagnation.

[0015] Preferably the inflatable membrane is preferably mounted so that the edges of the membrane lie on the inner surface of the drum or of the pressing chamber. In particular, the inflatable membrane is mounted so that the edges of the membrane coincide with the intersections between the inner surface of the drum or of the pressing chamber and an imaginary diametral plane of the drum or of the pressing chamber.

[0016] Preferably, said portion is made of a rigid or elastic material.

[0017] Preferably, said portion is coupled to the inner wall of the drum or of the pressing chamber by non-permanent connection means.

[0018] Preferably between said portion and the wall of the drum or of the pressing chamber there are arranged washing means or a washing device for spraying washing fluid against the back of the portion towards the inside, or towards the axis of the drum or of the pressing chamber. In particular, if the portion consists of wedge-shaped or V- or U-shaped filtering walls, the washing means or device may be housed within the concavity of said portion, more preferably in a position adjacent to the vertex of the portion. The advantage is that the portion and/or the inside of the drum can be quickly cleaned and from a close position.

[0019] Preferably, between said portion and the wall of the drum or of the pressing chamber a gas injection device or means is arranged to inject gas against the back of the portion towards the inside, or towards the axis, of the drum or of the pressing chamber. In particular, if the portion is constituted by wedge-shaped or V- or U-shaped filtering walls, the gas injection device or means may be housed within the concavity of said portion, more preferably in a position adjacent to the vertex of the portion. The advantage is that it is possible to process the mass of vegetable product with gases from a close position.

[0020] Preferably between said portion and the wall of the drum or of the pressing chamber liquid injection means or a liquid injection device are/is arranged to inject a liquid against the back of the portion towards the inside, or towards the axis, of the drum or of the chamber of pressing. In particular, if the portion consists of wedge-shaped or V-shaped or V-shaped filtering walls, the liquid injection means or device may be housed within the concavity of the said portion, more preferably in an adjacent position at the top of the portion. The advantage is that it is possible to process the mass of vegetable product by means of gases from a close position.

[0021] Preferably, the press comprises, between said portion and the wall of the drum or of the pressing chamber, injection means or an injection device of a liquid or a liquid mixture.

[0022] Preferably said liquid or mixture of liquids is suitable for favoring maceration and/or alcoholic fermentation and/or the pressing. As another example, the liquid may be washing liquid for the inside of the drum or the pressing chamber, e.g. water. Preferably the injection means or device are configured to inject the liquid or the mixture of liquids towards the inside, or towards the axis, of the drum or of the pressing chamber.

[0023] A preferred embodiment of the press will now be described with reference to the attached drawing, wherein

fig. 1 shows a side view of the press;

figures 2-3 show cross-sectional front views of the press according to the II-II plane in two structural configurations;

figures 4-7 show cross-sectional front views of the press in various operating configurations;

fig. 8 shows a side view of a variant of a press;

fig. 9 shows a sectional front view of the press of fig. 8 according to a vertical section plane.

[0024] In the drawings equal numerical references indicate equal parts, and relative terms such as *horizontal* are meant to be referred to the press as in use. In order not to crowd the drawings, some repeated elements are not always indicated.

[0025] A press MC comprises a hollow, e.g. cylindrical, drum 10 raised from the ground by a frame. The drum 10 can rotate about a horizontal axis X in a known manner driven by a motor 20.

[0026] The press MC may be constructed in two variants (Figures 2-3).

[0027] The first variant (fig. 2) provides for the drum 10 to be closed. Evenly distributed over the inner side surface of the drum 10, there are longitudinal drainage channels 12, which extend parallel to the axis X for a good part of the length of the drum 10. The drainage channels 12 communicate with collecting ducts 14 which bring the juice extracted by the pressing outside the drum 10, e.g. towards a collection tank 16.

[0028] In the second variant (fig. 3) the drum 10 is open, i.e. about half of the side surface of the drum 10 consists of a perforated wall or grid 22 for draining the vegetable product. The filtering action is carried out directly by the wall or grid 22, and the juice that percolates from the drum 10 is collected.

[0029] For both variants, the drum 10 contains a membrane 50 inflatable by means of a compressor 22 and deflated by means of an aspirator 24 which send or suck up fluid into/inside the drum 50 by means of a suitable access 18. The membrane 50 is attached to the inner side surface of the drum 10 along the intersection between the inner surface of the drum 10 and an imaginary

diametral plane of the drum. The membrane 50 is mounted so that at rest (when deflated) it lies against about half of the inner lateral surface of the drum 10, while in action (when it is inflated) it expands towards the side surface opposite to that from which it departed, where the channels 12 or the grid 22 are. Fig. 2 and 3 show the initial position of the membrane 50, when it is practically laid on the periphery without openings of the drum 10.

[0030] For both variants, the drum 10 can be loaded with vegetable product either through a hatch 90, placed on the lateral surface of the drum 10, or axially, by injecting the product into the drum 10 through a conduit 32 which opens at the axis X.

[0031] For both variants, the drum 10 comprises, on the inner wall opposite to the membrane 50, a draining portion 60 which projects from the concave surface toward the axis X.

[0032] In this case the portion 60 consists of a bump that protrudes from the inner lateral surface of the drum 10 and extends towards the axis X. The bump is formed by two perforated walls 62 converging towards a rounded vertex 64, e.g. perforated as well. The bases of the perforated walls 62 are attached to the inner lateral surface of the drum 10 while the rounded vertex 64 is the part closest to the axis X. Preferably, to avoid stagnation, the bases of the perforated walls 62 are attached to the inner lateral surface of the drum 10 through curved sections (in axial cross-section), in particular with sections (in axial cross-section) with concavity directed towards the axis X.

[0033] Said bump determines the concave portion of the filtering surface of the press. The bump, as in general the portion 60, may be

- a rigid filtering (e.g. non-deformable) or even elastic surface (for example a mesh of nylon), and/or

fully or partially removable (i.e. detachable from the inner wall of the drum 10), to facilitate internal cleaning operations of the same.

[0034] Preferably within the bump, or in general within the portion 60, there may be (see also Figures. 8-9) further components to increase the functionality of the press.

[0035] E.g. a preferred component relates to means or a washing device for spraying washing fluid against the back of the walls 62. The washing means or device comprises e.g. a tube 98 provided with washing nozzles extending longitudinally (parallel to the axis X) between the upper portion 60 and the lateral surface of the drum 10 (i.e. extending in the space relative to the concavity of the portion 60 or of the bump). The arrows in figure 8 and 9 indicate an example of a route for the washing fluid inside the drum 10.

[0036] Another preferred component relates to a device or means for injecting liquids or mixtures of liquids favoring the maceration and/or alcoholic fermentation and/or the pressing towards the mass of product contained in the drum 10 through the walls 62. The same

variations cited for the washing means or device are valid here.

[0037] Another preferred component relates to a device or means for injecting gas or a mixture of gas to inject gas towards the mass of product contained in the drum 10 through walls 62. The gas in particular serves to neutralize the mass, or to favor the extraction from it of aromas or compounds, or to oxidize the mass. The injection device or means e.g. comprises a conduit or tube 98 provided with one or more gas diffusers, wherein the conduit extends longitudinally (parallel to the axis X) between the bump or the portion 60 and the lateral surface of the drum 10 (or extends in the space relative to the concavity of the portion 60 or of the bump), in particular being positioned adjacent to the concavity of the vertex of the bump or of the portion 60. In this way the gas is injected directly into the mass to be filtered, with considerable advantages with respect to the diffusion itself of gas in the mass. The arrows in figure 8 and 9 indicate an example of the path for the gas inside the drum 10.

[0038] For each type of material to be injected into the drum 10, each aforesaid component may comprise a dedicated injection tube or duct independent from the others. Or advantageously the means or devices for the injection of gas, of liquid favoring the maceration/fermentation/pressing or the washing, may comprise or consist of a single duct or tube which, for example, alternatively performs the function of: (1) washing of the bump or of the portion 60 and also of the inner part of the press, and (2) injection and diffusion of the gas into the mass.

[0039] Preferably the walls 62 form an angle between 30 degrees and 90 degrees, in particular 60 degrees. Preferably the height of the bump, measured along a diameter of the drum 10 with respect to the adjacent inner lateral surface of the drum 10, is comprised between 15% and 50% of the diameter of the drum 10, in particular 30-35%. These values are those that experimentally produce greater efficiency for the press MC.

[0040] Fig. 4 shows in cross-section the axial loading of a press MC of the closed type.

[0041] Note the membrane 50 at rest and adhering to the inner surface of the drum 10, while the charged vegetable product is indicated with P.

[0042] Since the bump has a height equal to about 1/3 of the diameter of the drum 10 and an angle between the two filtering walls 62 of 60 degrees, the increase in the filtering surface is equal to 15% in the hypothesis that the loading percentage is 25%. 15% more draining surface translates, with respect to the hypothesis of complete loading, into a 4 times higher efficiency, that is to an efficiency increase of at least 60% compared to the situation of an analogous, by volume, known press.

[0043] It should be noted that the steepness of the walls 62 and the roundness of its top 64 cause the sieve 60 to be self-cleaning, because it avoids the accumulation of skins and seeds that would normally form a cap against the drain.

[0044] Moreover, since the sieve 60 wedges into the

mass of the product P, it reduces the thickness thereof and determines a considerable increase in efficiency.

[0045] Fig. 5 illustrates as an example the membrane 50 in action, while pressing the product P against the bump and the channels 12.

[0046] The arrows indicate the dripping paths followed by the liquid.

[0047] Fig. 6 shows in cross-section a 75% axial loading of a closed-type press MC. Compare with fig. 7 which shows in cross-section the axial loading at 75% of an open-type press MC. In both these two cases, during the pressing phase the efficiency increase can be considered equal to 20-30%.

[0048] In a known manner the rotation of the drum 10 around the axis X serves to break up and expel the solid part of the pressed vegetable product which has remained packed against the draining channels 12 or on the wall or perforated grid 22.

[0049] The operations of the press MC are preferably managed by a programmable electronic unit or a PLC. In particular, the programmable electronic unit or the PLC manages the motor 20, the compressor 22 and the aspirator 24, all the valves of the press MC. The longitudinal drainage channels 12 may be of a different shape from the illustrated one.

Claims

1. Press (MC) for a vegetable product, e.g. pressed grapes, comprising:

a pressing chamber (10) which extends along and around a longitudinal axis (X) and is provided on the internal surface with a draining sieve (12) for separating the vegetable product into solid and liquid part,
a membrane (50) which is mounted inside the chamber and is inflatable for pressing the vegetable product against the draining sieve,
wherein the draining sieve comprises a portion (60) which, seen from said axis (X), is convex with respect to a remaining concave inner surface of the chamber, in particular said portion extends radially from the concave inner surface of the chamber towards the axis.

2. Press (MC) according to claim 1, wherein the pressing chamber comprises
a hollow drum (10) rotatable about a horizontal axis (X) and provided on the inner side surface with a draining sieve (12) for separating the vegetable product into solid and liquid part,
a membrane (50) which is mounted inside the drum and inflatable for pressing the vegetable product against the draining sieve (12),
wherein the draining sieve comprises a portion (60) which, seen from the axis (X) of the drum (10), is

convex with respect to the concave inner surface of the drum.

3. Press (MC) according to claim 1 or 2, wherein said portion and/or the drainage sieve comprises or consists of a perforated grid or mesh (62), which may be rigid or elastic.
4. Press (MC) according to any one of the previous claims, wherein said portion (60) comprises or consists of filtering walls (62) shaped like a wedge or in the shape of a V or U, the wedge having a base at the inner side surface of the chamber and a tapered part facing the axis.
5. Press (MC) according to claim 4, wherein the wedge-shaped walls form therebetween an angle comprised between 30 degrees and 90 degrees.
6. Press (MC) according to claim 4 or 5, wherein the wedge-shaped walls (62) have a convexity such that between the part of the portion closest to the axis and the inner lateral surface of the chamber there is a distance of 15% to 50% of the chamber's diameter.
7. Press (MC) according to claim 4 or 5 or 6, wherein said distance is between 30-35% of the chamber diameter.
8. Press (MC) according to claim 4 or 5 or 6 or 7, wherein the angle between the two filtering walls (62) is equal to 60 degrees.
9. Press (MC) according to any one of the previous claims, comprising, between said portion (60) and the wall of the chamber (10), a washing means or device for spraying washing fluid against the back of the portion towards the inside, or towards the axis (X), of the chamber (10).
10. Press (MC) according to any one of the previous claims, comprising, between said portion (60) and the filtering wall of the chamber (10), a gas injection means or device for injecting gas against the back of the portion (60) towards the inside, or towards the axis (X), of the chamber (10).
11. Press (MC) according to any one of the previous claims, comprising, between said portion (60) and the filtering wall of the chamber (10), means or a device for injecting liquid or a mixture of liquids against the back of the portion (60) towards the interior, or towards the axis (X), of the chamber (10), one or each liquid having chemical properties that favor the maceration and/or the alcoholic fermentation of the product inside the chamber (10).

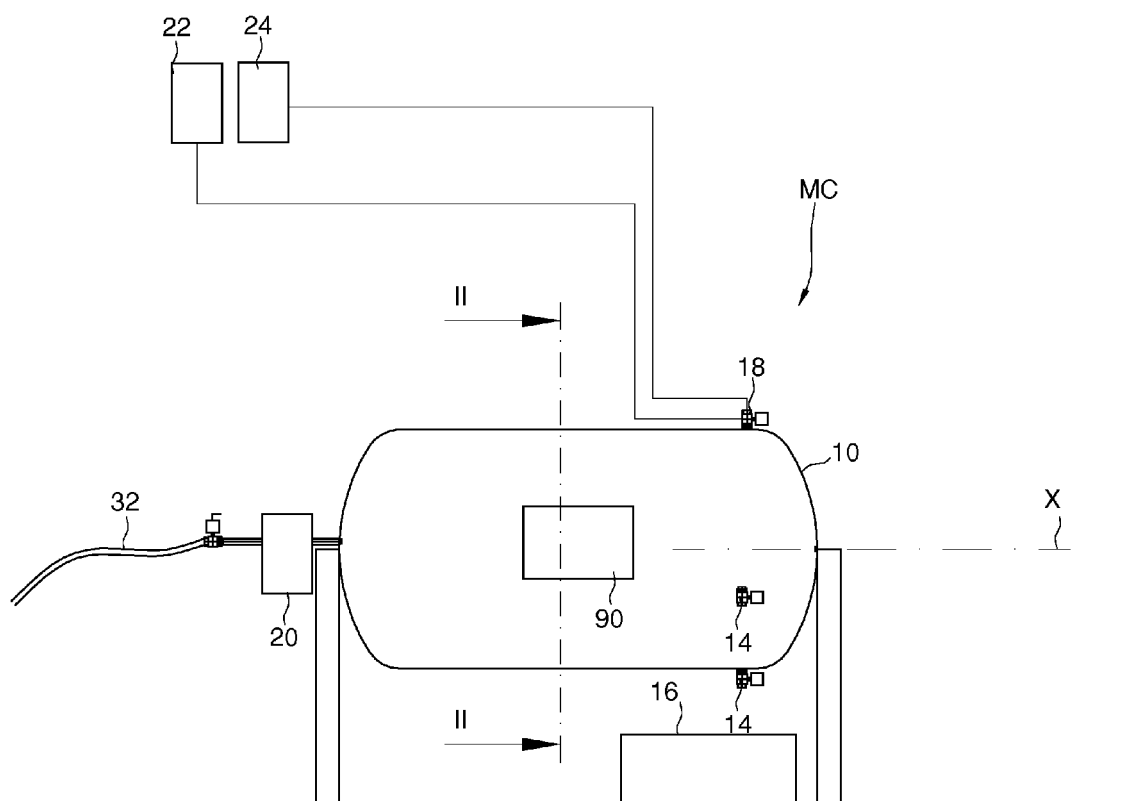


Fig. 1

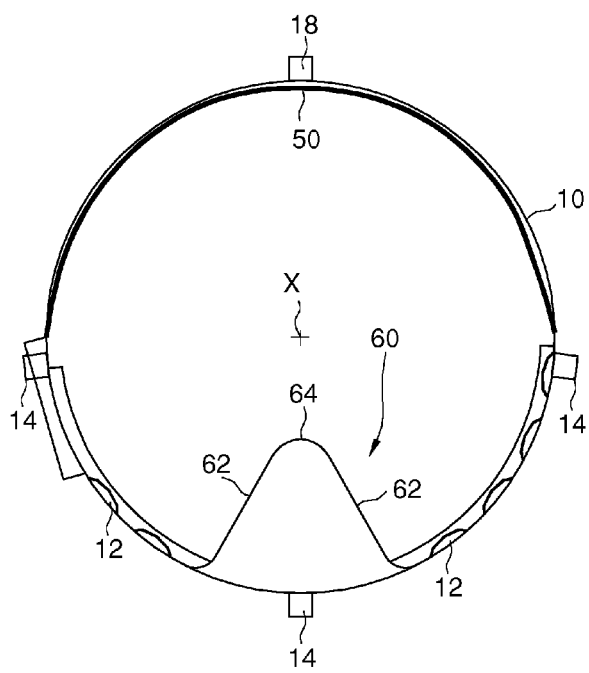


Fig. 2

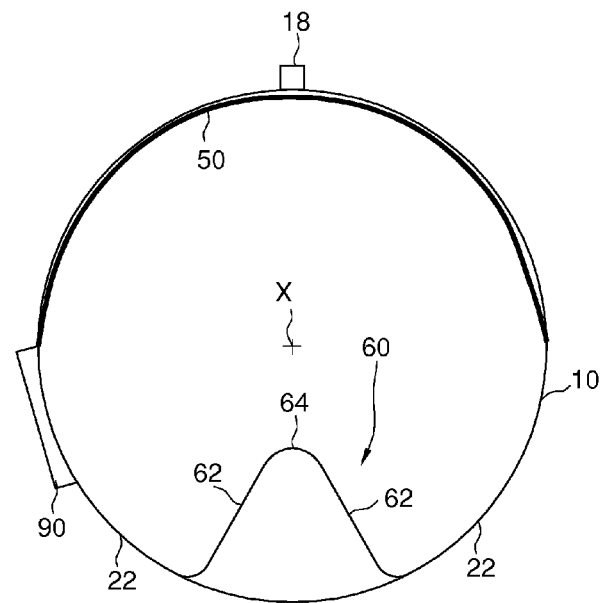


Fig. 3

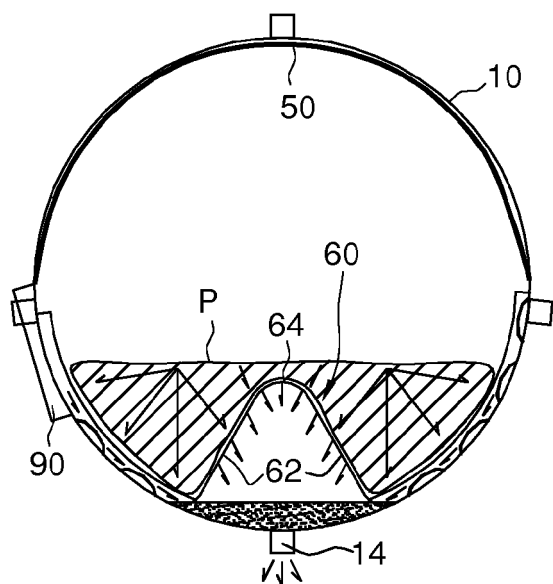


Fig. 4

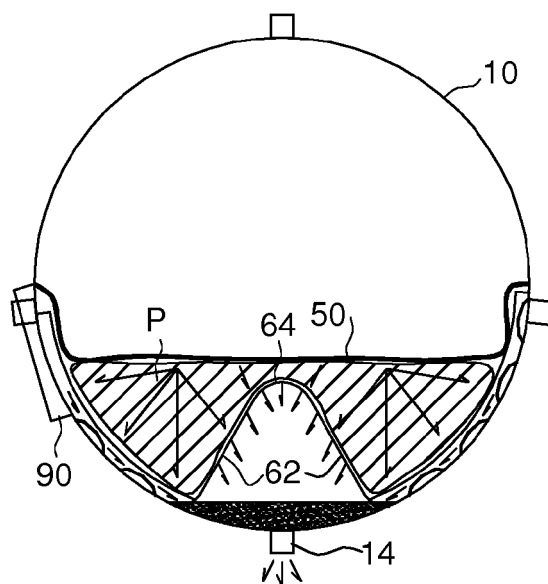


Fig. 5

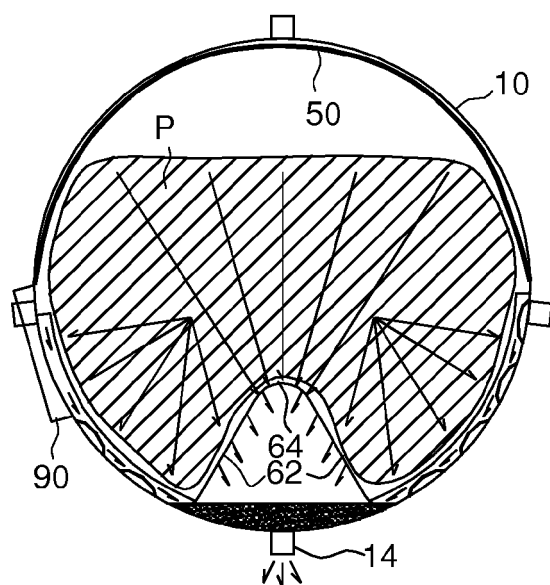


Fig. 6

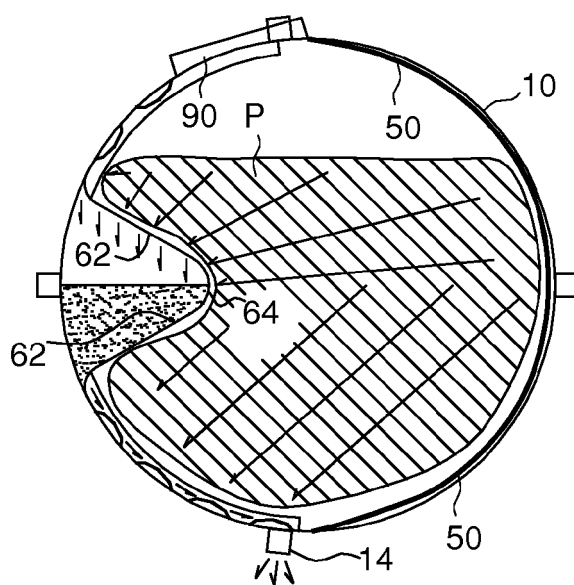
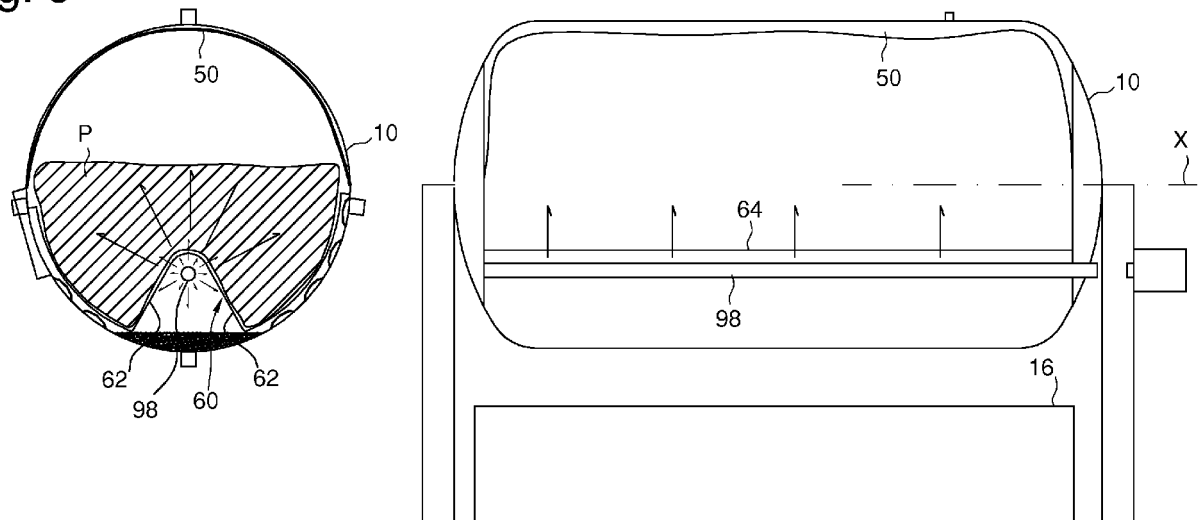


Fig. 7

Fig. 8

Fig. 9





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 Application Number
 EP 19 15 7350

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Place of search The Hague		Date of completion of the search 18 July 2019	Examiner Baradat, Jean-Luc
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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