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(54) Title
PETHOD AT THE MAKING OF FIBRE PULP

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(56) Prior Art Documents
US 3910511
US 4423845
US 3149792

(57) Claim

1. A method at the manufacture of fiber pulp from lignocellulose-containing material, where the material is supplied from a central inlet opening in the presence of water in such an amount that the dry solids content in the material/aqueous suspension exceeds 15% and is disintegrated between two grinding discs rotating relative to each other, said discs being provided with grinding segments with bars and intermediate grooves extending from the centre outward to the periphery of the grinding discs, in such a manner that the material first is disintegrated to smaller particles in a pre-grinding zone with substantially radially, sparsely located bars and discharged from there to a proper grinding zone with a denser pattern, c h a r a c t e r i z e d i n that the material in the proper grinding zone, in order to reduce the long-fiber content, is defibered and fibrillated by a shear-like effect between opposed bars in the grinding segments on the two grinding discs, in that the angle (a) between the bar edges and the radius (M) of the segments of the two grinding discs is between 5° and 30° in

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both directions, so that reverse relative rotation of the grinding discs is made possible.

3. A grinding segment for a refiner having two opposite grinding discs rotating relative to each other for producing pulp from lignocellulose-containing material at a dry content exceeding 15%, where the segment is provided with bars and intermediate grooves extending from the centre outward to the periphery of the grinding discs, the ginding segment having an inner pre-grinding zone with substantially radially, sparsely located bars and an outer proper grinding zone with a denser pattern,

c h a r a c t e r i z e d i n that there are bars (1) in the proper grinding zone angled in one direction from the radius (M) of the segment and bars (1) angled in the other direction from the radius (M), the angle (a) between the bar edges and the radius (M) in both directions being between 5^{o} and 30^{o}, so that the bars on the grinding segment together with the bars on the grinding segment on the opposite grinding disc will give a shear-like effect for reduction of the long-fiber content, the segment at the same time being reversible.

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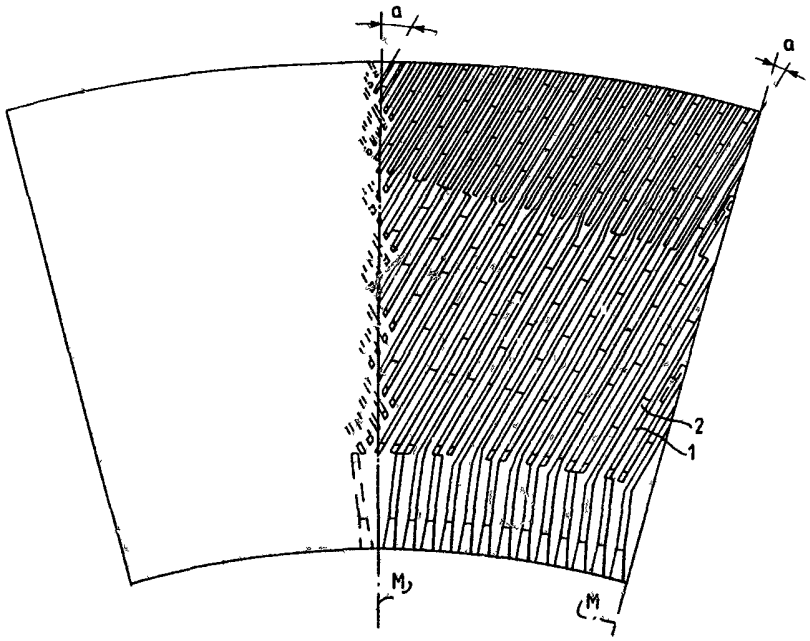
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Published
With international search report.
With amended claims.

(54) Title: METHOD AT THE MAKING OF FIBRE PULP



(57) Abstract

The invention relates to a method of manufacturing fibre pulp from lignocellulose-containing material, where the material is disintegrated between two grinding discs rotating relative to each other. According to the invention, the material is defibered and fibrillated by a shear-like effect between opposed bars in the two grinding discs, in that the angle (a) between the bar edges and the radius (M) of the segment in the two grinding discs is between 5° and 30°, preferably between 7.5° and 22.5°.

Method at the making of fibre pulp

This invention relates to a method of making fibre pulp from lignocellulose material at a torr solids content exceeding 15%.

The manufacture is carried out in a refiner comprising two grinding discs, at least one of which is rotary, in wuch a manner, that the material is fed in through a central opening in one disc and disintegrated in the gap between the discs while water is being supplied thereto. Conventionally the grinding discs are provided with bars and intermediate grooves, which extend from the centre outward to the periphery of the grinding discs.

Such methods are are since long known for the manufacture of mechanical cellulose pulp.

The pulps manufactured in conventional manner, however, contain a large long-fibre fraction. In certain connections, for example for newsprint, this is of value, because it results in high strength, especially tearing resistance, which is highly essential in view of the high machine speeds used at the manufacture and printing.

For other paper qualities, for example magazine paper and LWC(Light Weight Coated)-paper, however, the printability is of greater importance, and the necessary strength there is achieved by admixing chemical pulp.

Thermomechanical pulp (TMP) and chemi-mechanical pulp (CTMP) are pulps in very high yields, 90-95%, which implies that substantially all lignin remains in the pulp. The long fibres hereby become rigid, and the smoothness of the paper is deteriorated.

The present invention, therefore, is based on the problem to be able to manufacture a pulp with a lower proportion of long-fibres. The pulp, however, at the same time shall be well defibered and fibrillated, have low shives content and high bonding strength.

It is not possible to achieve this by using conventional refiner technique. In order to reduce the long-fibre content, the pulp must be re-ground in a separate step at low concentration.

The problem is solved according to the invention, in that the material is defibered and fibrillated by a shears-like effect between opposed bars in the two grinding discs. This effect is obtained in that the bars in the two grinding discs are arranged in both directions at a definite angle to the radius of the grinding segment. Experiments have shown that this angle should be from 5° to 30°, preferably from 7.5° to 22.5°.

In addition to the aforesaid requirement concerning the pulp quality, a grinding segment also is required to yield high production. This requires a high capacity for transporting pulp and generated steam through the grinding zone. As a further requirement, it must be possible that the rotation takes place in both directions in order to reduce the truing of the leading bar edge by wear.The pattern on the grinding segment, therefore, must be reversible.

Another requirement on a grinding segment is by the pattern design to contribute to the reduction of the otherwise high energy consumption.

The refining procedure in the grinding zone has been the subject of previous studies. According to one opinion, the treatment takes place in such a manner, that the chips in the grinding zone orient themselves with the fibre direction substantially in parallel with the edges on the bars of the grinding segment, which bars conventionally are oriented substantially radially. Chip pieces are rolled during the refining between the two grinding discs about an axis, which is in parallel with the fibre direction, and are disintegrated to increasingly smaller particles.

In consequence thereof, the fibre remains substantially intact in the longitudinal direction.

When the bar edges,according to the invention, instead are arranged so as to form a certain angle with the radius of the segment, a shear-like effect is obtained, by which the fibres are shorn and the long-fibre content is reduced. This angle is, according to the invention, 5^{o} to 30^{o}, preferably 7.5^{o} to 22.5^{o}.

In the attached Figure an embodiment of a grinding segment is shown, which is used at the method according to the invention.

The segment shown is provided with bars 1 and intermediate grooves 2, which form an angle a, in the present case $7.5\text{-}22.5^{o}$ with the radius M of the segment.

Pulp and generated steam are transported substantially through the grooves between the bars in the two grinding discs. This transport is powered by the centrifugal force, which is generated by the rotation and acts in radial direction. If all bars would form the aforesaid angle, the discharge in certain cases would be braked too much.

According to an especially important embodiment of the invention, therefore, the angle is varied on one and the same segment within the interval stated above. As the segment must be reversible, the bars are angled in both directions from the radius.

In order to prevent the chip pieces to be shorn to particles of sawdust type, which would be an unfavourable shape for the continued refining, and in order to simultaneously bring about an effective chip feed, the grinding segment is provided with a so-called pre-breaking zone, which is located closest to the centre and in the Figure designated by 3. In this zone the bars are arranged substantially redially in a coarse pattern. The chip pieces are there split lengthwise to thinner and narrower particles.

The invention is not restricted to the embodiment shown and described, but can be varied within the scope of the invention idea.

AMENDED CLAIMS

[received by the International Bureau on 23 February 1990 (23.02.90)
original claims 1-4 replaced by amended claims 1-5 (2 pages)]

1. A method at the manufacture of fiber pulp from lignocellulose-containing material, where the material is supplied from a central inlet opening in the presence of water in such an amount that the dry solids content in the material/aqueous suspension exceeds 15% and is disintegrated between two grinding discs rotating relative to each other, said discs being provided with grinding segments with bars and intermediate grooves extending from the centre outward to the periphery of the grinding discs, in such a manner that the material first is disintegrated to smaller particles in a pre-grinding zone with substantially radially, sparsely located bars and discharged from there to a proper grinding zone with a denser pattern, c h a r a c t e r i z e d i n that the material in the proper grinding zone, in order to reduce the long-fiber content, is defibered and fibrillated by a shear-like effect between opposed bars in the grinding segments on the two grinding discs, in that the angle (a) between the bar edges and the radius (M) of the segments of the two grinding discs is between 5^{o} and 30^{o} in both directions, so that reverse relative rotation of the grinding discs is made possible.

2. A method as defined in claim 1, c h a r a c t e r i z e d i n that the angle (a) is between 7.5^{o} and 22.5^{o}.

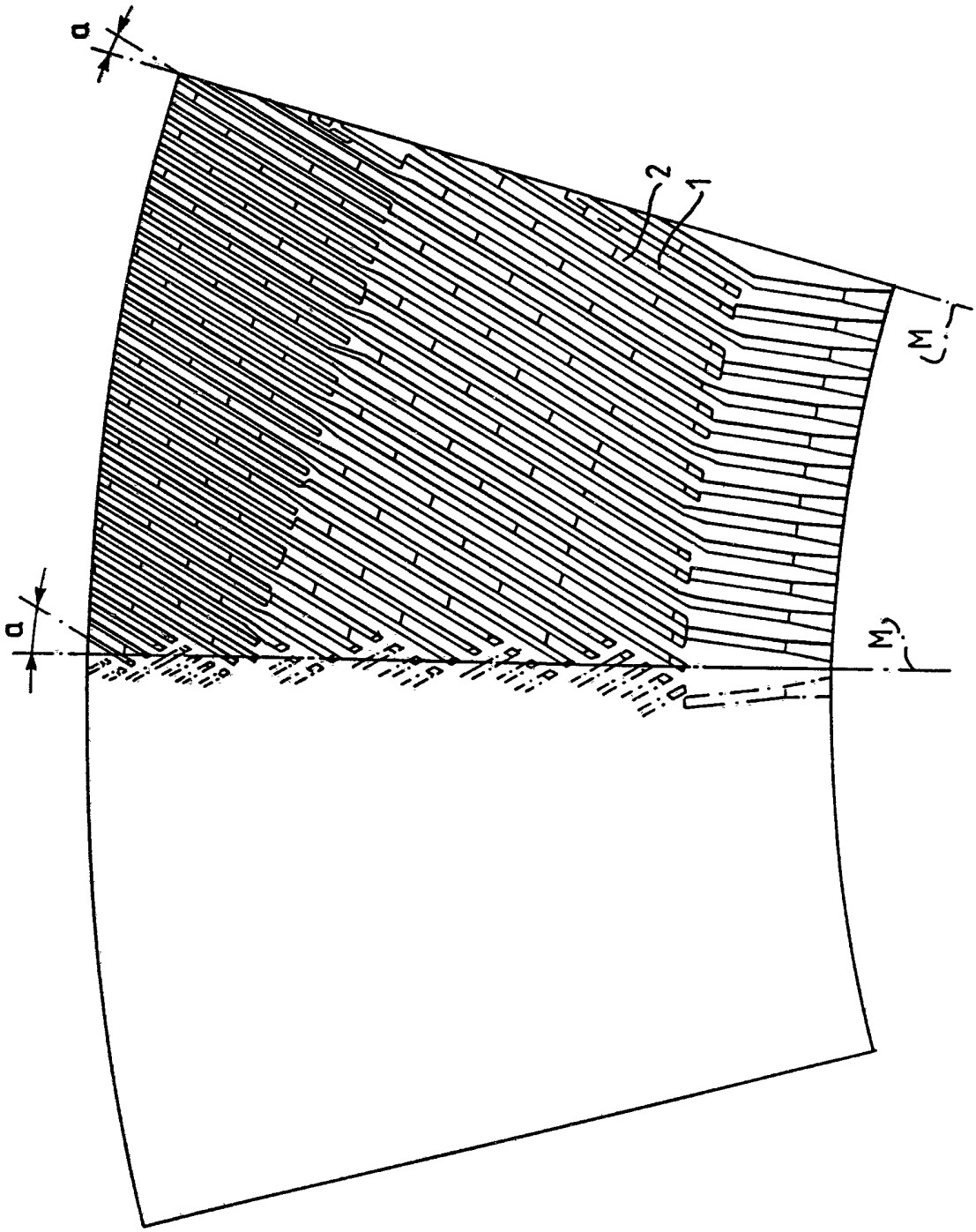
3. A grinding segment for a refiner having two opposite grinding discs rotating relative to each other for producing pulp from lignocellulose-containing material at a dry content exceeding 15%, where the segment is provided with bars and intermediate grooves extending from the centre outward to the periphery of the grinding discs, the ginding segment having an inner pre-grinding zone with substantially radially, sparsely located bars and an outer proper grinding zone with a denser pattern,

c h a r a c t e r i z e d i n that there are bars (1) in the proper grinding zone angled in one direction from the radius (M) of the segment and bars (1) angled in the other direction from the radius (M), the angle (a) between the bar edges and the radius (M) in both directions being between 5^{o} and 30^{o}, so that the bars on the grinding segment together with the bars on the grinding segment on the opposite grinding disc will give a shear-like effect for reduction of the long-fiber content, the segment at the same time being reversible.

4. A grinding segment as defined in claim 3, c h a r a c t e r i z e d i n that the angle (a) is between $7,5^{o}$ and 22.5^{o}.

5. A grinding segment as defined in claim 3 or 4, c h a r a c t e r i z e d i n that the angle (a) in one and the same segment is varied within the interval, so that the bars form different angles with the radius (M).

AUSTRALIAN PATENT OFFICE LS


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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 89/00527

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC4: D 21 B 1/14, D 21 D 1/30, B 02 C 7/12

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC4	D 21 B; D 21 D; B 02 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X Y	US, A, 3910511 (LEIDER ET AL) 7 October 1975, see abstract; figure 1 and 2 --	1,2 3,4
Y	US, A, 4423845 (FRAZIER ET AL) 3 January 1984, see column 3, line 61 - line 67; figure 3 --	4
Y	EP, A2, 0256972 (SIEMENS AG BERLIN UND MÜNCHEN) 24 February 1988, see figure 2 --	3
Y	US, A, 3149792 (CLINTON K TEXTOR) 22 September 1964, see column 2, line 46 - line 61; figure 1 --	3
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* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
11th December 1989	1989 -12- 14
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Wiva Asplund

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLIC ATION NO. PCT/SE 89/00527

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3910511	0 /10/75	DE-A- 2522349	04/12/75
		GB-A- 1461057	13/01/77
		CA-A- 1021617	29/11/77
		JP-A- 51004303	14/01/76
		SE-A- 7505745	21/11/75
US-A- 4423845	03/01/84	CA-A- 1151926	16/08/83
EP-A2- 0256972	24/02/88	DE-A- 3628195	25/02/88
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US-A- 3149792	22/09/64	NONE	