Title: METHOD FOR PRESSING, PRESS, PRESSED ARTICLE, AND PRESS LIQUID

Abstract: The invention relates to pressing pressed articles (PT) from wet pulp (MM), the pressing being carried out by means of a press chamber (2) and a piston (5) arranged therein. The invention is characterized by pressing wet pulp (MP) in the press chamber (2) by the piston (5) whose outer surface (11) in the direction of movement thereof is substantially even and the perimeter of the outer surface (11) thereof is smaller than the perimeter of a corresponding inner surface (12) of the press chamber (2) such that liquid (N) being separated from the wet pulp (MP) in connection with the pressing is discharged from the pressed articles via a flow channel (9) provided between the outer surface (11) of the piston (5) in the direction of movement thereof and the corresponding inner surface (12) of the press (2).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
METHOD FOR PRESSING, PRESS, PRESSED ARTICLE, AND PRESS LIQUID

BACKGROUND OF THE INVENTION

[0001] The invention relates to a method according to the preamble of claim 1 for pressing wet pulp, and more particularly to a method for pressing pressed articles with a fixed shape from wet pulp, in which method the pressing is performed by means of a press chamber and a piston arranged therein. The invention further relates to a press according to the preamble of claim 12 for pressing wet pulp, and more particularly to a press for pressing pressed articles with a fixed shape from wet pulp, the press comprising a press chamber and a piston arranged therein. The invention still further relates to a pressed article according to claim 24, and to press liquid according to claim 25.

[0002] Pellets, briquettes and corresponding pressed articles are commonly manufactured from “dry pulps” or materials whose dry solids content is more than 80 percentage by weight. Such dry pulps enable production into finished pressed articles with a substantially fixed shape, without removing or separating the liquid contained therein during the pressing process. When the dry solids content of the raw material of the pressed articles drops below 80 percentage by weight, it is no longer possible to manufacture such pressed articles with a fixed shape without removing the liquid contained in the pulp being pressed. When such wet pulp having dry solids content less than 80 percentage by weight is being pressed, liquid contained in the wet pulp being pressed is to be removed. According to the prior art, the liquid may be removed e.g. by drying the wet pulp prior to pressing. This, however, is not cost-effective, and it makes pellets and briquettes more complex to manufacture. Consequently, attempts have been made so as to combine the removal of liquid with the actual pressing process.

[0003] One such solution is disclosed in Finnish Patent No. 112 924, wherein the removal of liquid is performed in connection with pressing wet pulp and by utilizing a slot piston technique. In the solution described in this patent, wet pulp conveyed to a press chamber of a press is pressed by a slotted piston, whereby the liquid being removed from the wet pulp being pressed in connection with the pressing procedure is allowed to flow out via the slots provided in the piston.

[0004] A problem with the above-described slot piston technique is, however, that when pressing wet pulp, fine-grained pulp in particular, the solid
matter in the pulp being pressed tends to become pressed out via the slots, together with the liquid. Furthermore, the structures of a slot piston are complex, which makes the slot piston expensive to manufacture. Besides, it has proven difficult, even with modern machining techniques, to provide slots that are sufficiently narrow. A slot piston also requires a press to be provided with counter ridges or other cleaning equipment enabling the slots in the piston to be cleaned so that liquid can be led away from the pressed articles.

BRIEF DESCRIPTION OF THE INVENTION

[0005] An object of the invention is thus to provide a method for pressing wet pulp, and a press for pressing wet pulp and so as to enable the aforementioned problems to be solved. The object of the invention is achieved by a method according to the characterizing part of claim 1, which is characterized by pressing the wet pulp in the press chamber by the piston, wherein an outer surface of the piston in the direction of movement thereof is substantially even and the perimeter of the outer surface of the piston is smaller than a corresponding inner surface of the press chamber over at least a section of the distance of movement of the piston such that liquid being separated from the wet pulp in connection with pressing is led away from the pressed articles via a flow channel provided between the outer surface of the piston in the direction of movement thereof and a corresponding inner surface of the press chamber. The object of the invention is further achieved by a press according to the characterizing part of claim 12, which is characterized in that an outer surface of the piston in the direction of movement thereof is substantially even, and that the perimeter of the outer surface of the piston is smaller than the perimeter of a corresponding inner surface of the press chamber over at least a section of the distance of movement of the piston such that between the outer surface of the piston in the direction of movement thereof and the corresponding inner surface of the press chamber, a flow channel is provided via which liquid being separated from the wet pulp in connection with the pressing is dischargeable from the pressed articles. The object of that invention is still further achieved by a pressed article according to the characterizing part of claim 24, which is characterized in that the pressed article is manufactured by pressing wet pulp in a press chamber by a piston whose outer surface in the direction of movement thereof is substantially even and the perimeter of the outer surface of the piston is smaller than the perimeter of a corresponding inner surface of
the press chamber over at least a section of the distance of travel of the piston such that liquid being separated from the wet pulp in connection with the pressing is discharged from the articles being pressed via a flow channel provided between the outer surface of the piston in the direction of movement thereof and the corresponding inner surface of the press chamber.

[0006] Preferred embodiments of the invention are disclosed in the dependent claims.

[0007] The invention is based on using, in order to press wet pulp, a piston which, on its outer surface sliding against the walls of a press chamber, is substantially even and which, in connection with the pressing procedure, moves inside the press chamber at least partly loosely. In other words, the perimeter of the outer surface of the piston in the direction of movement thereof is made smaller than the corresponding inner surface of the press chamber such that a clearance or gap is provided between this outer surface of the piston and the inner surface of the press chamber, via which liquid being pressed from the wet pulp during the pressing procedure may be discharged from the pressed article being produced. In other words, the piston does not move in a tight manner inside the press chamber, which is usually the desired case in piston solutions, but the piston is made to generally move at least partly loosely, so that liquid is allowed to flow from a compression space defined by an end surface of the piston and the press chamber via the clearance. This may also be achieved such that the outer surface of the press chamber is formed so that only a section of the distance of movement of the piston is provided with a clearance, e.g. when the piston pushes its way forward in order to press the wet pulp, in which case in a backward-drawn position, no clearance any longer exists between the outer surface of the piston and the inner surface of the press chamber.

[0008] According to the invention, a clearance is provided by making the piston so much smaller than the press chamber that a gap is provided between a wall of the press chamber and the piston to allow liquid contained in the wet pulp to flow therethrough. This can be implemented in two alternative manners. When the cross-section of the piston perpendicular to the direction of movement thereof has the same shape as the corresponding cross-section of the press chamber, the piston is dimensioned such that a clearance or gap of equal size is provided at every point between the outer surface of the piston in the direction of movement thereof and the corresponding inner surface of the
press chamber. When the cross-section of the piston perpendicular to the direction of movement thereof has a shape different from that of the corresponding cross-section of the press chamber, no clearance or gap of equal size is provided at every point between the outer surface of the piston in the direction of movement thereof and the corresponding inner surface of the press chamber, but the clearance varies. In such a case, some points may be provided with no clearance at all, so that the outer surface of the piston is in contact with the inner surface of the press chamber, while some points may be provided with a clearance. An example of this includes using a piston having an oval cross-section perpendicular to the direction of movement in a press chamber whose corresponding cross-section is circular. As above, the piston is smaller than the press chamber, so that a gap is provided between the piston and the inner wall of the press chamber in the direction of movement of the piston.

[0009] The aforementioned clearance or gap thus forms a flow channel which allows liquid contained in the wet pulp to flow away from the pressed article being produced in connection with the pressing process. However, the clearance must not be too large so as not to enable the solid matter to pass therethrough. Therefore, the clearance is to be adjusted to be of the desired size in accordance with the properties of each particular pulp being pressed.

[0010] The method and press according to the invention enable pressed articles to be manufactured from any wet pulp. In the present context, wet pulp thus refers to pulp whose solids content is equal to or less than 80 percentage by weight, less than 75 percentage by weight, or less than 65 percentage by weight. The pressed articles being produced have a substantially fixed shape which may be any shape. The pressed articles may be e.g. pellets or briquettes that are used for producing thermal energy. Pressed articles may thus be pressed from any wet pulp; preferably, pressed articles are pressed from wet, plant-based raw material. Furthermore, press liquid separated from wet pulp and recovered during pressing may also be recovered and utilized.

[0011] An advantage of the method and press according to the invention is a simple and reliable structure, which is cost-efficient. The press is also easy and quick to service. In addition, the solution of the invention provides a way to remove liquid from wet pulp being pressed which is more efficient than the prior art solutions. A slotless piston is also easy to clean, and no separate cleaning equipment is necessary for cleaning the piston.
BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The invention is now described in closer detail in connection with the preferred embodiments and with reference to the accompanying drawings, in which

[0013] Figure 1 shows a longitudinal cross-section of a press according to the invention as well as phases for pressing wet pulp in the press;

[0014] Figure 2 shows a cross-section of the press of Figure 1 in a direction perpendicular to the longitudinal direction;

[0015] Figure 3 shows a cross-section of a press according to another embodiment; and

[0016] Figure 4 shows an embodiment according to the invention for adjusting a piston.

DETAILED DESCRIPTION OF THE INVENTION

[0017] Figure 1 shows a press 1 according to the present invention, and phases A, B, and C for pressing wet pulp such that during the phases a piston 5 makes one press movement in a press chamber 2. In the figures, MM refers to wet pulp to be fed, M refers to pulp from which liquid has been partly removed, KM refers to dry pulp from which liquid has been removed, and PT refers to a pressed article that has been produced. The press 1 according to Figure 1 comprises a press chamber 2 provided with a feed opening 7 for feeding wet pulp MM, a pressure cone 3 for pressing the wet pulp MM, a nozzle 4 for producing a pressed article and conveying it out of the press chamber, and a liquid discharge opening 8 for discharging liquid N separated from the wet pulp from the press chamber 2, as well as a piston 5 provided in the press chamber 2 and having a piston rod 6. A clearance or gap D is provided between an outer surface 11 of the piston 5 parallel with the direction of movement thereof and a corresponding inner surface 12 of the press chamber 2, in other words the piston 5 does not move in a tight manner inside the press chamber 2. The surfaces 11 and 12 thus refer to parallel surfaces of the piston 5 and the press chamber 2 which slide against one another during a press movement of the piston 5, i.e. to the side surfaces 11 of the piston 5 and the side surfaces 12 of the press chamber 2.

[0018] In phase A of Figure 1, the piston 5 is in a backward-drawn position, and wet pulp MM is fed to the press chamber 2 via the feed opening 7 so that a space defined by the press chamber 2, an end 13 of the piston 5 and
the pressure cone 3 is being filled up with the wet pulp MM. In phase B, the rod 6 of the piston 5 is subjected to a force in the direction of arrow F, whereby the piston 5 starts to move inside the press chamber 2 towards the pressure cone 3, which tapers towards the nozzle 4. At the same time, the piston 5 closes the feed opening 7, and the pulp M fed into the press chamber 2 starts becoming compressed, so that when the pressure it is being subjected to increases, the liquid contained in the pulp is pressed out of the pulp M. At the same time, compressed pulp PT, wherefrom liquid N has been discharged, is pushed out of the press chamber via the nozzle 4. Since a gap or clearance D constituting a flow channel 9 is, in accordance with Figure 1, provided between the outer surface 11 of the piston 5 and the inner surface of the press chamber 12, liquid being discharged from the pulp M in connection with the pressing procedure is allowed to flow away from the compression space defined by the end 13 of the piston 5, the press chamber 2 as well as the pressure cone 3, i.e. to the other side of the piston 5. The liquid flows, according to arrows N of phase B, via this flow channel 9, being discharged from the press chamber via the liquid discharge opening 8. Typically, liquid N is removed from the pulp M during the entire pressing phase B, until the piston 5 has moved to a completely forward-thrust position in phase C of Figure 1. In phase C, the piston has pushed the pulp M into the pressure cone 3 and into the nozzle 4, and liquid has been removed from the pulp M via the flow channel 9 provided between the outer surface 11 of the piston 5 parallel with the direction of movement thereof and the corresponding inner surface 12 of the press chamber 2. The solids content of the pressed pulp KM and the pressed article PT discharged from the nozzle 4 has thus increased as compared with that of the wet pulp MM that was fed into the press chamber 2. Hence, the method and press according to the invention also increase the solids content of the pulp being pressed. The solids content of the pressed pulp KM and/or the pressed article PT being produced is preferably more than 75 percentage by weight, more preferably more than 80 percentage by weight, and most preferably more than 90 percentage by weight. Next, the piston 5 returns into the backward-drawn position according to phase A, and the above-described phases are repeated. Any liquid N that possibly still resides on the side of the piston rod 6 of the piston 5 becomes discharged from the press chamber 2 via the liquid discharge opening 8 during the return movement of the piston 5.
[0019] Figure 2 shows a cross-section of a piston 5 and a press chamber 2 of the press 1 of Figure 1 perpendicular to the direction of movement of the piston 5. According to the figure, both the piston 5 and the press chamber 2 have a circular cross-section. It is to be noted, however, that both the piston 5 and the press chamber 2 may also be oval, square, polygonal, or of another shape. According to Figure 2, the diameter of the even outer surface 11 of the piston 5 is smaller than the diameter of the inner surface 12 of the press chamber 2 such that a gap or clearance D is provided between the outer surface 11 of the piston 5 and the inner surface of the press chamber 12, thus constituting a flow channel 9. In other words, the piston 5 moves loosely inside the press chamber 2. When wet pulp MM is pressed in accordance with what has been disclosed above in connection with Figure 1, the liquid being removed from the wet pulp MM is allowed to flow away from the pressed article being produced via the flow channel 9 onto the other side of the piston, i.e. outside the compression space. A compression space herein refers to a space defined by the front end 13 of the piston, the press chamber 2 and the pressure cone 3.

[0020] The properties of wet pulps to be pressed may vary significantly, so the optimal width of the clearance D also varies according to the wet pulp MM being pressed. For example, the fraction size of the solid matter and the amount of liquid contained in the wet pulp MM as well as the compressibility thereof etc. may vary. It is thus important to choose an appropriate piston 5 on the basis of the properties of the wet pulp MM to be pressed in order to make the flow channel 9 suitable for the pulp MM being pressed. In such a case, the perimeter of the outer surface 11 of the piston 5 is adjusted with respect to the perimeter of the inner surface 12 of the press chamber 2 according to the properties of the wet pulp MM being pressed at a given time so as to provide a width of the clearance D, i.e. size of the flow channel 9, which is suitable for the pulp MM being pressed. In the case of Figure 2, this may be carried out by dimensioning the diameter of the outer surface 11 of the piston 5 having a circular cross-section perpendicular to the direction of movement of the piston 5, with respect to the diameter of the inner surface 12 of the press chamber 2 having a correspondingly circular cross-section, according to the properties of the wet pulp MM being pressed at a given time in order to make the flow channel 9 suitable for the pulp MM being pressed. The piston may e.g. be changed according to the properties of the wet pulp being pressed at a
given time so as to enable a flow channel 9, i.e. a clearance D, in accordance with the needs of the properties of this particular pulp to be provided.

[0021] On the other hand, the above may be achieved by dimensioning and/or shaping the cross-section of the piston 5 perpendicular to the direction of movement thereof with respect to the corresponding cross-section of the press chamber 2 such that at least over a section of the outer surface 11 of the piston 5, a clearance D is provided between the outer surface 11 of the piston 5 and the inner surface 12 of the press chamber 2 so as to function as a flow channel 9. This means that the shape of the cross-section perpendicular to the direction of movement of the piston 5 may be different from the shape of the corresponding cross-section of the press chamber 2 in order to provide a flow channel 9 between the even outer surface 11 of the piston 5 and the inner surface 12 of the press chamber 2. In the case of Figure 2, this may be achieved by making the cross-section perpendicular to the direction of movement of the piston 5 oval and the corresponding cross-section of the press chamber 2 circular, whereby a flow channel 9 is provided between the outer surface of the piston 5 and the inner surface of the press chamber 2 substantially in the directions of the shorter axis of the oval cross-section of the piston 5. Such an oval piston may be dimensioned such that the outer surface of the piston, in the directions of the longer axis, is in a close contact with the inner surface of the press chamber, so that the clearance between the outer surface of the piston and the inner surface of the press chamber is provided only in the directions of the short axis of the substantially oval cross-section. It is further to be noted that this may be achieved by shaping the cross-section perpendicular to the direction of movement of the piston with respect to the corresponding cross-section of the press chamber in a numerous alternative ways. The point is that the outer surface in the direction of movement of the piston is even, and that the perimeter of this outer surface is smaller than the perimeter of the inner surface of the press chamber 2 such that when the piston resides inside the press chamber, a clearance is provided between the outer surface of the piston and the inner surface of the press chamber. According to the above, a clearance may also be provided only over a part of the perimeter of the piston and the press chamber, but the point is that the clearance, at least at some point, extends over the entire length of the outer surface of the piston in the direction of movement thereof. A flow channel may also be provided only over
a part of the reciprocal movement of the piston, e.g. in the vicinity of a state wherein the piston has been pushed completely forward.

[0022] Figure 3 shows an embodiment of the present invention, wherein the inner surface 12 of the press chamber 2 comprises a cavity 10 which constitutes at least a part of the flow channel 9 and which produces a clearance S. The cavity 10 may extend around the inner surface of the press chamber 2 or only over a part of the perimeter thereof. Furthermore, the cavity 10 may have a length which is shorter than the length of the outer surface 11 of the piston 5 or which is larger than or equal to the length of the outer surface 11 of the piston 5. In the solution according to Figure 3, the length of the cavity 10 is smaller than the length in the direction of movement of the outer surface 11 of the piston 5, whereby on the side of the cavity 10 facing the press cone 3 as well as on the side of the cavity 10 facing the piston rod 6, the flow rate of liquid in the flow channel 9 is higher than in the cavity itself. Consequently, the surfaces of the walls 11 and 12, at points where the flow is provided with very little space, stay cleaner on account of the higher pressure and flow rate. The cavity 10 may also by itself constitute the entire flow channel 9 when its length is larger than a length in the direction of movement of the outer surface 11 of the piston 5, in which case the flow channel 9 may be provided at a certain point in the reciprocal distance of movement of the piston 5. The depth, shape and location of the cavity 10 may vary.

[0023] In addition to the cavity, the cross-section transverse to the direction of movement of the piston 5 of the press chamber 2 may change over the length of the press chamber such that the cross-sectional area, i.e. the perimeter of the inner surface 12 of the press chamber, is increased towards the pressure cone 3. The flow channel 9 is then provided between the outer surface 11 of the piston 5 and the inner surface of the press chamber 2 when the piston 5 approaches the pressure cone 3. Also in this case, the flow channel 9 is provided only over a section of the distance of movement of the piston 5.

[0024] The width of the clearances D and/or S may further be adjusted by piston adjustment equipment such that a press comprises means for adjusting a flow channel 9 provided between the piston 5 and the press chamber 2 by adjusting the perimeter of the outer surface 11 of the piston 5. In such a case, the piston adjustment equipment may comprise e.g. means for adjusting the perimeter of the outer surface 11 of the piston 5 by means of thermal expansion and/or contraction. Figure 4 shows an example of piston adjustment
equipment which comprises means for producing liquid circulation in the piston 5. According to Figure 4, a flowing substance, which may be a gas or a liquid and which has a temperature T1, is fed from a pipe 26 to a tube 28, which is further connected with an input channel 22 provided in the piston rod. The substance flowing from the input channel passes to a chamber 20 provided in the piston, emitting or receiving thermal energy from the piston and further flowing along a discharge channel 24 out of the piston, having a temperature T2. The adjustable temperature T1 of the flowing substance enables the thermal expansion or contraction of the piston to be adjusted as necessary, e.g. according to the properties of different wet pulps or according to the temperature of a pressing process. This enables the diameter D2 of the outer surface of the piston to be kept at a desired value with respect to the diameter D1 of the inner surface of the press chamber. In such a case, the clearance D also remains as desired and/or suitable for each particular wet pulp to be pressed.

[0025] In addition to the liquid circulation, the diameter of the outer surface of the piston may be adjusted by means of mechanical or electromechanical piston adjustment equipment that may comprise e.g. an electric resistance. The mechanical piston adjustment equipment may further comprise an outer surface of the piston adjustable by a screw or threads. The piston adjustment equipment preferably enables the perimeter of the outer surface of the piston to be both increased and reduced.

[0026] By means of the above press and method, the invention further provides pressed articles as well as press liquid from liquid being removed from wet pulp. When pressing plant-based materials in particular, the subsequent press liquid may be utilized in many ways e.g. in chemical industry, agriculture, or in similar applications. The produced pressed articles may also have many uses, depending on the properties and quality of the substances being pressed.

[0027] It is apparent to a person skilled in the art that as technology progresses, the basic idea of the invention may be implemented in many different ways. The invention and its embodiments are thus not restricted to the above-described examples but may vary within the scope of the claims.
CLAIMS

1. A method for pressing pressed articles (PT) from wet pulp (MM), in which method the pressing is performed by means of a press chamber (2) and a piston (5) arranged therein, the piston reciprocating between a backward-drawn position and a forward-thrust position, characterized by

   feeding, via a feed opening (7), wet pulp (MM) to the press chamber (2) into a space defined by an end (13) of the piston (5) and the press chamber (2) when the piston (5) is in the backward-drawn position;

   pressing the wet pulp (MM) in the press chamber (2) by moving the piston (5) from the backward-drawn position to the forward-thrust position in order to press the wet pulp (MM), wherein an outer surface (11) of the piston (5) in the direction of movement thereof is substantially even and the perimeter of the outer surface (11) of the piston (5) is smaller than that of a corresponding inner surface (12) of the press chamber (2) over at least a section of the distance of movement of the piston (5) such that liquid (N) being separated from the wet pulp (MM) in connection with the pressing is discharged from the space defined by the end (13) of the piston (5) and the press chamber and from the pressed articles (PT) being produced via a flow channel (9) provided between the outer surface (11) of the piston (5) in the direction of movement thereof and the corresponding inner surface (12) of the press chamber (2), and such that at least part of the pressed article (PT) being produced is extruded out of the press chamber via a nozzle (4); and

   moving the piston (5) from the forward-thrust position to the backward-drawn position in order to remove the liquid (N) separated from the wet pulp (MM) from the press chamber (2) via a liquid discharge opening (8), and in order to feed wet pulp (MM) again into the space defined by the end (13) of the piston (5) and the press chamber (2).

2. A method as claimed in claim 1, characterized by selecting an appropriate piston (5) on the basis of properties of the wet pulp (MM) to be pressed at a given time so as to make the flow channel (9) appropriate for the pulp (MM) to be pressed.

3. A method as claimed in claim 2, characterized by adjusting the perimeter of the outer surface (11) of the piston (5) with respect to the perimeter of the inner surface (12) of the press chamber (2) according to the
properties of the wet pulp (MM) to be pressed at a given time so as to make the size of the flow channel (9) suitable for the pulp (MM) to be pressed.

4. A method as claimed in claim 2 or 3, characterized by dimensioning the diameter of the outer surface (11) of the piston (5) having a circular cross-section perpendicular to the direction of movement of the piston (5) with respect to the diameter of the inner surface (12) of the press chamber (2) whose corresponding cross-section is also circular according to the properties of the wet pulp (MM) to be pressed at a given time in order to make the flow channel (9) suitable for the pulp (MM) to be pressed.

5. A method as claimed in any one of the preceding claims, characterized by dimensioning and/or shaping the cross-section of the piston (5) perpendicular to the direction of movement thereof with respect to the corresponding cross-section of the press chamber (2) such that between the outer surface (11) of the piston (5) and the inner surface (12) of the press chamber (2) over at least a section of the outer surface (11) of the piston (5), a clearance D is provided which functions as a flow channel (9).

6. A method as claimed in any one of the preceding claims, characterized by providing the inner surface (12) of the press chamber (2) with a cavity (10) which constitutes at least part of the flow channel (9).

7. A method as claimed in claim 6, characterized by arranging the cavity (10) to extend circumferentially around the inner surface of the press chamber (2).

8. A method as claimed in any one of the preceding claims, characterized by adjusting the flow channel (9) provided between the piston (5) and the press chamber (2) by adjusting the perimeter of the outer surface (11) of the piston (5) by means of piston adjustment equipment.

9. A method as claimed in claim 8, characterized by adjusting the perimeter of the outer surface (11) of the piston (5) by means of piston adjustment equipment (20, 22, 24, 26, 28) which produces thermal expansion and/or contraction.

10. A method as claimed in claim 9, characterized by producing thermal expansion and/or contraction by means of liquid circulation.

11. A method as claimed in claim 8, characterized by adjusting the perimeter of the outer surface (11) of the piston (5) by means of mechanical or electromechanical piston adjustment equipment.
12. A press for pressing pressed articles (PT) from wet pulp (MM), which press comprises a press chamber (2) and a piston (5) arranged therein such that the piston (5) is movable between a backward-drawn position and a forward-thrust position, the press chamber comprising a feed opening (7) for feeding wet pulp (MM) into a space defined by an end (13) of the piston (5) and the press chamber when the piston (5) is in the backward-drawn position, and a nozzle (4) for discharging at least part of the pressed article (PT) being produced from the press chamber (2) when the piston (5) is moved to the forward-thrust position, characterized in that an outer surface (11) of the piston (5) in the direction of movement thereof is substantially even, and that the perimeter of the outer surface (11) of the piston (5) is smaller than the perimeter of a corresponding inner surface (12) of the press chamber (2) over at least a section of the distance of movement of the piston (5) such that between the outer surface (11) of the piston (5) in the direction of movement thereof and the corresponding inner surface (12) of the press chamber (2), a flow channel (9) is provided via which liquid (N) separated from the wet pulp (MM) in connection with the pressing is removable from the pressed articles (PT) and dischargeable from the press chamber (2) via a liquid discharge opening (8) provided therein when the piston (5) is moved from the forward-thrust position to the backward-drawn position.

13. A press as claimed in any one of the preceding claims, characterized in that both the press chamber (2) and the piston (5) have a circular cross-section perpendicular to the direction of movement of the piston (5), so that the outer diameter of the cross-section of the piston (5) is smaller than the inner diameter of the cross-section of the press chamber (2) such that the flow channel (9) is provided between the outer surface (11) of the piston (5) and the inner surface (12) of the press chamber (2).

14. A press as claimed in claim 12 or 13, characterized in that the shape of the cross-section perpendicular to the direction of movement of the piston (5) is different from the shape of the corresponding cross-section of the press chamber (2) in order to provide a flow channel (9) between the outer surface of the piston (5) and the inner surface of the press chamber (2).

15. A press as claimed in claim 14, characterized in that the cross-section perpendicular to the direction of movement of the piston (5) is oval while the corresponding cross-section of the press chamber (2) is circular, so that the flow channel (9) is provided between the outer surface (11) of the
piston (5) and the inner surface (12) of the press chamber (2) substantially in the directions of the shorter axis of the oval cross-section of the piston (5).

16. A press as claimed in any one of claims 12 to 15, characterized in that the cross-section perpendicular to the direction of movement of the piston (5) is dimensioned and/or shaped such that between the outer surface (11) of the piston (5) and the inner surface (12) of the press chamber (2) over at least a section of the outer surface (11) of the piston (5), a clearance D is provided which functions as a flow channel (9) and which, on the basis of properties of the wet pulp (MM) to be pressed at a given time, is arranged to suit the pulp (MM) to be pressed.

17. A press as claimed in any one of claims 12 to 16, characterized in that the inner surface (12) of the press chamber (2) comprises a cavity (10) which constitutes at least part of the flow channel (9).

18. A press as claimed in claim 17, characterized in that the cavity (10) extends circumferentially around the inner surface (12) of the press chamber (2).

19. A press as claimed in any one of claims 12 to 18, characterized in that it further comprises piston adjustment equipment for adjusting the flow channel (9) provided between the piston (5) and the press chamber (2) by adjusting the perimeter of the outer surface (11) of the piston (5).

20. A press as claimed in claim 19, characterized in that the piston adjustment equipment comprises means for adjusting the perimeter of the outer surface (11) of the piston (5) by means of thermal expansion and/or contraction.

21. A method as claimed in claim 20, characterized in that the piston adjustment equipment (20, 22, 24, 26, 28) comprises means for producing liquid circulation in the piston (5).

22. A method as claimed in claim 19 or 20, characterized in that the piston adjustment equipment comprises mechanical or electromechanical means for adjusting the perimeter of the outer surface of the piston.

23. A method as claimed in claim 22, characterized in that the piston adjustment equipment comprises a thermal resistance.

24. A pressed article (PT) pressed from wet pulp (MM), characterized in that the pressed article (PT) is produced by a method as claimed in any one of claims 1 to 11, and/or a press as claimed in any one of claims 12 to 23.
25. Press liquid (N) pressed from wet pulp (MM), characterized in that the press liquid (N) is produced by a method as claimed in any one of claims 1 to 11, and/or by a press as claimed in any one of claims 12 to 23.
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER
See extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC 8: B30B, B27M, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-INTERNAL, WPI, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>X, Y A</td>
<td>FI 112924 B (PARTANEN ESKO) 01 August 2002 (01.08.2002) abstract, figure 1</td>
<td>1-7, 12-18, 24, 25</td>
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- **X**: document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

Date of mailing of the international search report
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