(54) Title: BROKE SYSTEM FOR A PAPER MACHINE OR EQUIVALENT

(57) Abstract: A broke system for a paper machine or equivalent. The broke system of the invention is arranged between a broke discharge location and a pulper (12) and it includes: broke receiving means (1) arranged underneath the paper machine (WP, PS, 7) for receiving broke from the paper machine at a bulk density which corresponds to at least the bulk density of the broke at the broke discharge location; first pressing means (2, 3) for increasing the bulk density and the dry solids content of the broke coming from the paper machine to a substantially higher level than the dry solids content of the broke at the broke discharge location; second pressing means (10) for baling the broke; and a broke conveying line (19, 23) for transporting the broke from the broke receiving means (1) to a broke storage (11).

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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.
Broke system for a paper machine or equivalent

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The present invention relates to a broke system for a paper machine or equivalent.

In this patent application, the paper machine or equivalent refers to paper, board, soft tissue or pulp drying machines.

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Generally, at the wet end of a paper machine, broke is generated at many locations, among other things, in a wire section in trimming, in connection with web breaks in a press section and at the beginning of a dryer section, in open draws of a paper machine and, generally, when the web is not supported on the underside.

The basic principle of known broke systems is that broke is mixed with water in a pulper usually to achieve a consistency of about 3 %, after which the thus obtained slush is pumped into a broke tower, from which it is taken back to the paper machine, either as part of the stock or, in extreme situations, broke alone is used.

Typically, broke is disintegrated in pulpers situated under the machine at the production rate of the machine to a pumpable consistency, which is usually in a range of 4 to 5 %. The slush is normally pumped via a pulper of a wire section into a broke tower and the trim broke from the wire section is normally pumped as a continuous operation via a broke thickener into the broke tower or into a thickener. Coated broke, containing coating-derived ash, the amount of which in the paper is desired to be controlled, is kept separate from base paper broke and stored in a broke tower of coated paper. The broke is screened, among other things, because it is difficult to disintegrate coated broke. All broke can be
screened, in which connection, in order to control the amount of ash coming from 
broke into the base paper, coated broke and uncoated broke are first proportioned 
into a broke dosage chest, from which they are pumped via screening to stock 
dosage. Before dosage to the paper machine, broke is thickened with a gravity 
thickener, which may be located in the main line of base broke or as a separate 
thickening circulation in connection with a broke tower. Broke is usually dosed to 
a paper machine in an amount of 5 to 20 % of the machine's production. When the 
broke towers are run to empty them, for example, before a shutdown, the dosage 
may at times be up to 50 to 60 % of the machine's production.

A substantial problem with this kind of known broke systems is that the use of 
broke cannot be arranged to take place at the best possible time in respect of 
production. In addition, large broke towers, the large water volume of the broke 
system and the time delays affecting production are problematic. Regarding the 
problems it may also be stated that since the broke occurring at the wet and dry 
ends of the paper machine is caused by running problems that are associated with 
the properties or chemistry of the stock, it would be most advantageous to run the 
paper machine with fresh pulps. This is, however, not possible if broke cannot be 
recovered. In addition to running problems, the provision for broke increases 
capital expenditure because storage chests and dilution water tanks have to be 
built for storage of broke. Moreover, paper pulp does not keep at chest 
consistency for long periods of time and, on the other hand, attempts should be 
made to empty the chests as soon as possible in order that preparedness for 
handling the next break might be maintained.

The primary object of the present invention is to provide a novel broke system in 
particular for the wet end of a paper machine, by means of which system it would 
be possible to eliminate or at least substantially reduce the above-mentioned 
problems and drawbacks associated with conventional broke systems. In 
accordance with a special aspect of the present invention, a special object is to 
eliminate totally the mixing of broke with water. In accordance with a further
aspect of the present invention, an object is to increase the dry solids content of
the broke to a level sufficiently high from the viewpoint of stability in order that
the broke might be stored for several weeks without it being spoiled. Further, in
accordance with an additional aspect of the present invention, an object is to
provide a broke pre-handling process suitable for storage.

These objects are achieved by the broke system mentioned at the beginning,
which system, in accordance with its novel and inventive basic idea, is generally
characterized in that the broke system, which is arranged between a broke
discharge location and a pulper, includes: broke receiving means arranged
underneath the paper machine or equivalent for receiving broke from the paper
machine or equivalent at a bulk density which corresponds to at least the bulk
density of the broke at the broke discharge location; first pressing means for
increasing the bulk density and thus the dry solids content of the broke coming
from the paper machine or equivalent to a substantially higher level than the dry
solids content of the broke at the broke discharge location; second pressing means
for baling the broke; and a broke conveying line for transporting the broke from
the broke receiving means to a broke storage. Advantageously, the broke
receiving means is a broke collecting bin, which can receive broke of the width of
the web of the paper machine or equivalent.

In accordance with one embodiment of the invention, the second pressing means
are arranged on the broke conveying line after the broke collecting bin. In that
case, the broke conveying line includes a first conveying means for transporting
the broke away from the broke collecting bin to baling where the broke is
compressed into broke bales, and second conveying means for transporting the
broke bales from the baling to the broke storage. In accordance with another
embodiment of the invention, the second pressing means are arranged on the
broke conveying line in connection with the outlet of the broke collecting bin. In
that case, the broke conveying line comprises a single part including a first
conveying means for transporting the broke bales to the broke storage.
It is advantageous to the invention that the broke collecting bin underneath the paper machine or equivalent is provided with broke disintegration means to disintegrate the broke received in the broke collecting bin mechanically before the broke is compressed into broke bales. Advantageously, the means for mechanical disintegration of broke include a pair of rolls which rotate in opposite directions and are loaded against each other, the outer surface of at least one of said rolls being a shredding or tearing surface, whereby the web passing through the nip between the rolls is shredded or torn into smaller, advantageously flake-like broke pieces.

In accordance with the invention, the dry solids content of the broke bales transported to the broke storage is > 40 %, which makes it possible to store them for prolonged periods of time without any substantial risk of the broke being spoiled.

In accordance with one preferred embodiment of the invention, the first pressing means for increasing the dry solids content and the bulk density of broke before the broke collecting bin include press rolls which are loaded against each other and which form between themselves a press nip in which water is pressed out of the broke and the dry solids content of the broke increases. In accordance with a second preferred embodiment of the invention, the first pressing means for increasing the dry solids content and the bulk density of broke before the broke collecting bin include press rolls which are loaded against each other and of which rolls at least one is a felt-covered roll to ensure a suction effect serving to remove liquid from the broke. In accordance with a third preferred embodiment of the invention, the first pressing means for increasing the dry solids content and the bulk density of broke before the broke collecting bin include press rolls which are loaded against each other and of which rolls at least one has a cylinder shell which has been perforated to ensure a suction effect serving to remove liquid from the broke.
Regarding the advantages of the invention, it may be mentioned that the broke created in the paper machine can be used exactly when it is sensible from the viewpoint of the runnability of the paper machine and/or of the quality of paper, and that the broke can be processed more easily and more quickly by means of the shredder associated with the broke system in accordance with the invention. Runnability problems can be solved more quickly since it is possible to use fresh pulp, whereby the efficiency of the paper machine is substantially improved. The broke system in accordance with the invention can be accommodated, when desired, in a low cellar space, and there is no need for large broke towers on the paper machine, which means that capital expenditure is lower and the broke system is substantially more compact compared with conventional broke systems. Furthermore, control of the broke system in accordance with the invention is quicker and more precise because of smaller pulp volumes and continuous operation. With the invention it also becomes possible to use the broke that has been created, as raw material on another paper machine or equivalent.

In the following, the invention will be described in more detail by means of some of its embodiments considered advantageous with reference to the accompanying patent drawings, in which

Figure 1 is a schematic view of a broke system in accordance with the invention for handling broke at the wet end of a paper machine,

Figure 2 shows schematically and in more detail one embodiment of the invention considered advantageous and arranged to receive broke underneath a press section, and

Figure 3 schematically shows another embodiment of the invention which is considered advantageous, placed underneath a paper machine and arranged to receive broke between a wire section and a press section.

Reference is made to Fig. 1 illustrating a broke system in accordance with the invention at the wet end of a paper machine for receiving broke and for
transporting it to a broke storage 11. For the sake of clarity, several different broke discharge locations are represented in Fig. 1 by a broke discharge location before a dryer section between press rolls 6 of a press section of the paper machine before the dryer section. As stated, Fig. 1 shows only one of many broke discharge locations at the wet end of the paper machine. Generally, broke can be created, for example,
- as a result of edge trimming,
- as a result of a web break,
- in every open draw,
- in any part of a paper machine where a web R is not supported from below, and
- in any intermediate zone between the different units of the paper machine, such as, between a former unit and a press unit as well as between a press unit and a dryer unit.

In the embodiment shown in Fig. 1, the broke system in accordance with the invention is arranged in connection with a pair of the last press rolls 6 of the press section 7 preceding the first drying cylinder of the dryer section. The web R received in the width of the web into a broke collecting bin 1 under gravity and by means of a pair of guiding and pressing rolls 2 and 3 is disintegrated mechanically by a shredder 8 or a tearing means arranged in the lower part of the broke collecting bin 1.

The rolls 2 and 3 form between themselves a press nip in which water is removed from the broke web and in which nip between the rolls 2, 3 the dry solids content of the broke increases so that it is substantially higher than the dry solids content of the web R when it came from the wire section. It is particularly advantageous that in this first broke pressing stage the dry solids content of the broke could be increased from a dry solids content of 15-20 % by pressing to > 40 %, in which case the dry solids content of the broke is sufficiently high for storing the broke in the broke storage 11 even for prolonged periods of time without the broke being spoiled, or close to 40 %, in which case in the second broke pressing stage there
would be no need any more for any substantial pressing to reduce the liquid content.

In accordance with one embodiment of the invention that is considered advantageous, the pair of rolls 2, 3 belonging to the first pressing means, by which the dry solids content and the bulk density of broke are increased, can be formed of press rolls which are loaded against each other and which form between themselves a press nip in which water is squeezed out of the broke and the dry solids content of the broke rises. In accordance with a second preferred embodiment of the invention, the pair of rolls can be formed of press rolls which are loaded against each other and of which at least one is a felt-covered roll to ensure a suction effect serving to remove liquid from the broke. In accordance with a third preferred embodiment of the invention, the pair of rolls can be formed of press rolls which are loaded against each other and of which at least one has a cylinder shell perforated to ensure a suction effect serving to remove liquid from the broke.

It is essential to the invention that the broke is disintegrated mechanically in the broke collecting bin 1 and that transport of the shredded broke on a broke conveying line 19, 23 extending from the broke collecting bin 1 to the broke storage 11 is arranged without utilizing any transfer or carrier medium.

In accordance with the invention, in addition to the first pressing means 2, 3, the broke system also includes second pressing means 10 for baling the broke. By means of the second pressing means, the broke coming from the broke collecting bin 1 is baled into broke bales 20 and it is possible that the broke is pressed further to achieve a desired dry solids content of > 40 %. The broke bales 20 are transported by means of the broke conveying line 19, 23 to the broke storage 11.
In accordance with the invention, the second pressing means 10 can be arranged in connection with the broke collecting bin 1 or on the broke conveying line 19, 23 after the broke collecting bin 1.

When the second pressing means 10 are arranged in connection with the broke collecting bin 1, the broke conveying line 19 substantially comprises a single part and includes only the first conveying means 19, which is advantageously formed by a belt or compartment conveyor or an equivalent conveyor suitable for transport of the broke bales 20.

When the second pressing means are arranged after the broke collecting bin 1, the broke conveying line includes the first conveying means 19, which extends from the broke collecting bin 1 to the second pressing means 10, for transporting the broke away from the broke collecting bin 1 to baling where the broke is compressed into broke bales, and the second conveying means 23 for transporting the broke bales 20 from the baling to the broke storage 11. Both the first and the second conveying means 19, 23 is advantageously a belt or compartment conveyor or an equivalent conveyor suitable for transporting loose material or broke bales. As a conveyor of loose material, the first conveying means can also be a pneumatic transfer tube, in which shredded broke is transported pneumatically by means of air or another gaseous carrier.

The baling 10 accomplished in the second pressing means 10 can be carried out, in the cross or longitudinal direction of the paper machine, either against a stationary backing means, as shown in Fig. 2, or against a broke bale baled previously. In the baling 10, the bale pressing, cutting and binding do not in themselves involve any novelty because equivalent technology is in itself known, for example, from waste processing and collecting devices. Instead of a pressing piston (102, cf. Fig. 2), it is possible to use, for example, a screw rotating in a chamber space (103, cf. Fig. 2), in which case the baling operation is performed by means of a screw press.
If an adequate dry solids content is not achieved by the first pressing means 2, 3, it is possible to dispose, in connection with the outlet of the broke collecting bin, a pressing screw which is intended for the pressing of the broke and which removes liquid from the broke and feeds the thus pressed wet broke onto the broke conveying line 19, 23. As an alternative to such a pressing screw situated in connection with the outlet of the broke collecting bin 1, it is also, of course, possible to use an additional pair of pressing rolls 9, which is illustrated in Fig. 1 by a broken line and which feeds pressed broke as a mat-like mass onto the broke conveying line 19, 23.

In accordance with the invention, the aim is thus to raise the dry solids content of broke by means of pressing in the press nip between the press rolls 2 and 3 from a dry solids content of 15-20 % to a dry solids content of > 40 % in order that it should be easier to tear or shred the broke and no additional drying should be needed later, but, instead, the shredded broke might be stored in bales at this raised or increased dry solids content even prolonged periods of time without it being spoilt.

From the broke storage 11 the broke is transported to a pulper and from the pulper further to the paper machine. For example, as is explained below in connection with Fig. 3.

Reference is made to Fig. 2, which schematically shows an application of an embodiment of the invention considered advantageous in connection with the last pair of press rolls 6 of the press section preceding the dryer section 7. The dry solids content of the web R can be < 40 % in the press section 6. The press section is thus a typical unit of the wet end of the paper machine. For the purpose of increasing the dry solids content of broke, the broke created, for example, as a result of a web break, is passed through a press nip between the press rolls 2, 3 which are situated underneath the press section and which are loaded against each
other, whereby water is squeezed out of the broke in the press nip and the dry solids content of the broke increases so that it is higher than it was when it came from the wire section to the press section.

In the embodiment of Fig. 2, the web R of the width of the machine thus drops, for example, as a result of a web break, under gravity through the roll nip formed by the rolls 2, 3 and pressing the web R into the broke collecting bin 1 which is situated underneath and arranged to receive the web R in the width of the machine. The broke collecting bin 1 comprises means 8 for mechanical disintegration of broke. In this advantageous embodiment, the means for mechanical disintegration of broke include two rolls 81 and 82 which are loaded against each other and which rotate in opposite directions. The rolls 81 and 82 form between themselves a nip and one of the rolls, for example, the roll 82, as shown in Fig. 2, has a shredding or tearing surface, whereby in the nip between the rolls 81 and 82 the broke is shredded or torn into smaller, advantageously flake-like broke pieces. The shredded broke drops through the outlet at the bottom of the broke collecting bin 1 onto the first conveying means 19 arranged underneath the broke collecting bin 1.

In the embodiment of Fig. 2, the pressing means 10 for baling of broke are situated on the broke conveying line 19, 23 after the broke collecting bin 1. In that case, the broke is transported on the first conveying means 19, which is advantageously a belt or compartment conveyor or an equivalent conveyor suitable for transferring loose material, into the pressing means 10 for baling, after which the broke is transported on the second conveying means 23, which is advantageously a belt or compartment conveyor or an equivalent conveyor suitable for transferring the broke bales 20, to the broke storage 11, from which broke can be transferred, when needed, by a broke conveyor 21 to a pulper 12.

In the advantageous embodiment shown in Fig. 2, from the first conveying means 19, which transports the broke from the broke collecting bin 1 to the baling 10, the
shredded broke drops first into a dosing means 101 which is situated inside a funnel-shaped receiving bin of the pressing means 10 and which in this special exemplifying case shown in Fig. 2 is a rotating compartment dosing means comprising four compartments, such compartment dosing means being rotated a quarter of a turn at a time, when one compartment of the compartment dosing means has received a predetermined amount of shredded broke. After that, the dosed shredded broke drops to the pressing means, which, in this special exemplifying case shown in Fig. 2, is formed by a pressing piston 102 and a chamber space 103, to which the above-mentioned dosed shredded broke drops and in which the pressing piston 102 compresses the dosed shredded broke into a bale. If in the bailing chamber 102, non-shredded broke is pressed into a raw broke bale, it is advantageous that the pressing operation in the bailing chamber 103 is followed by cutting and binding of the raw broke bale (not shown) into broke bales 20.

The baling 10 can be accomplished, in the cross or longitudinal direction of the paper machine, either against a stationary backing means, as shown in Fig. 2, or against another broke bale baled previously. In the baling 10, the bale pressing, cutting and binding do not in themselves involve any novelty because equivalent technology is in itself known, for example, from waste processing and collecting devices. Instead of the pressing piston 102, it is possible to use, for example, a screw rotating in the chamber space 103, in which case the baling operation is performed by means of a screw press.

In the embodiment shown in Fig. 2, the broke bale 20 is transported by the second conveying means 23, which is a belt or compartment conveyor or an equivalent conveyor suitable for transporting broke bales, to the broke storage 11 to await transport to a pulper and from the pulper further to the paper machine. For example, as is explained below in connection with Fig. 3.
The advantageous embodiment of the invention shown in Fig. 3 shows a wire section WP, a press section PS and an initial end of a dryer section 7 of a paper machine as well as an associated broke handling system of the invention arranged underneath the paper machine. In one advantageous application of the embodiment shown in Fig. 3, the broke generated in the wire section WP during trimming or because of a web break is passed into the broke collecting bin 1 situated underneath through a press 2, 3 which precedes it and can be accomplished by means of a pair of rolls 2, 3. The rolls 2, 3 form between themselves a nip in which the dry solids content of the broke can be raised. It is particularly advantageous that at least one of the rolls 2, 3 is a felt-covered roll or that at least one of the rolls 2, 3 has a shell perforated to enhance the suction effect, thus improving the removal of liquid and increasing the dry solids content of the broke.

In accordance with the invention, the dry solids content of the broke is raised in this press 2,3 to a higher level than the web R had when it came from the wire section WP. In accordance with the invention, it is advantageous to increase the dry solids content of the broke by pressing in the nip between the press rolls 2 and 3 in order that it should be easier to shred the broke and in order that no additional drying of the broke should be needed later, but the broke might be stored in the storage 11 as baled even for prolonged periods of time without it being spoiled. The dry solids content of the broke coming from the wire section WP is about 15-20 % and the aim of the pressing operation is to increase the dry solids content of the broke after it to > 40%.

It is advantageous to the embodiment of Fig. 3 that the broke generated, for example, as a result of a web break, is passed through the pressing roll nip of the rolls 2, 3 to the broke collecting bin 1 situated underneath and arranged to receive the web R in the width of the machine. The broke collecting bin 1 includes means 8 for mechanical disintegration of broke. Advantageously, the means for mechanical disintegration of broke include two rolls (81 and 82, cf. Fig. 2) which
are loaded against each other and which rotate in opposite directions. The rolls form between themselves a nip and at least one of the rolls has a shredding or tearing surface, whereby in the roll nip the broke is shredded or torn into smaller, advantageously flake-like broke pieces. The shredded broke drops through the outlet at the bottom of the broke collecting bin 1 onto the first conveying means 19 arranged underneath the broke collecting bin 1.

The broke is transported on the first conveying means 19 of the broke conveying line, which first conveying means is advantageously a belt or compartment conveyor or an equivalent conveyor, to the broke pressing means 10, in which the broke is pressed into broke bales 20.

If the dry solids content of the broke is not 40 % after the first pressing operation, which is accomplished in the nip between the pressing rolls 2, 3, it is recommended that in connection with the outlet of the broke collecting bin 1 there shall be additional pressing means (9, cf. Fig. 1), which may be formed by a broke pressing screw pressing the wet broke onto the first conveying means 19 of the broke conveying line, or by a pair of rolls pressing a mat-like mass likewise onto the first conveying means of the broke conveying line.

By the first conveying means 19, the broke whose dry solids content has been raised to > 40 % is transported to baling, after which the broke is transported to the broke storage 11 by the second conveying means 23 of the broke conveying line, which second conveying means extends from below the broke pressing means 10 to the broke storage 11 and which is advantageously formed of a belt or compartment conveyor or an equivalent conveyor.

Broke can be transported from the broke storage 11, when needed, by the broke conveyor 21 to the pulper 12. To transfer broke to the paper machine, broke bales 20 are transported first from the broke storage 11 to the pulper 12, in which to disintegrate the broke, water is mixed with the broke from a circulation water line
such that the consistency of the disintegrated broke, i.e. of the slush formed, will typically be 4-5 %. The slush is pumped from the pulper 12 by a stock pump 16 via a stock feed line 25 to stock dosage, from which stock is fed to the paper machine typically in an amount of 5-20 %, up to 50-60 % of the paper machine's production.

In the advantageous embodiment of the invention shown in Fig. 3, the shredded broke transported by the first conveying means 19 from the broke collecting bin 1 to the baling 10 drops first into a dosing means which is situated inside a funnel-shaped broke collecting bin and which is, for example, a rotating compartment dosing means comprising four compartments (101, cf. Fig. 2), such compartment dosing means being rotated a quarter of a turn at a time, when one compartment of the compartment dosing means has received a predetermined amount of shredded broke. After that, the dosed shredded broke drops into a pressing space (103, cf. Fig. 2) situated in the pressing means 10, in which space a pressing piston (102, cf. Fig. 2) is reciprocating. The pressing piston presses the shredded broke dosed into the pressing space, in the cross or longitudinal direction of the paper machine, either against a stationary backing means or against another broke bale baled previously. However, if non-shredded broke is pressed into a raw broke bale in the baling chamber, it is advantageous that the pressing operation in the baling chamber is followed by cutting and binding of the raw broke bale (not shown) into broke bales 20. In the baling 10, the bale pressing, cutting and binding do not in themselves involve any novelty because equivalent technology is in itself known, for example, from waste processing and collecting devices. Instead of a pressing piston, it is possible to use, for example, a screw rotating in the chamber space, in which case the baling operation is performed by means of a screw press.

Above, the invention has been described only by way of example by means of some of its embodiments and applications considered advantageous. This is naturally not intended to limit the invention in any way but, as is clear to a person skilled in the art, many alternative arrangements and modifications are feasible.
within the inventive idea, within its scope of protection defined in the accompanying claims.
Claims

1. A broke system for a paper machine or equivalent, characterized in that the broke system, which is arranged between a broke discharge location and a pulper (12), includes: broke receiving means (1) arranged underneath the paper machine (WP, PS, 6, 7) or equivalent for receiving broke from the paper machine or equivalent at a bulk density which corresponds to at least the bulk density of the broke at the broke discharge location; first pressing means (2, 3) for increasing the bulk density and thus the dry solids content of the broke coming from the paper machine or equivalent to a substantially higher level than the dry solids content of the broke at the broke discharge location; second pressing means (10) for baling the broke; and a broke conveying line (19, 23) for transporting the broke from the broke receiving means (1) to a broke storage (11).

2. A broke system as claimed in claim 1, characterized in that the broke receiving means include a broke collecting bin (1), which is arranged to receive broke of the width of the web of the paper machine (WP, PC, 6, 7) or equivalent.

3. A broke system as claimed in claim 1 and/or 2, characterized in that the second pressing means (10) are arranged on the broke conveying line after the broke collecting bin (1), the broke conveying line including a first conveying means (19) for transporting the broke away from the broke collecting bin (1) to baling (10), where the broke is compressed into broke bales (20), and second conveying means (23) for transporting the broke bales from the baling (10) to the broke storage (11).

4. A broke system as claimed in claim 1 and/or 2, characterized in that the second pressing means (10) are arranged on the broke conveying line in connection with an outlet of the broke collecting bin (1), the broke conveying line comprising a single part including a first conveying means (19) for transporting the broke bales (20) to the broke storage (11).
5. A broke system as claimed in any one of claims 1 to 4, characterized in that the broke collecting bin (1) underneath the paper machine or equivalent is provided with broke disintegration means (8) to disintegrate the broke received in the broke collecting bin (1) mechanically before the broke is compressed into broke bales (20).

6. A broke system as claimed in claim 5, characterized in that the means (8) for mechanical disintegration of broke include a pair of rolls (81, 82) which rotate in opposite directions and are loaded against each other, the surface of at least one (82) of said rolls being a shredding or tearing surface, whereby a web (R) passing through a nip between the rolls (81, 82) is shredded or torn into smaller, advantageously flake-like broke pieces.

7. A broke system as claimed in any one of claims 1 to 6, characterized in that the dry solids content of the broke bales (20) transported to the broke storage (11) is > 40 %.

8. A broke system as claimed in any one of claims 1 to 9, characterized in that the first pressing means (2, 3) for increasing the dry solids content of broke before the broke collecting bin (1) include press rolls (2, 3) which are loaded against each other and which form between themselves a press nip in which water is pressed out of the broke and the dry solids content of the broke is increased.

9. A broke system as claimed in any one of claims 1 to 9, characterized in that the first pressing means (2, 3) include press rolls (2, 3) which are loaded against each other and of which rolls at least one is a felt-covered roll to ensure a suction effect serving to remove liquid from the broke.

10. A broke system as claimed in any one of claims 1 to 9, characterized in that the first pressing means (2, 3) include pressing rolls (2, 3) which are loaded
against each other and of which rolls at least one has a cylinder shell which has been perforated to ensure a suction effect serving to remove liquid from the broke.
FIG. 1.
INTERNATIONAL SEARCH REPORT

INTERNATIONAL APPLICATION No.
PCT/FI 02/01014

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21F 1/66
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)

IPC7: D21B, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<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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<tbody>
<tr>
<td>A</td>
<td>US 3236723 A (A.L. WHITESIDE), 22 February 1966 (22.02.66), figures 1,14,16,17, claims 1-5</td>
<td>1-10</td>
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<tr>
<td>A</td>
<td>WO 0173198 A1 (JLR PULPING SYSTEMS AB), 4 October 2001 (04.10.01), figures 1,2, claims 1-9, abstract</td>
<td>1-10</td>
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<td>PA</td>
<td>US 6358367 B1 (KLAUS DOELLE ET AL), 19 March 2002 (19.03.02), figures 2,3, claims 1-7, abstract</td>
<td>1-10</td>
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[X] Further documents are listed in the continuation of Box C.  [X] See patent family annex.

* Special categories of cited documents:
  "A" 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

19 March 2003

Date of mailing of the international search report

19-03-2003

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Form PCT/ISA/210 (second sheet) (July 1998)
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<tr>
<td>A</td>
<td>US 3773613 A (CHARLES A. LEE ET AL),&lt;br&gt;20 November 1973 (20.11.73), figures 1-3, claims 1-9, abstract</td>
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