

(19)



(11)

EP 4 579 035 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

02.07.2025 Bulletin 2025/27

(51) International Patent Classification (IPC):

D21H 11/18 ^(2006.01) **D21H 17/64** ^(2006.01)
D21H 27/10 ^(2006.01)

(21) Application number: **24223490.4**

(52) Cooperative Patent Classification (CPC):

D21H 27/10; D21H 11/18; D21H 17/64;
D21H 21/52; D21H 27/38

(22) Date of filing: **27.12.2024**

(84) Designated Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR

Designated Extension States:

BA

Designated Validation States:

GE KH MA MD TN

(30) Priority: **29.12.2023 BR 102023027868**

(71) Applicant: **Suzano S.A.**

41810-012 Pituba, Salvador, BA (BR)

(72) Inventors:

- **Pereira Maia, Elenice**
13468-150 Americana, SP (BR)
- **Da Cruz Monteiro, Guilherme**
13480-970 Limeira, SP (BR)

(74) Representative: **Grünecker Patent- und**

Rechtsanwälte

PartG mbB

Leopoldstraße 4

80802 München (DE)

(54) **HIGH-STRENGTH PAPER BASED ON SHORT-FIBER CELLULOSE AND USE THEREOF**

(57) The present invention claims a paper 100% composed of bleached short-fiber cellulose, of high strength, comprising mineral filler, as well as its use in

the production of kraftliner paper and wrappings, box packaging, corrugated materials, and bags, being suitable for food storage, but not limited to these applications.

EP 4 579 035 A1

Description**FIELD OF THE INVENTION**

5 **[0001]** This document belongs to the field of Chemical Engineering, Paper, and Cellulose, and corresponds to a paper 100% composed of bleached short fiber cellulose, of high strength, comprising mineral filler, as well as its use in the production of kraftliner paper and wrappers, packaging boxes, corrugated paper and bags, and is suitable for food storage.

STATE OF THE ART

10 **[0002]** Papers for the production of kraftliner paper and other types of packaging are commonly produced on the market from blends of cellulose fibers, which are usually long fibers or a mixture of long and short fibers. This composition directly influences the quality of the material, as well as the desired strength depending on the product that will be produced from this paper.

15 **[0003]** In general, these papers can present a grammage between 70 and 440 g/m², being most commonly found with a grammage between 90 and 170 g/m².

[0004] The main desired characteristics of this type of paper are its rigidity, tear and burst resistance, as well as low porosity to achieve a better printability quality in products. Furthermore, for the material to be applicable in the production of packaging suitable for food storage, it also needs to be ideal for being in contact with such products.

20 **[0005]** One of the characteristics to analyze paper strength is fibrillation. With fibrillation, the exposure of hydroxyl groups increases, and, consequently, the number of bonds between fibers increases. This promotes greater product strength.

[0006] In general, it is described in the state of the art that for a paper to present good resistance characteristics, it is necessary to use long cellulose fiber. In other words, the longer the fiber, the greater its resistance, especially to tearing.

25 **[0007]** In addition, another characteristic to analyze the strength of the paper is fibrillation. With fibrillation, the exposure of hydroxyl groups increases, and, consequently, the number of bonds between fibers increases. This promotes greater strength of the product.

30 **[0008]** The present invention stands out from the state of the art and materials currently on the market primarily because it presents a paper with characteristics of resistance and printability quality for the production of kraftliner paper and paper packaging, among other products, being composed exclusively of bleached and fibrillated short fiber cellulose, also comprising mineral filler.

SUMMARY OF THE INVENTION

35 **[0009]** In a first aspect, the present invention provides a paper 100% composed of bleached and fibrillated short-fiber cellulose, which presents high resistance and comprises a mineral filler.

[0010] In a second aspect, the present invention provides that the fibers comprise a width between 10 and 20 μm and variable length between 0.2-3.2 mm. More specifically, the fibers are distributed in: 20-25% with length between 0.2-0.6 mm; 60-65% with length between 0.6-1.2 mm; 1-5% with length between 1.2-2.0 mm; 0.1-1.0% with average length between 2.0-3.2 mm. Furthermore, it also provides that fibrillation is between 0.2 and 0.4%, and the degree of straightness of the fiber is 90.

40 **[0011]** In a third aspect, the present invention provides that the short fiber comprises the following morphological characteristics:

- 45 - Gravimetric Coarseness between 5 and 12 mg/100m;
- Optical Coarseness between 8 and 15 mg/100m;
- Arithmetic fiber length between 0.6 and 0.8 mm;
- Weighted length between 0.75 and 0.8 mm;
- Wall thickness between 3 and 5 pm;
- 50 - Width between 15 and 18 pm;
- Fibrillation between 0.2 and 0.4%;
- FS5 fines between 65 and 85%;
- FS5 fines A between 12 and 20%;
- FS5 fines B between 0.2 and 2%;
- 55 - Degree of fiber straightness between 80 and 90;
- Curvature index between 10 and 20%;
- Between 5 and 30 million fibers per gram;
- Number of flakes between 5 and 95 n/mg;

- Number of vessels between 5 and 50 n/mg;
- CD hygroexpansivity between 3 and 6%;
- MD hygroexpansivity between 0.1 and 0.6%.

[0012] In addition, the paper also presents a compression strength (RCT) of 0.5 to 2.0 kN/m.

[0013] In a fourth aspect, the present invention provides compostable and recyclable paper.

[0014] In a fifth aspect, the present invention provides that the paper presents smoothness and uniformity on its surface, conferring a high quality of printability. The smoothness is determined by the Bendtsen roughness, which comprises wire side Bendtsen roughness between 130 and 350 mL/min, and felt side Bendtsen roughness between 275 and 600 mL/min.

[0015] In a sixth aspect, the present invention provides that the paper is suitable for direct contact with food, in addition to having grammages between 70 and 210 g/m². With this, the paper can be used in the production of wrappers, box packaging, corrugated and bags, in particular in food packaging, but not limited to these applications. The packaging produced by the paper claimed herein is also suitable for storing frozen or hot food.

[0016] In a seventh aspect, the present invention provides that the production of the paper claimed herein uses mineral filler of up to 10%, more specifically using calcium for the application of mineral filler.

[0017] Finally, the present invention provides that the paper is produced at a lower starch bath temperature and in the corrugator, with reduced energy and higher speed.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The various embodiments of the present invention will now be referred to in more details, from which one or more examples are shown in the experimental descriptions below. Each example is provided by way of illustration of the present invention, and should not be construed as a limitation thereof.

[0019] The high-strength paper claimed herein is characterized by the use of 100% bleached eucalyptus short fiber, reduced amount of mineral filler, and high levels of refining. In addition, the paper requires a low level of surface sizing and high compression strength values. This product line does not use bleach or dye to control optical properties.

[0020] Table 1 below presents a summary of the technical specifications of the physical properties of the paper claimed herein, which grammages can vary from 70 to 210 g/m². It should be noted that the presented ranges vary according to the grammage of the product.

EP 4 579 035 A1

		UNIT	RANGE
5 10 15	EXTERNAL CONTROLS	GRAMMAGE	g/m ²
		THICKNESS	μm
		HUMIDITY	%
		(RCT) <i>Ring Crush Test</i>	kN/m
		(CMT) <i>Corrugating medium Test</i>	N
		BURSTING STRENGTH	kPa
		COBB WIRE SIDE (2 minutes)	g/m ²
		COBB FELT SIDE (2 minutes)	g/m ²
20 25 30	HISTORICAL DATA	GURLEY POROSITY	s
		WHITENESS FELT ISO	N°
		WHITENESS FELT D65/10	N°
		BENDTSEN WIRE SIDE ROUGHNESS	mL/min
35 40		BENDTSEN FELT SIDE ROUGHNESS	mL/min
		OPACITY	%
		LOAD	%

Table 1: Physical properties of high-strength paper

Claims

1. Paper **characterized by** being 100% bleached short fiber, presenting high resistance, and comprising mineral filler.
2. Paper, according to claim 1, **characterized by** the short fiber cellulose being fibrillated.
3. Paper, according to claims 1 and 2, **characterized by** comprising a fiber distribution in which the fibers comprise a width between 10 μm and 20 μm, and a variable length between 0.2-3.2 mm.
4. Paper, according to claim 2, **characterized by** the fact that the fibers are distributed in:
 - 20-25% with length between 0.2-0.6mm;
 - 60-65% with length between 0.6-1.2mm;
 - 1-5% with length between 1.2-2.0mm;
 - 0.1-1.0% with average length between 2.0 - 3.2mm.

5. Paper according to any one of the preceding claims, **characterized by** the fact that the hygroexpansion CD is between 3 and 6%, and the hygroexpansion MD is between 0.1 and 0.6%.
- 5 6. Paper according to any one of the preceding claims, **characterized by** the fact that the fibrillation is between 0.2 and 0.4%.
7. Paper, according to any of the preceding claims, **characterized by** the degree of fiber straightness being 90.
- 10 8. Paper according to any one of the preceding claims, **characterized by** the fact that the curvature index is between 10 and 20%.
9. Paper, according to any of the preceding claims, **characterized by** the compression strength (RCT) being at least 0.5 kN/m.
- 15 10. Paper according to claim 1, **characterized by** being compostable and recyclable.
11. Paper, according to claim 1, **characterized by** having smoothness and uniformity on the surface.
- 20 12. Paper according to claim 11, **characterized by** presenting Bendtsen roughness between 130 and 600 mL/min, preferably between 150 and 300 mL/min.
13. Paper, according to claim 1, **characterized by** being suitable for direct contact with food.
- 25 14. Paper, according to claim 1, **characterized by** having a grammage between 70 and 210 g/m².
15. Paper, according to claim 1, **characterized by** comprising the use of mineral filler of up to 10%.
16. Paper, according to claim 15, **characterized by** the use of calcium carbonate as mineral filler.
- 30 17. Use of the paper, as defined in any of the previous claims, **characterized by** being applied in the production of wrappings, box packaging, corrugated paper and bags, among others.
18. Use of the paper, according to claim 17, **characterized by** being applied in the production of food packaging.
- 35 19. Packaging or boxes for food storage **characterized by** being made of paper as described in any of the previous claims, comprising at least two layers, wherein each layer is composed of 100% bleached short fiber, presents high strength, and comprises mineral filler.
- 40 20. Packaging or boxes for food storage, according to claim 19, **characterized by** being suitable for storing frozen or hot food.



EUROPEAN SEARCH REPORT

Application Number

EP 24 22 3490

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2020/075050 A1 (RAIZ INSTITUTO DE INVESTIG DA FLORESTA E PAPEL [PT] ET AL.) 16 April 2020 (2020-04-16) * page 8, line 24 - page 10, line 22 * * page 11, line 15 - line 24; figure 2 * -----	1-20	INV. D21H11/18 D21H17/64 D21H27/10
			TECHNICAL FIELDS SEARCHED (IPC)
			D21H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		15 April 2025	Arz, Marius
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 24 22 3490

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15 - 04 - 2025

10

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 2020075050	A1	16-04-2020	EP	3864219 A1	18-08-2021
			PT	115074 A	13-04-2020
			WO	2020075050 A1	16-04-2020

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82