

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BILLERUD AKTIEBOLAG (PUBL)

Petitioner,

v.

WESTROCK MWV, LLC.

Patent Owner

U.S. Patent No. 11,293,142 B2

Issued: April 5, 2022

Filed: May 7, 2020

Inventors: Sergio A. Guiste, Steven Parker, Terrell J. Green

Title: SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS
FOR MANUFACTURING THE SAME

BILLERUD EXHIBIT 1002

The Relevant File History for US Patent 11,293,142

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor	1	Remove			
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Sergio	A.	Giuste		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
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	Steven		Parker		
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Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
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Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

City	Raleigh	State/Province	NC	Country of Residence	US
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Address 2					
City	Raleigh	State/Province	NC		
Postal Code	27612	Country	US		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	66061		
Email Address	docketadministrator@westrock.com	Add Email	Remove Email

Application Information:

Title of the Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		
Attorney Docket Number	23509-USORD1	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐ Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement that requires publication at eighteen months after filing.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	66061		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78. When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62/846278	2019-05-10

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐	This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
------------------	---	---------------------------------------

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
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- Person to whom the inventor is obligated to assign.
- Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name

Mailing Address Information For Applicant:

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Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
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If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

Signature: Remove				
NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c). This Application Data Sheet must be signed by a patent practitioner if one or more of the applicants is a juristic entity (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, all joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of all joint inventor-applicants. See 37 CFR 1.4(d) for the manner of making signatures and certifications.				
Signature	/Neil G. Cohen/		Date (YYYY-MM-DD)	2020-05-07
First Name	Neil	Last Name	Cohen	Registration Number
				35100
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	23509-USORD1
		Application Number	
Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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- 2 A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
- 4 A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
- 5 A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- 6 A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7 A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8 A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
- 9 A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

Applicant	:	WestRock Company
Inventors	:	Giuste et al.
Serial No.	:	To be assigned
Filed	:	Herewith
Title	:	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME
Conf. No.	:	To be assigned
Docket:	:	23509-USORD1
Examiner	:	To be assigned
Art Unit	:	To be assigned

Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

PRELIMINARY AMENDMENT

Amendments to the Claims are reflected in the listing of claims that begins on Page 2 of this paper.

Remarks begin on Page 7 of this paper.

Amendments to the Claims:

This listing of the pending claims will replace all prior versions and listings of claims in this application:

1. (Original) A method for manufacturing a paperboard structure comprising:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment; and

applying a topcoat to said basecoated paperboard substrate,

wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

2. (Original) The method of Claim 1 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 500 pli.

3. (Currently Amended) The method of Claim 1 ~~or Claim 2~~ wherein said elevated temperature is at least 250 °F.

4. (Canceled)

5. (Original) A method for manufacturing a paperboard structure comprising:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a

counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment blend comprising ground calcium carbonate and hyperplaty clay; and

applying a topcoat to said basecoated paperboard substrate.

6–9. (Canceled)

10. (Currently Amended) The method of ~~any one of Claims 5 through 9~~ Claim 5 further comprising applying starch to said paperboard substrate prior to said passing said paperboard substrate through said hot-hard calender.

11. (Currently Amended) The method of ~~any one of Claims 5 through 10~~ Claim 5 wherein said hot-hard calender further comprises a second nip defined by said thermo-roller and a second counter roller, and wherein said passing said paperboard substrate comprises passing said paperboard substrate through said nip and said second nip.

12. (Currently Amended) The method of ~~any one of Claims 5 through 11~~ Claim 5 wherein at least one of said thermo-roller and said counter roller comprises a metallic material.

13. (Currently Amended) The method of ~~any one of Claims 5 through 12~~ Claim 5 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 500 pli.

14–16. (Canceled)

17. (Currently Amended) The method of ~~any one of Claims 5 through 16~~ Claim 5 wherein said elevated temperature is at least 250 °F.

18–19. (Canceled)

20. (Currently Amended) The method of ~~any one of Claims 5 through 19~~ Claim 5 wherein said basecoat is applied to only one side of said calendered paperboard substrate.

21. (Canceled)

22. (Currently Amended) The method of ~~any one of Claims 5 through 21~~ Claim 5 further comprising applying an intermediate coating layer to said basecoated paperboard substrate prior to said applying said topcoat.

23. (Currently Amended) The method of ~~any one of Claims 5 through 22~~ Claim 5 wherein said basecoat binder comprises latex.

24. (Canceled)

25. (Currently Amended) The method of ~~any one of Claims 5 through 24~~ Claim 5 wherein said hyperplaty clay has an average aspect ratio of at least about 40:1.

26–27. (Canceled)

28. (Currently Amended) The method of ~~any one of Claims 5 through 27~~ Claim 5 wherein at most about 60 percent of said ground calcium carbonate of said basecoat pigment blend has a particle size smaller than 2 microns.

29–30. (Canceled)

31. (Currently Amended) The method of ~~any one of Claims 5 through 30~~ Claim 5 wherein said ground calcium carbonate comprises at least about 10 percent by weight of said basecoat pigment blend and at most about 60 percent by weight of said basecoat pigment blend.

32–35. (Canceled)

36. (Currently Amended) The method of ~~any one of Claims 5 through 35~~ Claim 5 wherein said topcoat comprises a topcoat binder and a topcoat pigment blend.

37. (Original) The method of Claim 36 wherein said topcoat binder comprises latex.

38. (Canceled)

39. (Currently Amended) The method of ~~any one of Claims 36 through 38~~ Claim 36 wherein said topcoat pigment blend comprises calcium carbonate and clay.

40–42. (Canceled)

43. (Currently Amended) The method of ~~any one of Claims 5 through 42~~ Claim 5 wherein said applying said basecoat and said applying said topcoat yields a coating structure on said paperboard substrate, said coating structure having a total coat weight, on a dry basis, ranging from about 8 lbs/3000 ft² to about 18 lbs/3000 ft².

44. (Canceled)

45. (Currently Amended) The method of ~~any one of Claims 5 through 44~~ Claim 5 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y₂ pounds per 3000 ft², wherein Y₂ is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

46. (Original) The method of Claim 45 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

47–48. (Canceled)

49. (Currently Amended) The method of ~~any one of Claims 5 through 48~~ Claim 5 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2' pounds per 3000 ft², wherein Y_2' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2' = 35.55 + 8.173X - 0.01602X^2.$$

50–52. (Canceled)

53. (Currently Amended) The method of ~~any one of Claims 5 through 52~~ Claim 5 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3 pounds per 3000 ft², wherein Y_3 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3 = 3.63 + 12.85X - 0.1566X^2.$$

54–56. (Canceled)

57. (Currently Amended) The method of ~~any one of Claims 5 through 56~~ Claim 5 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3' pounds per 3000 ft², wherein Y_3' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3' = 34.83 + 8.010X - 0.01570X^2.$$

58–61. (Canceled)

62. (Original) The paperboard structure manufactured by the method of Claim 5.

63–66. (Canceled)

Remarks:

Claims 3, 10–13, 17, 20, 22, 23, 25, 28, 31, 36, 39, 43, 45 49, 53 and 57 have been amended by this paper. Claims 4, 6–9, 14–16, 18, 19, 21, 24, 26, 27, 29, 30, 32–35, 38, 40–42, 44, 47, 48, 50–52, 54–56, 58–61 and 63–66 have been canceled without prejudice or disclaimer. Claims 1–3, 5, 10–13, 17, 20, 22, 23, 28, 31, 36, 37, 39, 43, 45, 46, 49, 53, 57 and 62 are pending.

Prompt and favorable action is respectfully requested.

The Commissioner is hereby authorized to treat any paper that is filed in this application, which requires an extension of time, as incorporating a request for such an extension. The Commissioner is further authorized to charge any fees required by this paper, or to credit any overpayment, to Deposit Account No. 13-2500.

Respectfully submitted,

/Neil G. Cohen/

May 7, 2020

Neil G. Cohen
Reg. No. 35,100

WESTROCK COMPANY
Attn: IP Law Group – Patents
501 South 5th Street, 3rd Floor
Richmond, Virginia 23219-0501

SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME

PRIORITY

[0001] This application claims priority from U.S. Ser. No. 62/846,278 filed on May 10, 2019. The entire contents of U.S. Ser. No. 62/846,278 are incorporated herein by reference.

FIELD

[0002] The present patent application relates to smooth, low-density paperboard and to methods for manufacturing the same.

BACKGROUND

[0003] Paperboard is used in various packaging applications. For example, aseptic liquid packing paperboard is used for packaging beverage cartons, boxes and the like. Therefore, customers often prefer paperboard having a generally smooth surface with few imperfections to facilitate the printing of high quality text and graphics, thereby increasing the visual appeal of products packaged in paperboard.

[0004] Conventionally, paperboard smoothness is achieved by a wet stack calendering process in which the paperboard is rewetted and passed through a calendering device having two or more hard rolls. The wet stack calendering process smooths the paperboard by compressing the fiber network (e.g., applies a nip load) to reduce the pits and crevices in the raw stock board. Therefore, smooth paperboard is typically more dense (e.g., less bulky) than less smooth paperboard.

[0005] Nonetheless, low density is a desirable quality in many paperboard applications. However, preparing a smooth paperboard using conventional processes generally requires substantially increasing paperboard density.

[0006] Accordingly, those skilled in the art continue with research and development efforts in the field of paperboard manufacturing.

SUMMARY

[0007] In one aspect, the disclosed method for manufacturing a paperboard structure includes passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, the hot-hard calender including a nip defined by a thermo-roller and a counter roller, wherein a contact surface of the thermo-roller is heated to an elevated temperature. The disclosed method then includes applying a basecoat to the calendered paperboard substrate to yield a basecoated paperboard substrate, the basecoat includes a basecoat binder and a basecoat pigment blend. The disclosed method further includes applying a topcoat to the basecoated paperboard substrate. The paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf smoothness, the Parker Print Surf smoothness being at most about 3 microns, the basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of the caliper thickness (X) in point (1 point = one thousandth of an inch) and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

[0008] In another aspect, the disclosed method for manufacturing a paperboard structure includes passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, the hot-hard calender including a nip defined by a thermo-roller and a counter roller, wherein a contact surface of the thermo-roller is heated to an elevated temperature. The disclosed method then includes applying a basecoat to the calendered paperboard substrate to yield a basecoated paperboard substrate, the basecoat includes a basecoat binder and a basecoat pigment blend. The disclosed method further includes applying a topcoat to the basecoated paperboard substrate.

[0009] Other aspects of the disclosed method for manufacturing a paperboard structure, and the paperboard structures manufactured by such methods, will become apparent from the following detailed description, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a cross-sectional view an example smooth, low density paperboard structure.

[0011] Fig. 2 is a schematic illustration of a first example of a method for manufacturing a smooth, low density paperboard structure.

[0012] Fig. 3 is a schematic illustration of a second example of a method for manufacturing a smooth, low density paperboard structure.

[0013] Fig. 4 is a graphical representation of density versus caliper thickness of various examples of the disclosed smooth, low density paperboard structures, as well as prior art examples.

[0014] Fig. 5 is a graphical representation of density versus Parker Print Surf smoothness of various examples of the disclosed smooth, low density paperboard structures having a caliper thickness of about 10 points, as well as prior art examples.

[0015] Fig. 6 is a graphical representation of density versus Parker Print Surf smoothness of various examples of the disclosed smooth, low density paperboard structures having a caliper thickness of about 14 points, as well as prior art examples.

[0016] Fig. 7 is a graphical representation of basis weight versus caliper thickness of various examples of the disclosed smooth, low density paperboards.

[0017] Fig. 8 is a graphical representation of basis weight versus caliper thickness for the disclosed smooth, low density paperboards, as well as prior art examples.

[0018] Fig. 9 is a graphical representation of basis weight versus caliper thickness of various examples of the disclosed smooth, low density paperboards.

[0019] Fig. 10 is a graphical representation of basis weight versus caliper thickness for the disclosed smooth, low density paperboards, as well as prior art examples.

DETAILED DESCRIPTION

[0020] Referring to Fig. 1, an example paperboard structure 10 that may be manufactured using the method 20 disclosed herein is shown. The paperboard structure 10 may have a caliper

thickness T and an upper surface S upon which text or graphics may be printed. The paperboard structure also includes a paperboard substrate 12 and a coating structure 19.

[0021] The paperboard substrate 12 may be any paperboard material that is capable of being coated, such as with the disclosed basecoat 14. The paperboard substrate 12 may be bleached, and may be a single-ply substrate or a multi-ply substrate. However, use of an unbleached paperboard substrate 12 is also contemplated. Those skilled in the art will appreciate that the paperboard substrate 12 will be thicker and more rigid than paper. Generally, a paperboard substrate 12 has an uncoated basis weight of about 85 pounds per 3000 ft² or more. In one or more examples, however, the paperboard substrate 12 may have an uncoated basis weight of about 100 pounds per 3000 ft² or more. One specific, non-limiting example of an appropriate paperboard substrate 12 is solid bleached sulfate (SBS). In one particular example, the paperboard substrate 12 may include a substantially chemically (rather than mechanically) treated fiber, such as an essentially 100 percent chemically treated fiber. Examples of appropriate chemically treated fiber substrates include solid bleached sulfate paperboard or solid unbleached sulfate paperboard.

[0022] Additional components, such as binders, fillers, pigments and the like, may be added to the paperboard substrate 12 without departing from the scope of the present disclosure. Furthermore, the paperboard substrate 12 may be substantially free of plastic pigments for increasing bulk, such as hollow plastic pigments or expandable microspheres, or other chemical bulking agents. Still furthermore, the paperboard substrate 12 may be substantially free of ground wood particles.

[0023] The coating structure 19 includes a basecoat 14, a topcoat 18 and may include any number of intermediate coating layers 16. The basecoat 14, topcoat 18, and optional intermediate coating layers 16 may improve the smoothness of the surface S of the paperboard structure 10 without substantially reducing the caliper thickness T of the paperboard structure 10. The basecoat 14 is applied first, directly to the paperboard substrate 12, and may be followed by various intermediate coating layers 16. The topcoat 18 is applied last to form the outermost layer (e.g., the basecoat is positioned between the topcoat and the paperboard substrate). Once applied, the coating structure may have a total coat weight equal to the combined weight of the

individual layers (e.g., basecoat 14, topcoat 18 and intermediate coating layers 16). The total coat weight may be measured after the coating structure has been dried. In one example, the coating structure may have a total coat weight, on a dry basis, ranging from about 8 lbs/3000 ft² to about 18 lbs/3000 ft². In another example, the coating structure may have a total coat weight, on a dry basis, ranging from about 10 lbs/3000 ft² to about 18 lbs/3000 ft². In yet another example, the coating structure may have a total coat weight, on a dry basis, ranging from about 12 lbs/3000 ft² to about 16 lbs/3000 ft².

[0024] The basecoat 14 includes a basecoat binder, a basecoat pigment (or basecoat pigment blend) and, optionally, various other components. In one particular implementation, the basecoat pigment blend includes ground calcium carbonate and hyperplaty clay (e.g., clay having a relatively high aspect ratio or shape factor). For example, the basecoat pigment blend may consist essentially of ground calcium carbonate and hyperplaty clay. The terms “aspect ratio” and “shape factor” refer to the geometry of the individual clay particles, specifically to a comparison of a first dimension of a clay particle (e.g., the diameter or length of the clay particle) to a second dimension of the clay particle (e.g., the thickness or width of the clay particle). The terms “hyperplaty,” “high aspect ratio” and “relatively high aspect ratio” refer to aspect ratios generally in excess of 40:1, such as 50:1 or more, particularly 70:1 or more, and preferably 90:1 or more.

[0025] In one example, the hyperplaty clay of the basecoat pigment blend may include a platy clay wherein, on average, the clay particles have an aspect ratio of about 40:1 or more. In another example, the hyperplaty clay of the basecoat pigment blend may include a platy clay wherein, on average, the clay particles have an aspect ratio of about 70:1 or more. In yet another example, the hyperplaty clay of the basecoat pigment blend may include a platy clay wherein, on average, the clay particles have an aspect ratio of about 90:1 or more. An example of such a clay is BARRISURF™, which is available from Imerys Pigments, Inc. of Roswell, Ga.

[0026] The ground calcium carbonate of the basecoat pigment blend may range from fine to coarse depending on the particle size of the ground calcium carbonate. Wherein about 95 percent of the ground calcium carbonate particles are less than about 2 microns in diameter, the ground calcium carbonate is generally considered to be “fine.” Wherein about 60 percent of the

ground calcium carbonate particles are less than about 2 microns in diameter, the ground calcium carbonate is generally considered to be “coarse.” Further, ground calcium carbonate may also be “extra coarse” when about 35 percent of the ground calcium carbonate particles are less than about 2 microns in diameter.

[0027] In one example, the basecoat pigment blend may include ground calcium carbonate wherein about 60 percent of the calcium particles are less than about 2 microns in diameter. An example of such a ground calcium carbonate is HYDROCARB® 60 available from Omya AG of Oftringen, Germany. In another example, the basecoat pigment blend may include ground calcium carbonate wherein about 45 percent of the calcium particles are less than about 2 microns in diameter. In yet another example, the basecoat pigment blend may include ground calcium carbonate wherein about 35 percent of the calcium particles are less than about 2 microns in diameter.

[0028] The ratio of ground calcium carbonate to hyperplaty clay in the basecoat pigment blend may vary. In one example, the ground calcium carbonate may be at least about 10 percent by weight of the basecoat pigment blend and at most about 60 percent by weight of the basecoat pigment blend. In another example, the ground calcium carbonate may be at least about 40 percent by weight of the basecoat pigment blend and at most about 60 percent by weight of the basecoat pigment blend. In yet another example, the basecoat pigment blend includes about 50 percent by weight ground calcium carbonate and about 50 percent by weight hyperplaty clay.

[0029] The basecoat binder may be any suitable binder and may be selected based on a variety of manufacturing considerations. In one example, the basecoat binder may include latex. In another example, the basecoat binder may include styrene-acrylic latex. Examples of suitable basecoat binders include RHOPLEX P-308 available from the Dow Chemical Corporation of Midland, MI and RESYN 1103 available from Celanese International Corporation of Irving, TX. Likewise, the various other basecoat components may vary as well depending on manufacturing considerations. In one or more examples, however, the various other basecoat components may include a dispersant. An example of such a dispersant is BERCHEM 4842 available from Bercen, Inc. of Denham Springs, LA.

[0030] The topcoat 18 may be applied to the paperboard substrate 12 after a basecoat 14 has been applied. The topcoat 18 may be any appropriate topcoat and may include a topcoat binder, a topcoat pigment blend, and various other components. The topcoat pigment blend may include calcium carbonate and clay. In one example, calcium carbonate may be at least about 50 percent by weight of the topcoat pigment blend and at most about 70 percent by weight of the topcoat pigment blend. In another example, the topcoat pigment blend may include about 60 percent by weight calcium carbonate and about 40 percent by weight clay. The topcoat pigment blend may vary or be substantially similar to the basecoat pigment blend in terms of the coarseness of the calcium carbonate and the aspect ratio of the clay. In one example, the topcoat pigment blend may include fine ground calcium carbonate, such as HYDROCARB[®] 90 available from Omya AG of Oftringen, Germany. In another example, the topcoat pigment blend may include clay, such as Kaofine 90 available from Thiele Kaolin Company of Sandersville, GA. In yet another example, the topcoat pigment blend may include fine ground calcium carbonate and clay.

[0031] The topcoat binder may be any suitable binder and may be selected based on a variety of manufacturing considerations. In one example, the basecoat binder may include latex. In another example, the basecoat binder may include styrene-acrylic latex. Examples of suitable basecoat binders include RHOPLEX P-308 available from the Dow Chemical Corporation of Midland, MI and RESYN 1103 available from Celanese International Corporation of Irving, TX. The various other topcoat components may similarly include any suitable additive such as a dispersant, a lubricant and polyvinyl alcohol. An example of a suitable lubricant is NOPCOTE C-104 available from Geo Specialty Chemicals, Inc. of Lafayette, IN. An example of a suitable polyvinyl alcohol is SEKISUI SELVOL 205 available from Sekisui Specialty Chemicals America of Dallas, TX.

[0032] Referring to Fig. 2, an example method 20 for manufacturing a paperboard structure 10 is illustrated. The method 20 may begin at the head box 22 which may discharge a fiber slurry onto a Fourdrinier 24 to form a paperboard substrate 26. The paperboard substrate 26 may pass through one or more wet presses 28 and, optionally through one or more dryers 30. A size press 32 may be used and may slightly reduce the caliper thickness of the paperboard substrate 26 and an optional dryer 34 may additionally dry the paperboard substrate 26.

[0033] The paperboard substrate 26 then passes through a hot-hard calender 60 to yield a calendered paperboard substrate. The hot-hard calender 60 includes a nip 62 wherein a nip load may be applied to the paperboard substrate 26. Further, the nip 62 is defined by a counter roller 68 and a thermo-roller 64. The counter roller 68 and/or the thermo-roller 64 may be made from a metallic material, such as steel or iron, or other suitably hard materials, such as a heat-resistant resin composite. The thermo-roller 64 includes at least one contact surface 66 (for contacting the paperboard substrate 26) that is heated to an elevated temperature. In another example, shown in Fig. 3, the hot-hard calender 60 may alternatively include a nip 62 and a second nip 63 wherein the nip 62 is defined by a thermo-roller 64 and a counter roller 68, and the second nip 63 is defined by same thermo-roller 64 and a second counter roller 69.

[0034] The nip load applied to the paperboard substrate 12 may vary. In an example, the nip load applied to the paperboard substrate 12 may range from about 20 pli (pounds per linear inch) to about 500 pli. In an example, the nip load applied to the paperboard substrate 12 may range from about 20 pli to about 350 pli. In an example, the nip load applied to the paperboard substrate 12 may range from about 20 pli to about 160 pli. In an example, the nip load applied to the paperboard substrate 12 may range from about 30 pli to about 140 pli.

[0035] While passing the paperboard substrate 12 through the hot-hard calender 60, the contact surface 66 of the thermo-roller 64 is heated to an elevated temperature so as to heat the paperboard substrate 12 as it is being calendered. In one example, the elevated temperature may be at least 250 °F. In another example, the elevated temperature may be at least 300 °F. In another example, the elevated temperature may be at least 400 °F. In yet another example, the elevated temperature may be at least 500 °F.

[0036] After being calendered, the paperboard substrate 12 may pass through another optional dryer 38 and to the first coater 40. The first coater 40 may be a blade coater or the like and may apply the basecoat 14 onto the paperboard substrate 12, thereby yielding a basecoated paperboard substrate. An optional dryer 42 may dry, at least partially, the basecoat 14 prior to application of another coat. A second coater 44 may then apply a topcoat 18 to the basecoated paperboard substrate, thereby yielding the paperboard structure. Another optional dryer 46 may finish the drying process before the paperboard substrate 26 proceeds to the optional gloss

calender 48 and the paperboard substrate 26 is rolled onto a reel 50. Those skilled in the art will appreciate that additional coaters may be utilized after the application of the basecoat 14 and before the application of the topcoat 18 without departing from the scope of the present disclosure.

These additional coaters may apply, for example, intermediate coating layers 16.

[0037] At this point, those skilled in the art will appreciate that the basecoats 14, topcoats 18, intermediate coating layers 16 and associated application techniques disclosed above may substantially increase the smoothness of the resulting paperboard structure 10 while essentially maintain the caliper thickness of the paperboard substrate throughout the coating process, thereby yielding a smooth (e.g., a Parker Print Surf smoothness of 3 microns or less), low density paperboard structure 10.

EXAMPLES

[0038] Specific example of smooth, low density paperboard prepared in accordance with the present disclosure are presented below.

Example 1

[0039] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 145 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0040] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland, using a hot-hard calender having a two roll (e.g., one nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 140 pli and the surface temperature of the thermo-roller was about 480 °F.

[0041] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0042] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0043] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 14 lbs/3000 ft².

[0044] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0045] The coated paperboard structure had a total basis weight of 164 lbs/3000 ft², a caliper of about 0.0155 inches (15.5 points), and a Parker Print Surf (PPS 10S) roughness of about 1.9 microns.

Example 2

[0046] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 145 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0047] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland using a hot-hard calender having a two roll (e.g., one nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 140 pli and the surface temperature of the thermo-roller was about 480 °F.

[0048] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0049] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0050] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 12 lbs/3000 ft².

[0051] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0052] The coated paperboard structure had a total basis weight of 161 lbs/3000 ft², a caliper of about 0.0151 inches (15.1 points), and a Parker Print Surf (PPS 10S) roughness of about 1.9 microns.

Example 3

[0053] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 145 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0054] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland using a hot-hard calender having a two roll (e.g., one nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 140 pli and the surface temperature of the thermo-roller was about 480 °F.

[0055] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0056] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0057] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 16 lbs/3000 ft².

[0058] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a

soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0059] The coated paperboard structure had a total basis weight of 164 lbs/3000 ft², a caliper of about 0.0153 inches (15.3 points), and a Parker Print Surf (PPS 10S) roughness of about 1.7 microns.

Example 4

[0060] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 104 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0061] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland using a hot-hard calender having a three roll (e.g., two nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 90 pli and the surface temperature of the thermo-roller was about 500 °F.

[0062] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0063] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0064] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 12 lbs/3000 ft².

[0065] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0066] The coated paperboard structure had a total basis weight of 119 lbs/3000 ft², a caliper of about 0.0105 inches (10.5 points), and a Parker Print Surf (PPS 10S) roughness of about 1.3 microns.

Example 5

[0067] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 104 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0068] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland using a hot-hard calender having a three roll (e.g., two nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 90 pli and the surface temperature of the thermo-roller was about 500 °F.

[0069] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0070] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0071] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 12 lbs/3000 ft².

[0072] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0073] The coated paperboard structure had a total basis weight of 117 lbs/3000 ft², a caliper of about 0.0103 inches (10.3 points), and a Parker Print Surf (PPS 10S) roughness of about 1.4 microns.

Example 6

[0074] An uncoated solid bleached sulfate (SBS) paperboard substrate having a basis weight of about 104 lbs/3000 ft² was prepared using a full-scale production process. Starch was applied to the surface of the SBS board during production.

[0075] The paperboard substrate was calendered by Valmet Technologies Oy of Järvenpää, Finland using a hot-hard calender having a two roll (e.g., one nip) design. The hot-hard calender included one thermo-roller and one counter roller. The nip load was about 90 pli and the surface temperature of the thermo-roller was about 500 °F.

[0076] A basecoat was prepared as a mixture of 50 parts high aspect ratio clay, 50 parts of extra coarse calcium carbonate, 17 parts of a Styrene-Acrylic Binder, 4 parts of a surfactant stabilized polyvinyl acetate, and minor amounts of dispersant.

[0077] A topcoat was also prepared as a mixture of 60 parts of fine carbonate, 40 parts of fine clay, 9 parts of Styrene-Acrylic Binder, 3 parts of a surfactant stabilized polyvinyl acetate, less than 2% of Polyvinyl Alcohol, and minor amounts of dispersant and lubricant.

[0078] The calendered paperboard substrate was then coated on one side (C1S) with the basecoat and then the topcoat. The total quantity of applied coating (basecoat and topcoat) was about 15 lbs/3000 ft².

[0079] The coated paperboard structure was then final calendered using a gloss-type calender at the WestRock pilot plant. The gloss-type calender included a counter roller covered with a soft polyurethane cover and applied a nip load of around 150 pli while roller surface temperatures were maintained around 200 °F.

[0080] The coated paperboard structure had a total basis weight of 120 lbs/3000 ft², a caliper of about 0.0106 inches (10.6 points), and a Parker Print Surf (PPS 10S) roughness of about 1.3 microns.

Comparative Examples 1–6

[0081] For each of the above examples, a Comparative Example was also prepared to demonstrate the improvement presented by the disclosed method (e.g., Comparative Example 1 is comparable to Example 1, Comparative Example 2 is comparable to Example 2, and so on). The paperboard substrate for each Comparative Example was initially prepared in the same manner as the corresponding Example (e.g., uncoated, same basis weight and with starch applied). However, instead of being calendered by a hot-hard calender, the paperboard substrates of the Comparative Examples were calendered using a traditional calender under traditional calendering conditions. Compared to any of the Examples, the nip load applied to the Comparative Examples was much higher at 350 pli and the roller surface temperatures was much lower at 200 °F. After being calendered, the Comparative Examples were coated in the same manner and with the same basecoat and topcoat formulations at their corresponding Examples. The Comparative Examples were also final calendered in the same manner as their corresponding Examples.

Summary

[0082] The results are summarized in Tables 1 and 2 presented below. Table 1 presents the conditions under which the paperboard substrates were calendered prior to being coated and Table 2 presents the resulting data after having been coated.

TABLE 1

	Nip Load (pli)	Roller Surface Temp. (°F)	Qty of Nips
Example 1	140	480	1
Example 2	140	480	1
Example 3	140	480	1
Example 4	90	500	2
Example 5	90	500	2
Example 6	90	500	1
Comparative Example 1	350	200	4
Comparative Example 2	350	200	4
Comparative Example 3	350	200	4
Comparative Example 4	350	200	4
Comparative Example 5	350	200	4
Comparative Example 6	350	200	4

TABLE 2

	Actual Caliper (points)	Basis Weight (lbs/3,000ft ²)	Density (lbs/3,000ft ² /points)	PPS (microns)	Total Coat Weight (lbs/3,000ft ²)
Example 1	15.5	164	10.6	1.9	14
Example 2	15.1	161	10.6	1.9	12
Example 3	15.3	164	10.8	1.7	16
Example 4	10.5	119	11.3	1.3	12
Example 5	10.3	117	11.3	1.4	12
Example 6	10.6	120	11.3	1.3	15
Comparative Example 1	14.6	162	11.1	1.9	13
Comparative Example 2	14.8	164	11.1	1.6	15
Comparative Example 3	14.6	164	11.1	1.8	15
Comparative Example 4	10.3	120	11.7	1.4	11
Comparative Example 5	10.3	123	11.9	1.2	14
Comparative Example 6	10.3	121	11.8	1.3	12

[0083] As shown in Tables 1 and 2, a comparably smooth paperboard structure may be manufactured using the disclosed method (which utilizes the hot-hard calender) despite applying a significantly lower nip load. The nip loads applied in Examples 1–6 ranged from 60% to 74.3% lower than the nip loads applied in their corresponding Comparative Examples. Without being bound by any particular theory, it is believed that calendering paperboard substrates at significantly higher temperatures may compensate for lower nip loads in achieving a desired smoothness.

[0084] The density (e.g., basis weight divided by caliper) versus caliper data from Examples 1–6, together with density versus caliper data for prior art paperboard, is plotted in Fig. 4. Those skilled in the art will appreciate that significantly lower densities are achieved when paperboard is prepared in accordance with the present disclosure. Those skilled in the art will also appreciate that density is a function of caliper, so one should compare individual calipers separately when evaluating Parker Print Surf smoothness (PPS).

[0085] Fig. 5 illustrates density versus Parker Print Surf smoothness for a 10 point board (Examples 4–6) in accordance with the present disclosure, plotted against density versus Parker Print Surf smoothness of prior art 10 point board. Fig. 6 illustrates density versus Parker Print Surf smoothness of 14 point board (Examples 1–3), plotted against density versus Parker Print Surf smoothness of prior art 14 point board. Those skilled in the art will appreciate that the paperboard of the present disclosure presents significantly lower densities relative to the prior art, while maintaining smoothness (e.g., lower Parker Print Surf smoothness values).

[0086] The basis weight versus caliper data from Examples 1–6 is plotted in Fig. 7 and the basis weight versus caliper data for prior art paperboard is plotted in Fig. 8. All the data points from Examples 1–6 fall below curve Y_2 , which is a plot of $Y_2 = 3.71 + 13.14X - 0.1602X^2$, while all of the prior art data is found above curve Y_2 . Furthermore, five of the data points from the disclosed Examples fall below curve Y_3 , which is a plot of $Y_3 = 3.63 + 12.85X - 0.1566X^2$.

[0087] Similarly, basis weight versus caliper data of paperboard structures prepared in accordance with the present disclosure is plotted in Fig. 9 and the basis weight versus caliper data for prior art paperboard is plotted in Fig. 10. All of the data points from Examples 1–6 fall below curve Y_2' , which is a plot of $Y_2' = 35.55 + 8.173X - 0.01602X^2$, while all of the prior art data is found above curve Y_2' . Furthermore, three data points fall below curve Y_3' , which is a plot of $Y_3' = 34.83 + 8.010X - 0.01570X^2$.

[0088] While basis weight data is currently presented in Figs. 7–10 for caliper thickness of 10 and 14, those skilled in the art will appreciate that since the disclosed method and coatings were capable of achieving surprising low densities while simultaneously maintaining smoothness, it is to be expected that similar low densities and smoothness's may be achieved at other caliper thicknesses. In one or more examples, the paperboard structure may have a Parker Print Surf smoothness of at most 2.5 microns. In one or more examples, the paperboard structure may have a Parker Print Surf smoothness of 2.0 microns. In one or more examples, the paperboard structure may have a Parker Print Surf smoothness of 1.5 microns.

[0089] Accordingly, the method of the present disclosure provides desired smoothness (e.g., PPS 10S smoothness below 3 microns), while maintaining low board density (e.g., basis weight below the disclosed thresholds as a function of caliper thickness).

[0090] Although various aspects of the disclosed method for manufacturing a paperboard structure, and the paperboard structures manufactured by such methods, have been shown and described, modifications may occur to those skilled in the art upon reading the specification. The present patent application includes such modifications and is limited only by the scope of the claims.

What is claimed is:

1. A method for manufacturing a paperboard structure comprising:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment; and applying a topcoat to said basecoated paperboard substrate,

wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

2. The method of Claim 1 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 500 pli.

3. The method of Claim 1 or Claim 2 wherein said elevated temperature is at least 250 °F.

4. The method of any one of Claims 1 through 3 wherein said topcoat comprises a topcoat binder and a topcoat pigment.

5. A method for manufacturing a paperboard structure comprising:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment blend comprising ground calcium carbonate and hyperplaty clay; and

applying a topcoat to said basecoated paperboard substrate.

6. The method of Claim 5 wherein said passing said paperboard substrate through said hot-hard calender comprises passing an uncoated paperboard substrate through said hot-hard calender.

7. The method of Claim 5 or Claim 6 wherein said passing said paperboard substrate through said hot-hard calender comprises passing a solid bleached sulfate paperboard substrate through said hot-hard calender.

8. The method of any one of Claims 5 through 7 wherein said passing said paperboard substrate through said hot-hard calender comprises passing a paperboard substrate having a basis weight of at least 85 lbs/3000 ft² through said hot-hard calender.

9. The method of any one of Claims 5 through 8 wherein said passing said paperboard substrate through said hot-hard calender comprises passing a paperboard substrate having a basis weight of at least 100 lbs/3000 ft² through said hot-hard calender.

10. The method of any one of Claims 5 through 9 further comprising applying starch to said paperboard substrate prior to said passing said paperboard substrate through said hot-hard calender.

11. The method of any one of Claims 5 through 10 wherein said hot-hard calender further comprises a second nip defined by said thermo-roller and a second counter roller, and wherein said passing said paperboard substrate comprises passing said paperboard substrate through said nip and said second nip.

12. The method of any one of Claims 5 through 11 wherein at least one of said thermo-roller and said counter roller comprises a metallic material.

13. The method of any one of Claims 5 through 12 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 500 pli.

14. The method of any one of Claims 5 through 13 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 350 pli.

15. The method of any one of Claims 5 through 14 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 160 pli.

16. The method of any one of Claims 5 through 15 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 30 pli to about 140 pli.

17. The method of any one of Claims 5 through 16 wherein said elevated temperature is at least 250 °F.

18. The method of any one of Claims 5 through 17 wherein said elevated temperature is at least 300 °F.

19. The method of any one of Claims 5 through 18 wherein said elevated temperature is at least 500 °F.

20. The method of any one of Claims 5 through 19 wherein said basecoat is applied to only one side of said calendered paperboard substrate.

21. The method of Claim 20 wherein said basecoat is positioned between said topcoat and said calendered paperboard substrate.

22. The method of any one of Claims 5 through 21 further comprising applying an intermediate coating layer to said basecoated paperboard substrate prior to said applying said topcoat.

23. The method of any one of Claims 5 through 22 wherein said basecoat binder comprises latex.

24. The method of any one of Claims 5 through 23 wherein said basecoat binder comprises styrene-acrylic latex.

25. The method of any one of Claims 5 through 24 wherein said hyperplaty clay has an average aspect ratio of at least about 40:1.

26. The method of any one of Claims 5 through 25 wherein said hyperplaty clay has an average aspect ratio of at least about 70:1.

27. The method of any one of Claims 5 through 26 wherein said hyperplaty clay has an average aspect ratio of at least about 90:1.

28. The method of any one of Claims 5 through 27 wherein at most about 60 percent of said ground calcium carbonate of said basecoat pigment blend has a particle size smaller than 2 microns.

29. The method of any one of Claims 5 through 28 wherein at most about 45 percent of said ground calcium carbonate of said basecoat pigment blend has a particle size smaller than 2 microns.

30. The method of any one of Claims 5 through 29 wherein at most about 35 percent of said ground calcium carbonate of said basecoat pigment blend has a particle size smaller than 2 microns.

31. The method of any one of Claims 5 through 30 wherein said ground calcium carbonate comprises at least about 10 percent by weight of said basecoat pigment blend and at most about 60 percent by weight of said basecoat pigment blend.

32. The method of any one of Claims 5 through 31 wherein said ground calcium carbonate comprises at least about 40 percent by weight of said basecoat pigment blend and at most about 60 percent by weight of said basecoat pigment blend.

33. The method of any one of Claims 5 through 32 wherein said basecoat pigment blend comprises about 50 percent by weight ground calcium carbonate and about 50 percent by weight hyperplaty clay.

34. The method of any one of Claims 5 through 33 wherein said basecoat pigment blend consists essentially of said hyperplaty clay and ground calcium carbonate.

35. The method of any one of Claims 5 through 34 wherein said basecoat further comprises a dispersant.

36. The method of any one of Claims 5 through 35 wherein said topcoat comprises a topcoat binder and a topcoat pigment blend.

37. The method of Claim 36 wherein said topcoat binder comprises latex.

38. The method of Claim 36 or Claim 37 wherein said topcoat binder comprises styrene-acrylic latex.

39. The method of any one of Claims 36 through 38 wherein said topcoat pigment blend comprises calcium carbonate and clay.

40. The method of Claim 39 wherein said calcium carbonate comprises at least about 50 percent by weight of said topcoat pigment blend and at most about 70 percent by weight of said topcoat pigment blend.

41. The method of Claim 39 or Claim 40 wherein said topcoat pigment blend comprises about 60 percent by weight calcium carbonate and about 40 percent by weight clay.

42. The method of any one of Claims 5 through 41 wherein said topcoat comprises at least one of a dispersant, a lubricant and polyvinyl alcohol.

43. The method of any one of Claims 5 through 42 wherein said applying said basecoat and said applying said topcoat yields a coating structure on said paperboard substrate, said coating structure having a total coat weight, on a dry basis, ranging from about 8 lbs/3000 ft² to about 18 lbs/3000 ft².

44. The method of any one of Claims 5 through 43 wherein said applying said basecoat and said applying said topcoat yields a coating structure on said paperboard substrate, said coating structure having a total coat weight, on a dry basis, ranging from about 12 lbs/3000 ft² to about 16 lbs/3000 ft².

45. The method of any one of Claims 5 through 44 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y₂ pounds per 3000 ft², wherein Y₂ is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

46. The method of Claim 45 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

47. The method of Claim 45 or Claim 46 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.0 microns.

48. The method of any one of Claims 45 through 47 wherein said Parker Print Surf (PPS 10S) smoothness is at most 1.5 microns.

49. The method of any one of Claims 5 through 48 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2' pounds per 3000 ft², wherein Y_2' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2' = 35.55 + 8.173X - 0.01602X^2.$$

50. The method of Claim 49 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

51. The method of Claim 49 or Claim 50 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.0 microns.

52. The method of any one of Claims 49 through 51 wherein said Parker Print Surf (PPS 10S) smoothness is at most 1.5 microns.

53. The method of any one of Claims 5 through 52 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3 pounds per 3000 ft², wherein Y_3 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3 = 3.63 + 12.85X - 0.1566X^2.$$

54. The method of Claim 53 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

55. The method of Claim 53 or Claim 54 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.0 microns.

56. The method of any one of Claims 53 through 55 wherein said Parker Print Surf (PPS 10S) smoothness is at most 1.5 microns.

57. The method of any one of Claims 5 through 56 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3' pounds per 3000 ft², wherein Y_3' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3' = 34.83 + 8.010X - 0.01570X^2.$$

58. The method of Claim 57 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

59. The method of Claim 57 or Claim 58 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.0 microns.

60. The method of any one of Claims 57 through 59 wherein said Parker Print Surf (PPS 10S) smoothness is at most 1.5 microns.

61. The method of any one of Claims 5 through 60 further comprising drying said basecoated paperboard substrate.

62. The paperboard structure manufactured by the method of Claim 5.

63. The paperboard structure of Claim 62 having a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3

microns, said basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

64. The paperboard structure of Claim 62 or Claim 63 having a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2' pounds per 3000 ft², wherein Y_2' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2' = 35.55 + 8.173X - 0.01602X^2.$$

65. The paperboard structure of any one of Claims 62 through 64 having a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3 pounds per 3000 ft², wherein Y_3 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3 = 3.63 + 12.85X - 0.1566X^2.$$

66. The paperboard structure of any one of Claim 62 through 65 having a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3' pounds per 3000 ft², wherein Y_3' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3' = 34.83 + 8.010X - 0.01570X^2.$$

ABSTRACT

A method for manufacturing a paperboard structure includes passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, the hot-hard calender including a nip defined by a thermo-roller and a counter roller, wherein a contact surface of the thermo-roller is heated to an elevated temperature. The method then includes applying a basecoat to the calendered paperboard substrate to yield a basecoated paperboard substrate, the basecoat includes a basecoat binder and a basecoat pigment blend. The method further includes applying a topcoat to the basecoated paperboard substrate.

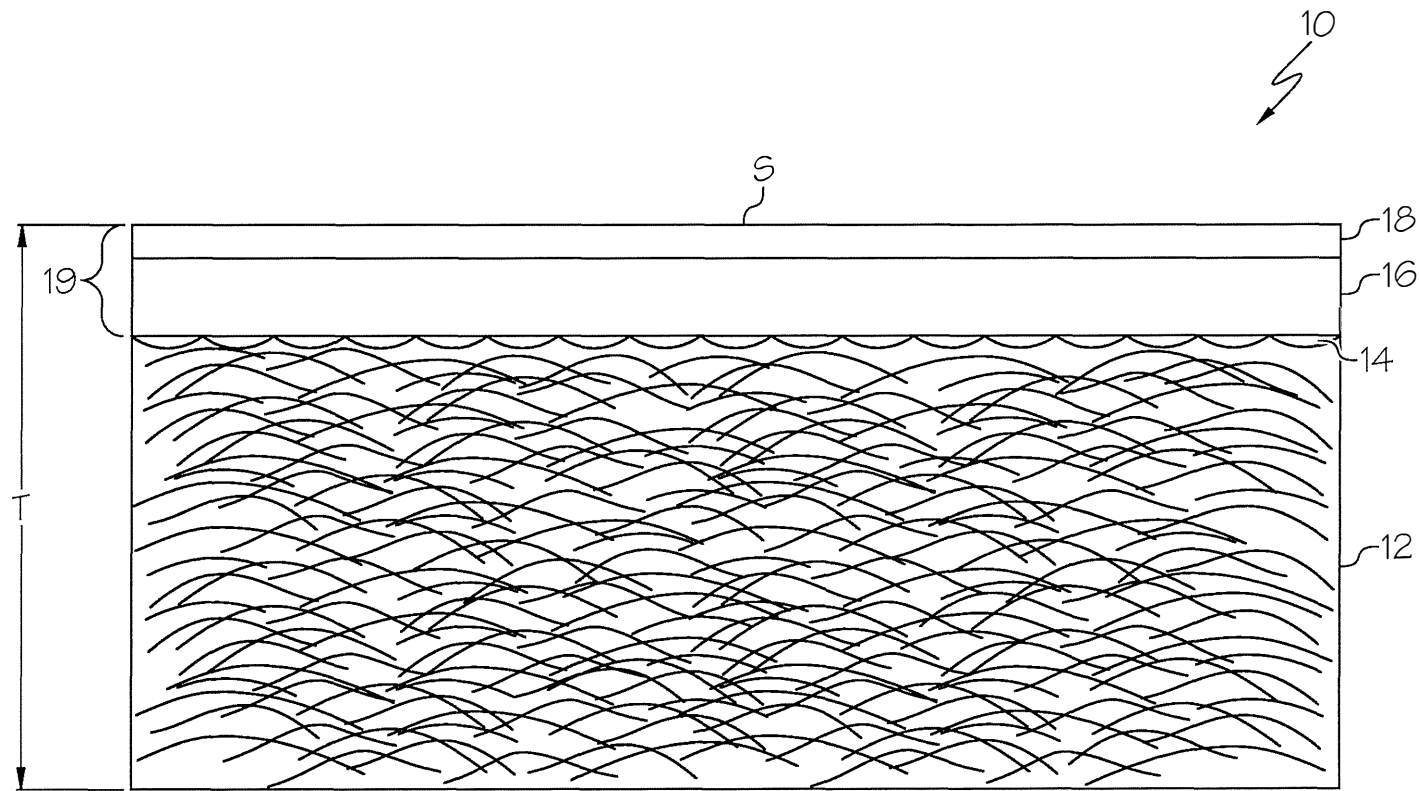


FIG. 1

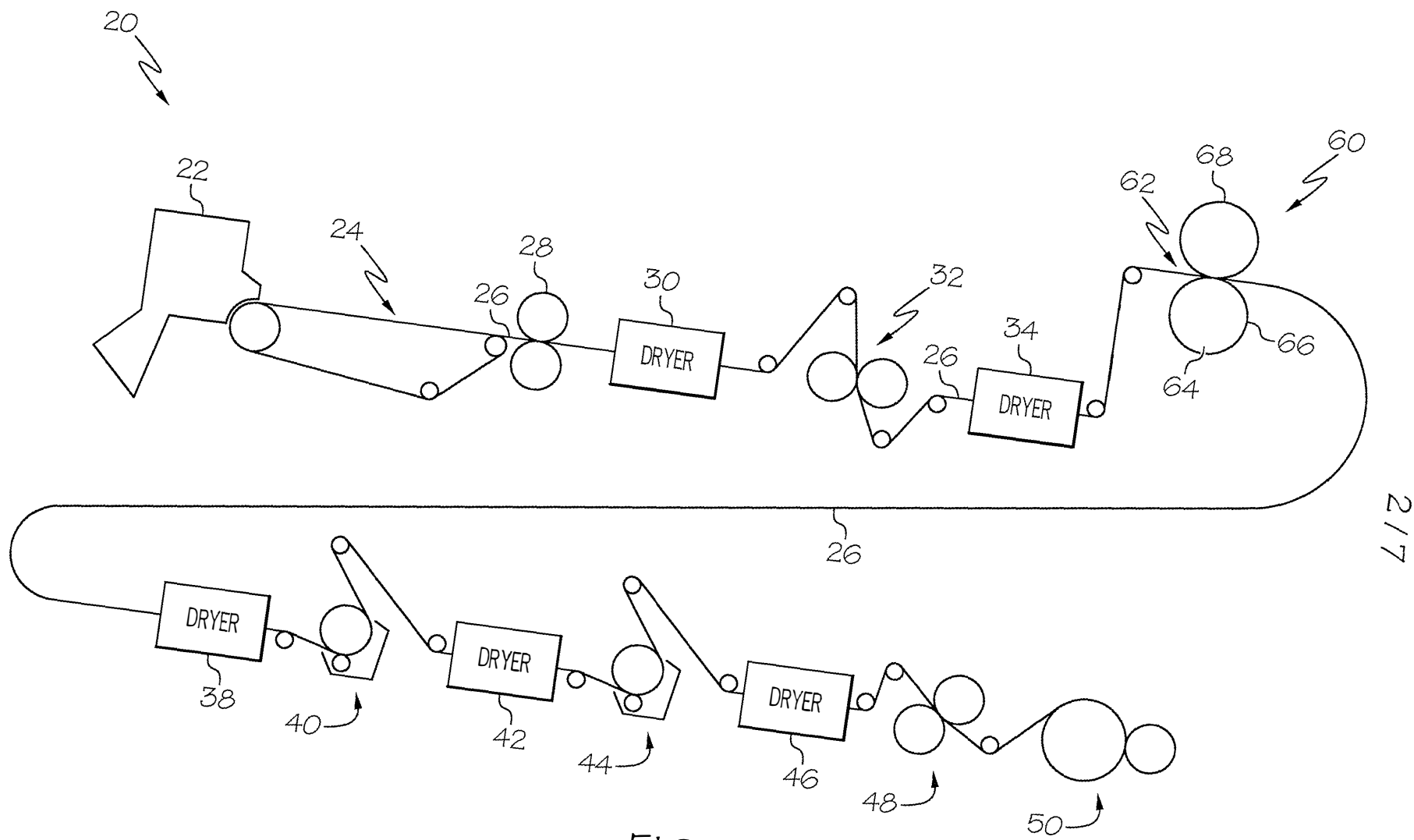
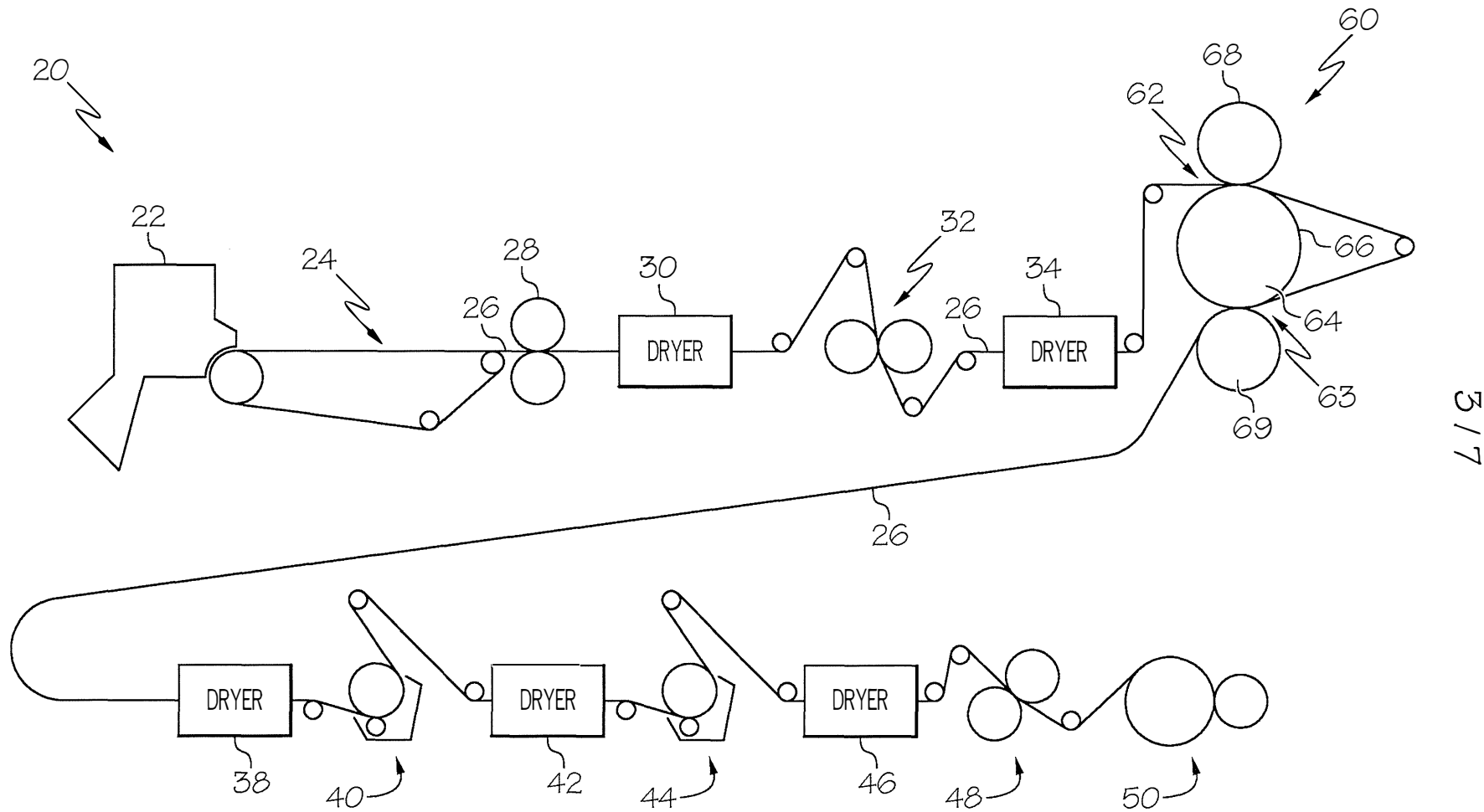


FIG. 2



3 / 7

FIG. 3

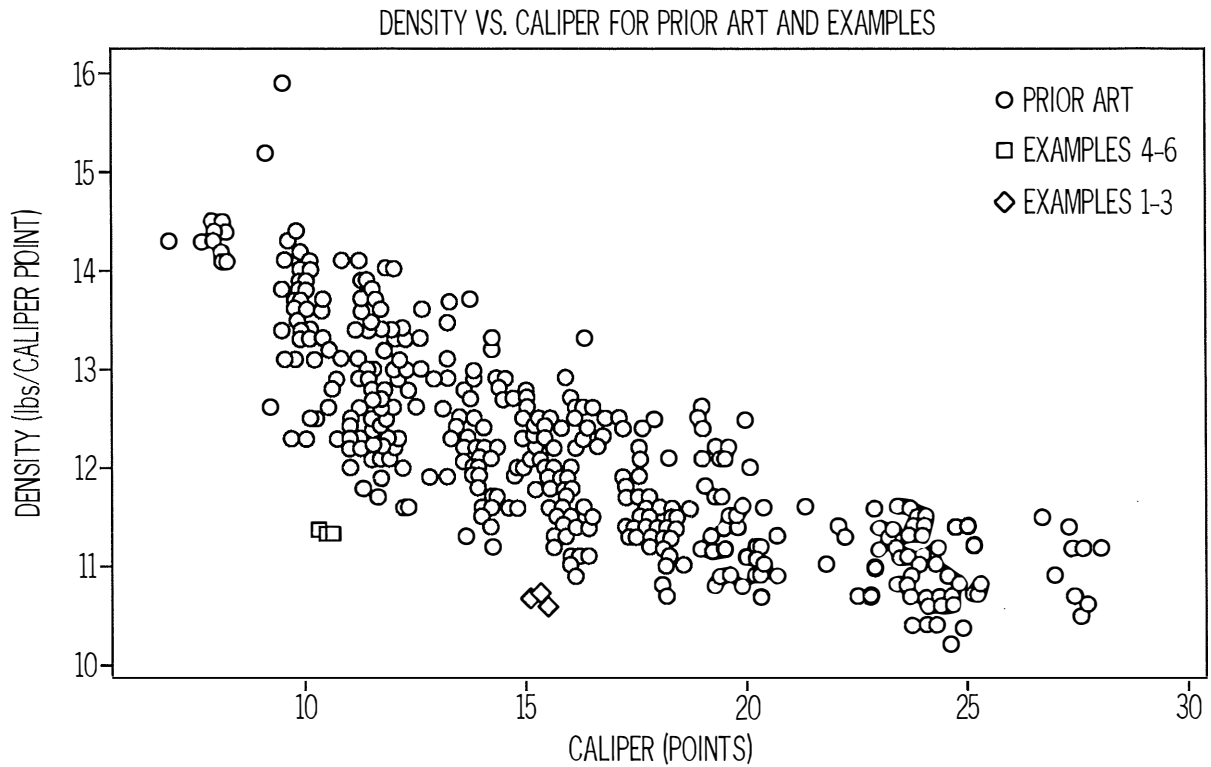


FIG. 4

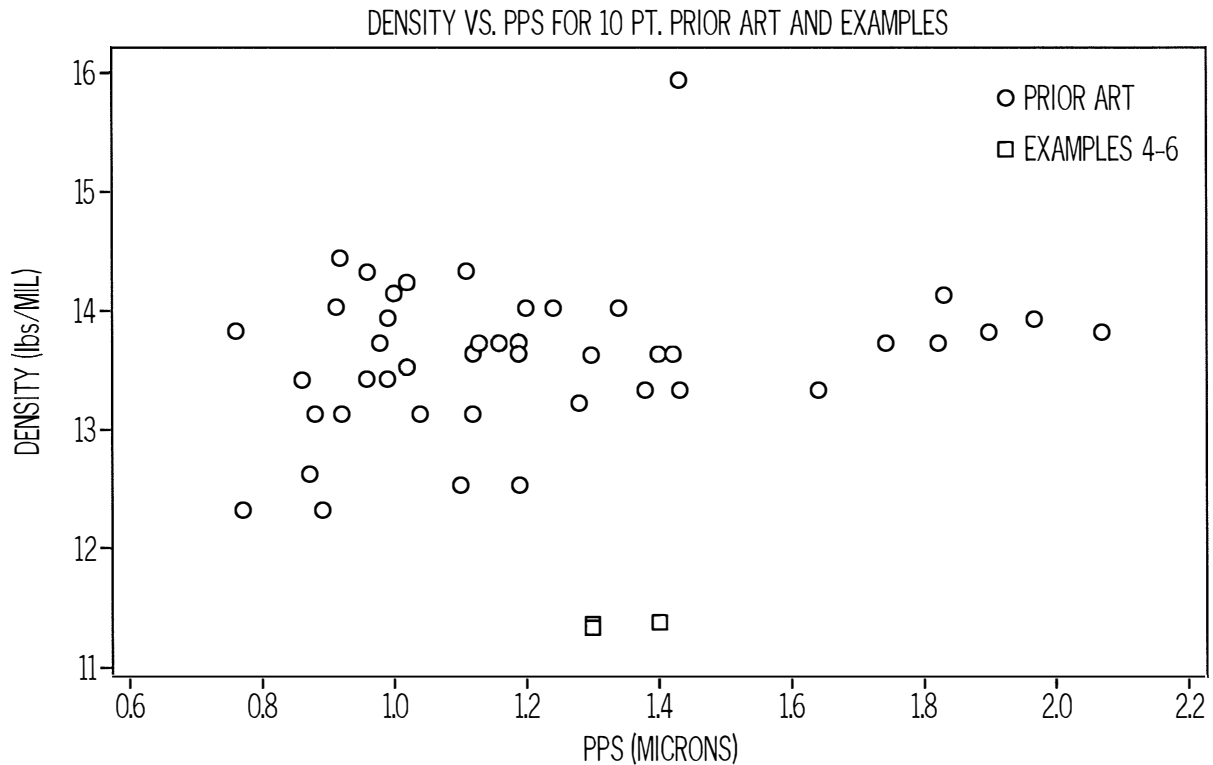


FIG. 5

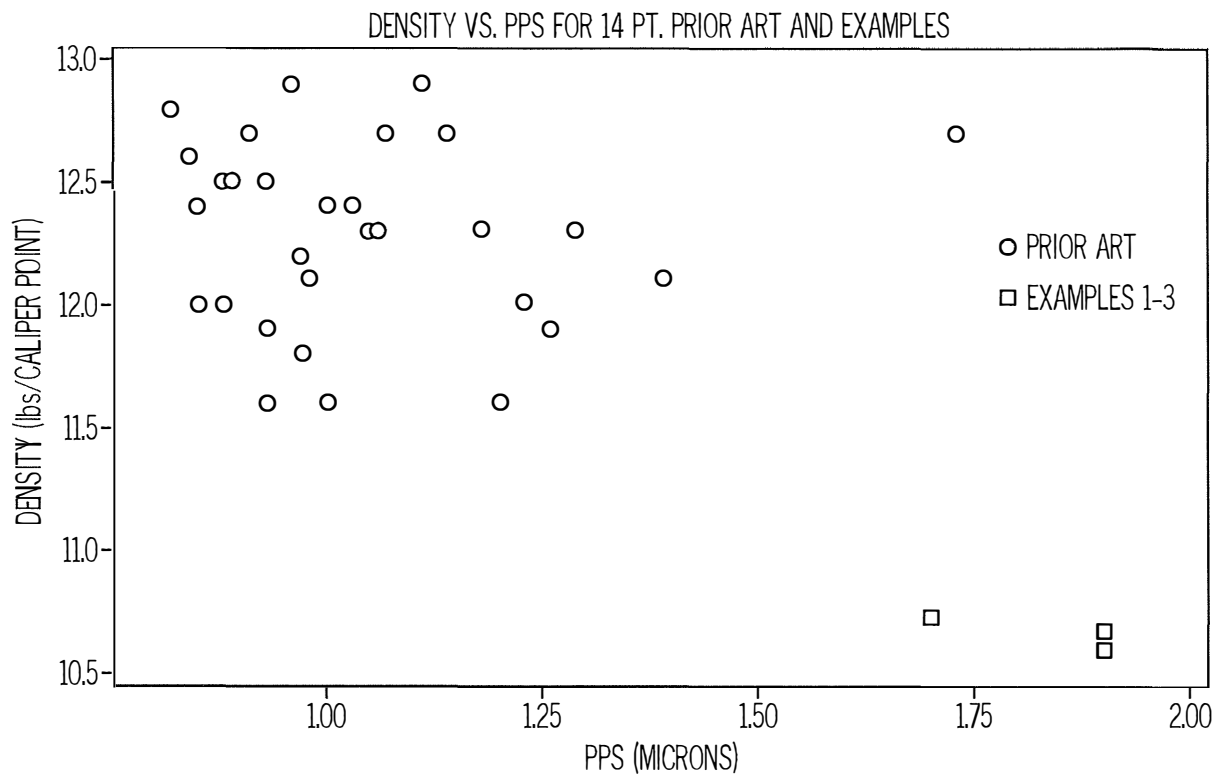


FIG. 6

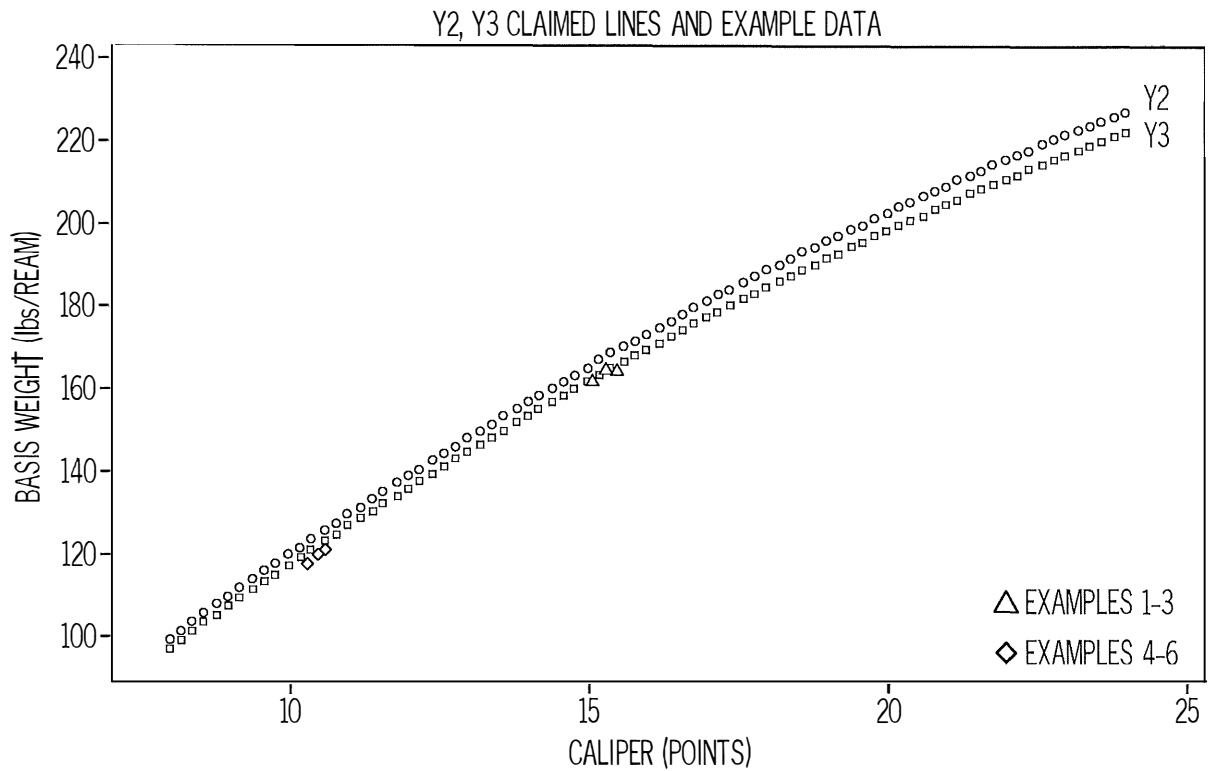


FIG. 7

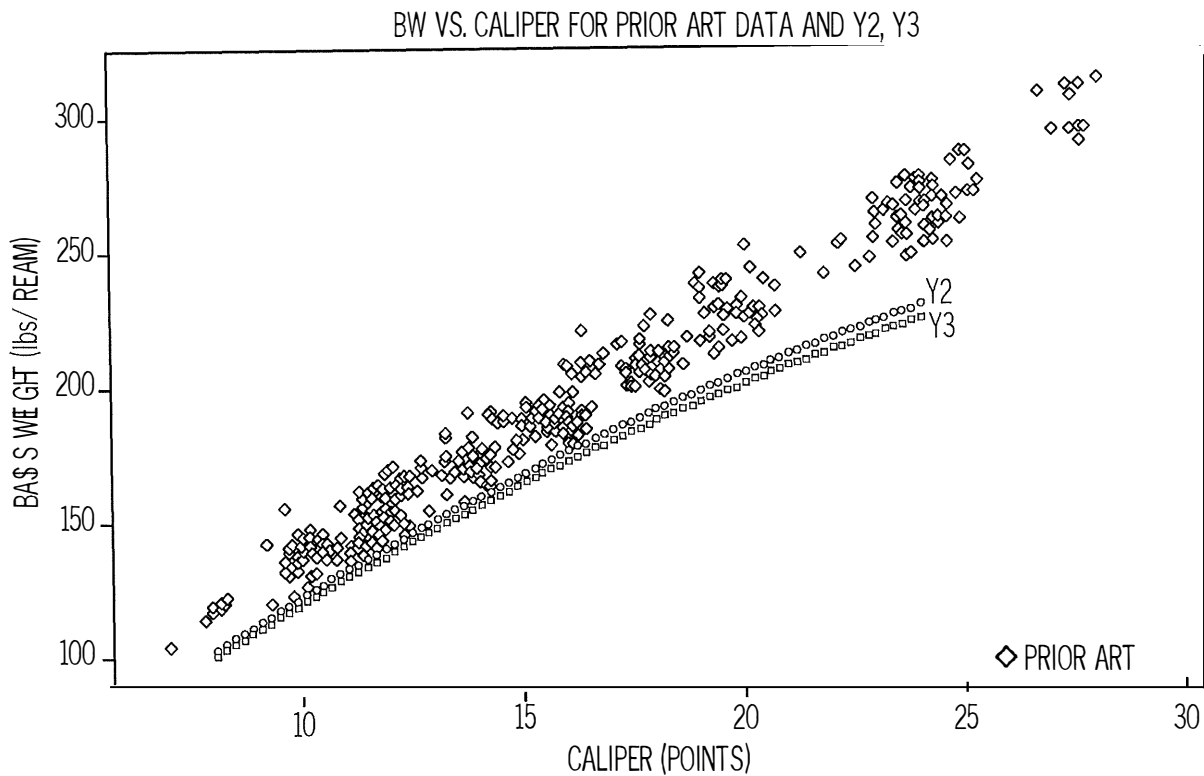


FIG. 8

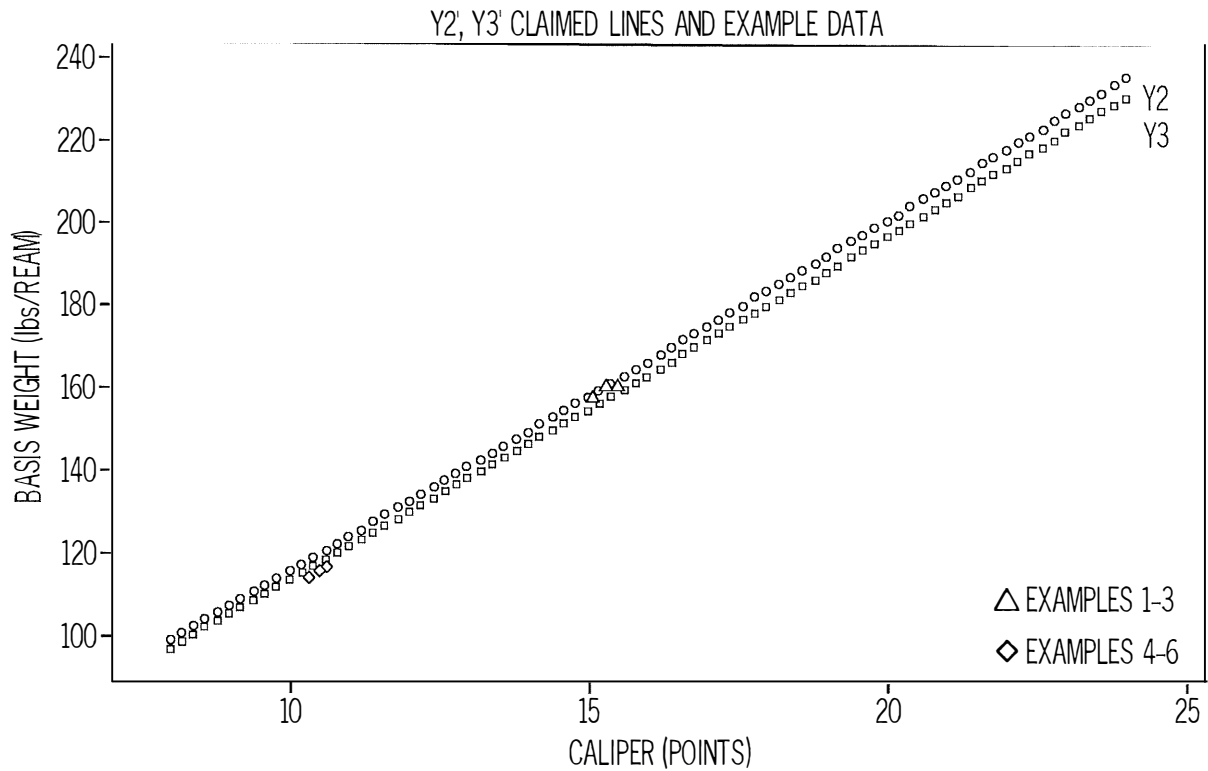


FIG. 9

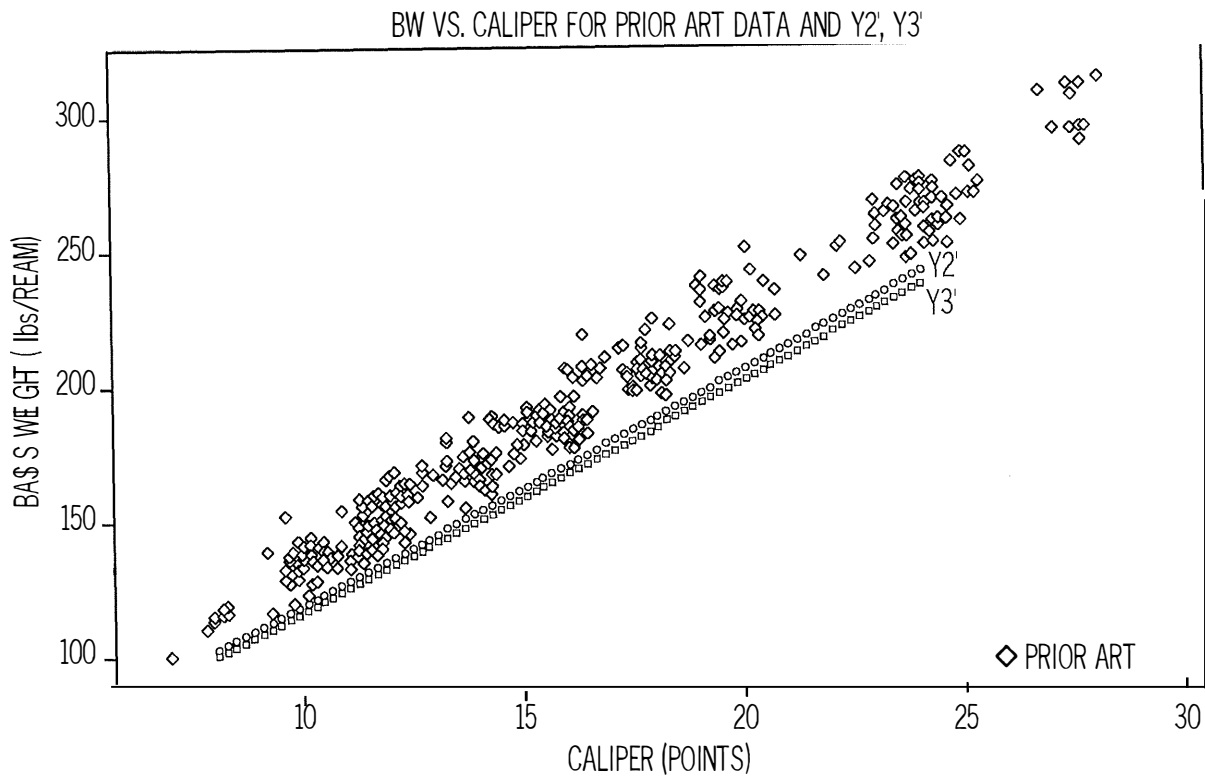


FIG. 10

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)**Title of
Invention****SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR
MANUFACTURING THE SAME**

As the below named inventor, I hereby declare that:

This declaration
is directed to:

The attached application, or



United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

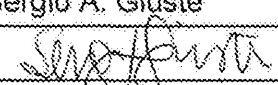
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LEGAL NAME OF INVENTORInventor: Sergio A. Giuste

Date (Optional): _____

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.53. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1460, Alexandria, VA 22313-1460.**

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APPLICATION DATA SHEET (37 CFR 1.76)**

Title of
Invention

**SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR
MANUFACTURING THE SAME**

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____

filed on: _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001
by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Terrell J. Green

Date (Optional):

5/1/2020

Signature:

Terrell J. Green

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 118 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME
---------------------------	--

As the below named inventor, I hereby declare that:

This declaration is directed to: ☒ The attached application, or
☐ United States application or PCT international application number _____
filed on _____

The above identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Steven Parker Date (Optional): 3/21/2020
Signature: *Steven Parker*

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

The collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the filing of an application with the USPTO to process an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, reviewing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments or the amount of time you require to complete the form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

Applicant : WestRock Company
Inventors : Giuste et al.
Serial No. : To be assigned
Filed : Herewith
Title : SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND
METHODS FOR MANUFACTURING THE SAME
Conf. No. : To be assigned
Docket: : 23509-USORD1
Examiner : To be assigned
Art Unit : To be assigned

Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

INFORMATION DISCLOSURE STATEMENT

Pursuant to 37 C.F.R. § 1.56, the Examiner's attention is directed to the references listed on the attached Information Disclosure Citation Sheet(s). Copies of all foreign references and non-patent literature, if any, are provided herewith.

It is to be understood that the present submission of art is in no way intended to be a waiver of any arguments or defenses available to the applicant under the rules of the United States Patent and Trademark Office and the statutes and regulations of the United States.

This paper is being submitted on the filing date and, therefore, no fee is required.

Respectfully submitted,

/Neil G. Cohen/

May 7, 2020

Neil G. Cohen
Reg. No. 35,100

WESTROCK COMPANY
Attn: IP Law Group – Patents
501 South 5th Street, 3rd Floor
Richmond, Virginia 23219-0501

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		4,749,445	06/07/1988	Vreeland			
		4,823,688	04/25/1989	Wedel et al.			
		4,888,983	12/26/1989	Dunfield et al.			
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Examiner		Document No.	Date	Name	Class	Sub	
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		2004/0065423	04/08/2004	Swerin et al.			
		2004/0229063	11/18/2004	Concannon et al.			

		2005/0039872	02/24/2005	Urscheler et al.			
		2006/0009566	01/12/2006	Jones et al.			
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FOREIGN PATENT DOCUMENT

Trans

Examiner		Document No.	Date	Country	Class	Sub	Y	N
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(Including Author, Title, Date, Pertinent Pages, Etc.)

	Steffner et al., "Influence of the calendering conditions on the structure and the properties of woodfree paper - A comparison between soft nip calendering and hard nip calendering," <i>Nordic Pulp & Paper Research Journal</i> , vol. 13, no. 1 (2018).
	Rättö, "Description and analysis of paper deformation in a calender nip – effects of high roll temperatures and thickness variations," <i>Nordic Pulp & Paper Research Journal</i> , vol. 17, no. 2 (2002).
	Endres et al., "Influence of calendering conditions on paper surface characteristics : a comparison between hard-nip, soft-nip, and extended soft-nip calendering," <i>TAPPI Journal</i> , vol. 4, no. 9, pp. 9-14 (2005).

EXAMINER:

DATE CONSIDERED:



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BIB DATA SHEET

CONFIRMATION NO. 1626

SERIAL NUMBER 16/869,156	FILING or 371(c) DATE 05/07/2020 RULE	CLASS 162	GROUP ART UNIT 1748	ATTORNEY DOCKET NO. 23509-USORD1		
APPLICANTS WestRock MWV, LLC, Atlanta, GA INVENTORS Sergio A. Giuste, Midlothian, VA; Steven Parker, Raleigh, NC; Terrell J. Green, Raleigh, NC; ** CONTINUING DATA ***** This appln claims benefit of 62/846,278 05/10/2019 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 05/13/2020						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/MARK HALPERN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY VA	SHEETS DRAWINGS 7	TOTAL CLAIMS 25	INDEPENDENT CLAIMS 2
ADDRESS WESTROCK COMPANY ATTN: IP LAW GROUP - PATENTS 501 South 5th Street, 3rd Floor Richmond, VA 23219-0501 UNITED STATES						
TITLE SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME						
FILING FEE RECEIVED 2220	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit			



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
16/869,156	05/07/2020	1782	2220	23509-USORD1	25	2

CONFIRMATION NO. 1626

FILING RECEIPT



CC000000116984473

66061

WESTROCK COMPANY
ATTN: IP LAW GROUP - PATENTS
501 South 5th Street, 3rd Floor
Richmond, VA 23219-0501

Date Mailed: 05/14/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Sergio A. Giuste, Midlothian, VA;
Steven Parker, Raleigh, NC;
Terrell J. Green, Raleigh, NC;

Applicant(s)

WestRock MWV, LLC, Atlanta, GA

Power of Attorney: The patent practitioners associated with Customer Number 66061.

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/846,278 05/10/2019

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/13/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/869,156**

Projected Publication Date: 11/12/2020

Non-Publication Request: No

Early Publication Request: No

Title

SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR
MANUFACTURING THE SAME

Preliminary Class

428

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1

CONFIRMATION NO. 1626

PUBLICATION NOTICE



OC000000121294794

66061
WESTROCK COMPANY
ATTN: IP LAW GROUP - PATENTS
501 South 5th Street, 3rd Floor
Richmond, VA 23219-0501

Title:SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME

Publication No.US-2020-0354894-A1

Publication Date:11/12/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626
66061	7590	06/04/2021	EXAMINER	
WESTROCK COMPANY			HALPERN, MARK	
ATTN: IP LAW GROUP - PATENTS				
501 South 5th Street, 3rd Floor				
Richmond, VA 23219-0501				
			ART UNIT	PAPER NUMBER
			1748	
			NOTIFICATION DATE	DELIVERY MODE
			06/04/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketadministrator@westrock.com

Office Action Summary	Application No. 16/869,156	Applicant(s) Giuste et al.	
	Examiner MARK HALPERN	Art Unit 1748	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-3,5,10-13,17,20,22-23,25,28,31,36-37,39,43,45-46,49,53,57 and 62 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☐ Claim(s) ____ is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☒ Claim(s) 1-3,5,10-13,17,20,22-23,25,28,31,36-37,39,43,45-46,49,53,57 and 62 are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 4) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

This application contains claims directed to the following patentably distinct species

- a) a method for manufacturing a paperboard structure recited in claim 1 (including claims 2-3);
- b) a method for manufacturing a paperboard structure and the paperboard structure recited in claim 5 (including claims 10-13, 17, 20, 22-23, 25, 28, 31, 36-37, 39, 43, 45-46, 49, 53, 57, 62).

The species are independent or distinct because the methods manufacture a paperboard structure of different basis weight, caliper thickness and smoothness.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species, or a single grouping of patentably indistinct species, for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable.

There is a search and/or examination burden for the patentably distinct species as set forth above because at least the following reason(s) apply: Claim 1 includes a mathematical formula for the calculation of paperboard structure basis weight as a function of caliper thickness.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species or grouping of patentably indistinct species**, including any

claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species or grouping of patentably indistinct species.

Should applicant traverse on the ground that the species, or groupings of patentably indistinct species from which election is required, are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing them to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be corrected in compliance with 37 CFR 1.48(a) if one or more of the currently named inventors is no longer an inventor of at least one claim

remaining in the application. A request to correct inventorship under 37 CFR 1.48(a) must be accompanied by an application data sheet in accordance with 37 CFR 1.76 that identifies each inventor by his or her legal name and by the processing fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARK HALPERN whose telephone number is (571)272-1190.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abbas Rashid can be reached on 571-270-7457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

/MARK HALPERN/
Primary Examiner, Art Unit 1748

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No. : 16/869,156
First Named Inventor : Sergio A. GIUSTE
Filed : May 7, 2020
For: : SMOOTH AND LOW DENSITY PAPERBOARD
STRUCTURES AND METHODS FOR
MANUFACTURING THE SAME
Art Unit : 1748
Examiner : HALPERN, MARK
Docket No. : 23509-USORD1
Confirmation No. : 1626

Honorable Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

RESPONSE TO RESTRICTION REQUIREMENT

In response to the Restriction Requirement of June 4, 2021, please reconsider the above-identified application as follows:

Remarks begin on page 2 of this paper.

REMARKS:

Restriction Requirement

With the Restriction Requirement of June 4, 2021, the Office Action identifies two groups, Group I: Claims 1-3 (a method for manufacturing a paperboard structure) and Group II: Claim 5, including Claims 10-13, 17, 20, 22-23, 25, 28, 31, 36-37, 39, 43, 45-46, 49, 53, 57, 62 (a method for manufacturing a paperboard structure and the paperboard structure). Applicant elects Group I (claims 1-3), **without traverse**.

Reservation of Rights

Applicant reserves the right to petition from the requirement under 37 CFR 1.144. Applicant also reserves the right to rejoinder of the process claims, amended to include the features of the product claims, upon an indication of allowance for the product claims (see MPEP 821.04).

Conclusion:

Applicant believes that the present application is in condition for allowance. Favorable reconsideration of the application is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

If any fees are due in connection with the filing of this response, including any excess claim fees, such fees may be charged to Deposit Account No. 13-2500. If a fee is required for an extension of time under CFR § 1.136 that is not accounted for above, such an extension is hereby requested and the fee may also be charged to the above Deposit Account.

Case Docket No. 23059-USORD1
U.S. Serial No. 16/869,156
Page 3 of 3

Respectfully submitted,

/Neil G. Cohen/

/Neil G. Cohen/

Registration No.: 35100

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Customer No. : 66061



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626
66061	7590	08/20/2021		
WESTROCK COMPANY			EXAMINER	
ATTN: IP LAW GROUP - PATENTS			HALPERN, MARK	
501 South 5th Street, 3rd Floor				
Richmond, VA 23219-0501			ART UNIT	PAPER NUMBER
			1748	
			NOTIFICATION DATE	DELIVERY MODE
			08/20/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketadministrator@westrock.com

Office Action Summary	Application No. 16/869,156	Applicant(s) Giuste et al.	
	Examiner MARK HALPERN	Art Unit 1748	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 8/4/2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-3,5,10-13,17,20,22-23,25,28,31,35-37,39,43,45-46,49,53,57 and 62 is/are pending in the application.
- 5a) Of the above claim(s) 5,10-13,17,20,22-23,25,28,31,36-37,39,43,45-46,49,53,57 and 62 is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-3 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 5/7/2020 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some** c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.
- 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____.
- 4) ☐ Other: ____.

DETAILED ACTION

1) Applicants' election without traverse of invention I, drawn on claims 1-3, in the reply filed on 8/4/2021, is acknowledged.

Claims 5, 10-13, 17, 20, 22-23, 25, 28, 31, 36-37, 39, 43, 45-46, 49, 53, 57, 62, are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Objections

2) Claims 5, 10-13, 17, 20, 22-23, 25, 28, 31, 36-37, 39, 43, 45-46, 49, 53, 57, 62, status identifiers are to recite - (Withdrawn) - .

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

3) Claim 1 is rejected under 35 U.S.C. 102(a)(2) as anticipated by or, in the alternative, under 35 U.S.C. 103 as obvious over **Fugitt et al. (US 2009/0236062)**.

Claim 1: Fugitt discloses a method of manufacturing a paperboard structure. See Figures 11-12. Web 26, formed from a slurry onto a mesh of a Fourdrinier machine 24, undergoes drying in dryers 30, 34, followed by calendering in dry stack calender 36 to form paperboard 37. At least some of the rolls in nips with counter rolls in the calender 36 are steam heated to an elevated temperature [0026]. Example 3 (Pages 3-4) discloses a basecoat being applied to the paperboard. The basecoat has a coat weight of about 6.0 lbs/3000 ft². The basecoat includes binder and pigment [0054]. A top coat is applied to over the basecoat to improve the surface smoothness. The topcoat has a coat weigh of about 5.4 lbs/3000 ft² [0056]. The resulting coated paperboard structure has a total basis weight of about 130.0 lbs/3000 ft², a caliper of about 0.012 inches (12 points) and a Parker Print Surf (PPS 10S) smoothness of about 1.5 microns [0057] (Examples 1-3, claims 1-20, Figures 11-12). The total basis weight of about 130.0 lbs/3000 ft² reads on formula of Y₂ basis weight. Fugitt discloses the invention, or in the least the differences, if any, are small and would have been obvious to one skilled in the art at the time the invention was filed.

4) Claims 2-3, are rejected under 35 U.S.C. 103 as being unpatentable over **Fugitt et al.**

Claim 2: the invention is disclosed per claim 1, above. The calender nip load is not disclosed, however, it would have been obvious to one skilled in the art at the time

the invention was filed, that the calender nip load be optimized in order to obtain desired smoothness of the paperboard product.

Claim 3: the invention is disclosed per claim 1, above. The thermo-roller elevated temperature is not disclosed, however, it would have been obvious to one skilled in the art at the time the invention was filed, that the thermo-roller elevated temperature be optimized in order to obtain desired smoothness of the paperboard product.

Conclusion

5) Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARK HALPERN whose telephone no. is (571)272-1190.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abbas Rashid can be reached on 571-270-7457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

/MARK HALPERN/
Primary Examiner, Art Unit 1748

Notice of References Cited	Application/Control No. 16/869,156		Applicant(s)/Patent Under Reexamination Giuste et al.	
	Examiner MARK HALPERN		Art Unit 1748	Page 1 of 1

U.S. PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20090236062-A1	09-2009	Fugitt; Gary P.	D21H11/04	162/109
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS						
*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS		
*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

INFORMATION DISCLOSURE CITATION SHEET**U.S. PATENTS**

Examiner		Document No.	Date	Name	Class	Sub	
		4,749,445	06/07/1988	Vreeland			
		4,823,688	04/25/1989	Wedel et al.			
		4,888,983	12/26/1989	Dunfield et al.			
		5,245,920	09/21/1993	Hess			
		5,298,335	03/29/1994	Reed et al.			
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		5,378,497	01/03/1995	Johnson et al.			
		5,631,080	05/20/1997	Fugitt			
		5,690,527	11/25/1997	Rutledge et a.			
		6,200,424	03/13/201	Saari et al.			
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		6,582,553	06/24/2003	Jewell et al.			
		6,777,075	08/17/2004	Concannon et al.			
		6,802,938	10/12/2004	Mohan et al.			
		6,866,906	03/15/2005	Williams et al.			
		6,698,342	03/02/2004	Heikkinen et al.			
		7,208,039	04/24/2007	Jones et al.			
		7,306,668	12/11/2007	Pring et al.			
		7,425,246	09/16/2008	Urscheler			
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		7,749,583	07/06/2010	Fugitt et al.			
		8,142,887	03/27/2012	Fugitt et al.			
		9,567,709	02/14/2017	Fugitt et al.			

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		2003/0085012	05/08/2003	Jones et al.			
		2004/0065423	04/08/2004	Swerin et al.			
		2004/0229063	11/18/2004	Concannon et al.			

		2005/0039872	02/24/2005	Urscheler et al.			
		2006/0009566	01/12/2006	Jones et al.			
		2006/0124033	06/15/2006	Pruett et al.			
		2007/0169902	07/26/2007	Brelsford et al.			
		2008/0060774	03/13/2008	Zuraw et al.			
		2008/0311416	12/18/2008	Kelly et al.			
		2015/0136349	05/21/2015	Pietikainen et al.			

FOREIGN PATENT DOCUMENT

Trans

Examiner		Document No.	Date	Country	Class	Sub	Y	N
		EP 1470289	08/07/2003	EP				
		EP 0448332	09/25/1991	EP				
		JP 2009001953	01/08/2009	JP				
		JP 01-118692	05/11/1989	JP				
		JP 2009013513	01/22/2009	JP				
		WO 98/51860	11/19/1998	WO				
		WO 01/14014	01/03/2001	WO				
		WO 2006/033952	03/30/2006	WO				
		WO 2009/091406	07/23/2009	WO				

OTHER DOCUMENTS

(Including Author, Title, Date, Pertinent Pages, Etc.)

	Steffner et al., "Influence of the calendering conditions on the structure and the properties of woodfree paper - A comparison between soft nip calendering and hard nip calendering," <i>Nordic Pulp & Paper Research Journal</i> , vol. 13, no. 1 (2018).
	Rättö, "Description and analysis of paper deformation in a calender nip – effects of high roll temperatures and thickness variations," <i>Nordic Pulp & Paper Research Journal</i> , vol. 17, no. 2 (2002).
	Endres et al., "Influence of calendering conditions on paper surface characteristics : a comparison between hard-nip, soft-nip, and extended soft-nip calendering," <i>TAPPI Journal</i> , vol. 4, no. 9, pp. 9-14 (2005).

EXAMINER: /MARK HALPERN/

DATE CONSIDERED: 08/11/2021

Search Notes 	Application/Control No. 16/869,156	Applicant(s)/Patent Under Reexamination Giuste et al.
	Examiner MARK HALPERN	Art Unit 1748

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner
D21H 19/40, 19/58, 19/822, 19/385, 19/54, 19/82, 25/14, 23/30	08/16/2021	MH
D21G 1/0246, 1/0253	08/16/2021	MH

US Classification - Searched*			
Class	Subclass	Date	Examiner
162	136	08/16/2021	MH

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST Search (history attached)	08/16/2021	MH
Inventor Search	08/16/2021	MH
International Search Review	08/16/2021	MH

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8	giuste.in. near2 sergio	US-PGPUB; USPAT	OR	ON	2021/08/16 12:20
L2	1	giuste.in. near2 sergio and method and paperboard and basecoat and topcoat and basis near weight and smoothness and caliper	US-PGPUB; USPAT	OR	ON	2021/08/16 12:21
L3	7	parker.in. near steven and method and paperboard and basecoat and topcoat and basis near weight and smoothness and caliper	US-PGPUB; USPAT	OR	ON	2021/08/16 12:22
L4	1	green.in. near2 terrell and method and paperboard and basecoat and topcoat and basis near weight and smoothness and caliper	US-PGPUB; USPAT	OR	ON	2021/08/16 12:22
L5	36	method and paperboard and basecoat and topcoat and basis near weight and smoothness and caliper	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/08/16 12:41
L6	435	162/136	US-PGPUB; USPAT	OR	ON	2021/08/16 12:42
L7	170	6 AND ((D21H19/36 OR D21H19/42 OR D21H19/38 OR D21H19/84 OR D21H25/005 OR D21H19/40 OR D21H19/82 OR D21H23/48 OR D21H23/50 OR D21H23/56 OR D21H23/72 OR D21H25/06 OR D21H19/385 OR D21H19/44 OR D21H21/24 OR D21H23/22 OR D21H23/34 OR D21H23/70 OR D21H19/18 OR D21H19/20 OR D21H19/72 OR D21H23/38 OR D21H25/04 OR D21H19/10 OR D21H19/22 OR D21H19/28 OR D21H19/34 OR D21H19/64 OR D21H19/66 OR D21H19/80 OR D21H19/822 OR D21H23/24 OR D21H23/28 OR D21H23/36 OR D21H23/76 OR D21H23/765 OR D21H23/78 OR D21H25/10 OR D21G1/00 OR D21G1/006 OR D21G1/0093).CPC.)	US-PGPUB; USPAT	OR	ON	2021/08/16 12:46

L8	1	7 and method and paperboard and basecoat and topcoat and basis near weight and smoothness and caliper	US-PGPUB; USPAT	OR	ON	2021/08/16 12:46
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8/16/2021 12:47:48 PM

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

Applicant : WestRock Company
Inventors : Giuste et al.
Serial No. : 16/869,156
Filed : May 7, 2020
Title : SMOOTH AND LOW DENSITY PAPERBOARD
STRUCTURES AND METHODS FOR MANUFACTURING
THE SAME
Conf. No. : 1626
Docket : 23509-USORD1
Examiner : Mark Halpern
Art Unit : 1748

Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT

This paper is filed in response to the non-final Office action issued on August 20, 2021.
Please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims that begins on Page 2 of
this paper.

Remarks begin on Page 6 of this paper.

AMENDMENTS TO THE CLAIMS:

This listing of the pending claims will replace all prior versions and listings of claims in this application:

1. (Currently Amended) A method for manufacturing a paperboard structure comprising:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature of at least 250 °F;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment; and
applying a topcoat to said basecoated paperboard substrate,

wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

2. (Original) The method of Claim 1 wherein said passing said paperboard substrate through said hot-hard calender comprises applying a nip load to said paperboard substrate ranging from about 20 pli to about 500 pli.

3. (Currently Amended) The method of Claim 1 wherein said elevated temperature is at least ~~[[250]]~~ 500 °F.

4-66. (Canceled)

67. (New) The method of Claim 1 further comprising applying starch to said paperboard substrate prior to said passing said paperboard substrate through said hot-hard calender.

68. (New) The method of Claim 1 wherein said hot-hard calender further comprises a second nip defined by said thermo-roller and a second counter roller, and wherein said passing said paperboard substrate comprises passing said paperboard substrate through said nip and said second nip.

69. (New) The method of Claim 1 wherein at least one of said thermo-roller and said counter roller comprises a metallic material.

70. (New) The method of Claim 1 wherein said basecoat is applied to only one side of said calendered paperboard substrate.

71. (New) The method of Claim 1 further comprising applying an intermediate coating layer to said basecoated paperboard substrate prior to said applying said topcoat.

72. (New) The method of Claim 1 wherein said basecoat binder comprises latex.

73. (New) The method of Claim 1 wherein said basecoat pigment comprises at least one of clay and calcium carbonate.

74. (New) The method of Claim 1 wherein said basecoat pigment comprises clay and calcium carbonate.

75. (New) The method of Claim 74 wherein said clay has an average aspect ratio of at least about 40:1.

76. (New) The method of Claim 74 wherein said calcium carbonate is ground calcium carbonate.

77. (New) The method of Claim 76 wherein at most about 60 percent by weight of said ground calcium carbonate has a particle size smaller than 2 microns.

78. (New) The method of Claim 76 wherein said ground calcium carbonate comprises at least about 10 percent by weight of said basecoat pigment and at most about 60 percent by weight of said basecoat pigment.

79. (New) The method of Claim 1 wherein said topcoat comprises a topcoat binder and a topcoat pigment blend.

80. (New) The method of Claim 79 wherein said topcoat binder comprises latex.

81. (New) The method of Claim 79 wherein said topcoat pigment blend comprises calcium carbonate and clay.

82. (New) The method of Claim 1 wherein said applying said basecoat and said applying said topcoat yields a coating structure on said paperboard substrate, said coating structure having a total coat weight, on a dry basis, ranging from about 8 lbs/3000 ft² to about 18 lbs/3000 ft².

83. (New) The method of Claim 1 wherein said Parker Print Surf (PPS 10S) smoothness is at most 2.5 microns.

84. (New) The method of Claim 1 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2' pounds per 3000 ft², wherein Y_2' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2' = 35.55 + 8.173X - 0.01602X^2.$$

85. (New) The method of Claim 1 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3 pounds per 3000 ft², wherein Y_3 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3 = 3.63 + 12.85X - 0.1566X^2.$$

86. (New) The method of Claim 1 wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_3' pounds per 3000 ft², wherein Y_3' is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_3' = 34.83 + 8.010X - 0.01570X^2.$$

87. (New) The paperboard structure manufactured by the method of Claim 1.

REMARKS:

Status of Claims

By this paper, Claims 1 and 3 are amended, Claims 5, 10–13, 17, 20, 22, 23, 28, 31, 36, 37, 39, 43, 45, 46, 49, 53, 57 and 62 are canceled, and new Claims 67–87 are added. Claims 1–3 and 67–87 are now pending.

Support for Claim Amendments

Support for the amendments to Claims 1 and 3 may be found, for example, in Paragraph 35 of the specification. Support for the new claims may be found throughout the specification and in the originally-filed claims. No new matter has been added.

Sections 102 and 103 Rejections

Claim 1 is rejected under 35 U.S.C. § 102(a)(1) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. § 103 as allegedly being obvious over U.S. Pat. Pub. No. 2009/0236062 to Fugitt et al. (“Fugitt”). Claims 2 and 3 are rejected under 35 U.S.C. § 103 as allegedly being obvious over Fugitt. The rejections are respectfully traversed.

Claim 1 is drawn to a method for manufacturing a paperboard structure that includes steps of:

passing a paperboard substrate through a hot-hard calender to yield a calendered paperboard substrate, said hot-hard calender comprising a nip defined by a thermo-roller and a counter roller, wherein a contact surface of said thermo-roller is heated to an elevated temperature of at least 250 °F;

applying a basecoat to said calendered paperboard substrate to yield a basecoated paperboard substrate, said basecoat comprising a basecoat binder and a basecoat pigment; and

applying a topcoat to said basecoated paperboard substrate,

wherein said paperboard structure has a basis weight, a caliper thickness and a Parker Print Surf (PPS 10S) smoothness, said Parker Print Surf (PPS 10S) smoothness being at most 3 microns, said basis weight being at most Y_2 pounds per 3000 ft², wherein Y_2 is a function of said caliper thickness (X) in points and is calculated as follows:

$$Y_2 = 3.71 + 13.14X - 0.1602X^2.$$

Thus, Claim 1 requires, among other things, passing a paperboard substrate through the nip of a hot-hard calender, wherein the nip is defined by a thermo-roller and a counter roller, and wherein the contact surface of the thermo-roller is heated to an elevated temperature of at least 250 °F.

Fugitt does not disclose or suggest a method that includes passing a paperboard substrate through the nip of a hot-hard calender, wherein the nip is defined by a thermo-roller and a counter roller, and wherein the contact surface of the thermo-roller is heated to an elevated temperature of at least 250 °F. Therefore, Fugitt cannot, as a matter of law, anticipate Claim 1 or the claims depending therefrom.

The Examiner notes that Paragraph 26 of Fugitt discloses that the “rolls of the calender may be steam heated.” (*Office action*, p. 3.) However, Fugitt does not disclose heating a thermo-roller to an elevated temperature of at least 250 °F.

Traditional calenders may employ rollers that are heated to temperatures that are greater than the ambient temperature. This is acknowledged in the present application. “Comparative Examples 1–6” disclosed in Paragraph 82 of the specification of the present application were prepared using a roller surface temperature of 200 °F. The claimed method requires a temperature that is significantly hotter than traditional temperatures—specifically, an elevated temperature of at least 250 °F—which is not disclosed or suggested by Fugitt. Therefore, Fugitt fails to establish a *prima facie* case of obviousness of the pending claims.

Accordingly, Applicant submits the pending claims of the present application are in condition for allowance. Prompt and favorable action is respectfully requested.

The Commissioner is hereby authorized to treat any paper that is filed in this application, which requires an extension of time, as incorporating a request for such an extension. The Commissioner is further authorized to charge any fees required by this paper, or to credit any overpayment, to Deposit Account No. 13-2500.

Respectfully submitted,

/Neil G. Cohen/

October 15, 2021

.....
Neil G. Cohen
Reg. No. 35,100

WESTROCK COMPANY
Attn: IP Law Group – Patents
501 South 5th Street, 3rd Floor
Richmond, Virginia 23219-0501



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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626
66061	7590	10/22/2021		
WESTROCK COMPANY			EXAMINER	
ATTN: IP LAW GROUP - PATENTS			HALPERN, MARK	
501 South 5th Street, 3rd Floor				
Richmond, VA 23219-0501			ART UNIT	PAPER NUMBER
			1748	
			NOTIFICATION DATE	DELIVERY MODE
			10/22/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketadministrator@westrock.com

DETAILED ACTION

1) Acknowledgement is made of Amendment received on 10/15/2021.

Claims 1, 3, are amended, claims 5, 10-13, 17, 20, 22-23, 25, 28, 31, 36-37, 39, 43, 45-46, 49, 53, 57, 62, are cancelled, and new claims 67-87, are offered for consideration.

Election/Restrictions

2) Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-3, 67-86, drawn to a method for manufacturing a paperboard structure, classified in D21H 19/40 .

II. Claim 87, drawn to a paperboard structure, classified in B32B 5/26.

The inventions are independent or distinct, each from the other because:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the paperboard structure can be made by process wherein calendaring of the paperboard is performed at a lower temperature.

Restriction for examination purposes as indicated is proper because all the inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because one or more of the following reasons apply:

- the inventions have acquired a separate status in the art in view of their different classification
- the inventions require a different field of search due to their different classification (e.g., searching different classes /subclasses or electronic resources, or employing different search strategies or search queries).

Applicant is advised that the reply to this requirement to be complete must include (i) an election of an invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention.**

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103 or pre-AIA 35 U.S.C. 103(a) of the other invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be corrected in compliance with 37 CFR 1.48(a) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. A request to correct inventorship under 37 CFR 1.48(a) must be accompanied by an application data sheet in accordance with 37 CFR 1.76 that identifies each inventor by his or her legal name and by the processing fee required under 37 CFR 1.17(i).

The examiner has required restriction between product or apparatus claims and process claims. Where applicant elects claims directed to the product/apparatus, and all product/apparatus claims are subsequently found allowable, withdrawn process claims that include all the limitations of the allowable product/apparatus claims should be considered for rejoinder. All claims directed to a nonelected process invention must include all the limitations of an allowable product/apparatus claim for that process invention to be rejoined.

In the event of rejoinder, the requirement for restriction between the product/apparatus claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product/apparatus are found allowable, an otherwise proper restriction requirement between product/apparatus claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product/apparatus claim will not be rejoined. See MPEP § 821.04.

Additionally, in order for rejoinder to occur, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product/apparatus claims. **Failure to do so may result in no rejoinder.** Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Conclusion

3) Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

4) Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARK HALPERN whose telephone no. is (571)272-1190.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abbas Rashid can be reached on 571-270-7457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

/MARK HALPERN/
Primary Examiner, Art Unit 1748

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

Applicant : WestRock Company
Inventors : Giuste et al.
Serial No. : 16/869,156
Filed : May 7, 2020
Title : SMOOTH AND LOW DENSITY PAPERBOARD
STRUCTURES AND METHODS FOR MANUFACTURING
THE SAME
Conf. No. : 1626
Docket : 23509-USORD1
Examiner : Mark Halpern
Art Unit : 1748

Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

RESPONSE TO RESTRICTION

This paper is filed in response to the Office action issued on October 22, 2021, in which the Examiner alleges the application contains the following groups:

Group I: Claims 1–3 and 67–86 drawn to a method for manufacturing a paperboard structure; and

Group II: Claim 87 drawn to a paperboard structure.

Applicant elects **Group I** without traverse. Claims 1–3 and 67–86 encompass the elected group.

Respectfully submitted,

/Neil G. Cohen/

November 16, 2021

Neil G. Cohen
Reg. No. 35,100

WESTROCK COMPANY
Attn: IP Law Group – Patents
501 South 5th Street, 3rd Floor
Richmond, Virginia 23219-0501



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

66061 7590 11/30/2021
WESTROCK COMPANY
ATTN: IP LAW GROUP - PATENTS
501 South 5th Street, 3rd Floor
Richmond, VA 23219-0501

EXAMINER	
HALPERN, MARK	
ART UNIT	PAPER NUMBER
1748	

DATE MAILED: 11/30/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626

TITLE OF INVENTION: SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	02/28/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREEMONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

66061 7590 11/30/2021
WESTROCK COMPANY
ATTN: IP LAW GROUP - PATENTS
501 South 5th Street, 3rd Floor
Richmond, VA 23219-0501

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626

TITLE OF INVENTION: SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	02/28/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
HALPERN, MARK	1748	162-136000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. Use of a **Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626
66061	7590	11/30/2021	EXAMINER	
WESTROCK COMPANY			HALPERN, MARK	
ATTN: IP LAW GROUP - PATENTS				
501 South 5th Street, 3rd Floor			ART UNIT	
Richmond, VA 23219-0501			PAPER NUMBER	
			1748	

DATE MAILED: 11/30/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection, or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency for the purpose of identifying or locating individuals who are wanted for criminal or civil offenses.

Notice of Allowability	Application No. 16/869,156	Applicant(s) Giuste et al.	
	Examiner MARK HALPERN	Art Unit 1748	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Response of 1116/2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1-3 and 67-86. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| 1. ☐ Notice of References Cited (PTO-892) | 5. ☐ Examiner's Amendment/Comment |
| 2. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____. | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material _____. | 7. ☐ Other _____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/MARK HALPERN/
Primary Examiner, Art Unit 1748

1) An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Claim 87 is cancelled.

2) The following is an examiner's statement of reasons for allowance:

The primary reason for allowance is that the cited prior art does not disclose a method for manufacturing a paperboard structure per steps claimed, the method including passing a paperboard substrate through a nip of a hot-hard calender, wherein the nip is defined by a thermo-roller and a counter roller, and wherein the contact surface of the thermo-roller is heated to an elevated temperature of at least 250 °F (claim 1).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3) Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARK HALPERN whose telephone number is (571)272-1190.

/MARK HALPERN/
Primary Examiner, Art Unit 1748

Search Notes 	Application/Control No. 16/869,156	Applicant(s)/Patent Under Reexamination Giuste et al.
	Examiner MARK HALPERN	Art Unit 1748

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner
D21H 19/40, 19/58, 19/822, 19/385, 19/54, 19/82, 25/14, 23/30	08/16/2021	MH
D21G 1/0246, 1/0253	08/16/2021	MH

US Classification - Searched*			
Class	Subclass	Date	Examiner
162	136	08/16/2021	MH

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST Search (history attached)	08/16/2021	MH
Inventor Search	08/16/2021	MH
International Search Review	08/16/2021	MH
Search Updated (history attached)	11/17/2021	MH

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
Same as above		11/17/2021	MH

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Issue Classification 	Application/Control No. 16/869,156	Applicant(s)/Patent Under Reexamination Giuste et al.
	Examiner MARK HALPERN	Art Unit 1748

CPC						
Symbol					Type	Version
D21H	/	19	/	58	F	2013-01-01
D21G	/	1	/	0246	I	2013-01-01
D21G	/	1	/	0253	I	2013-01-01
D21H	/	19	/	385	I	2013-01-01
D21H	/	19	/	40	I	2013-01-01
D21H	/	19	/	54	I	2013-01-01
D21H	/	19	/	822	I	2013-01-01
D21H	/	23	/	30	I	2013-01-01

CPC Combination Sets							
Symbol				Type	Set	Ranking	Version
	/		/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	23	
/MARK HALPERN/ Primary Examiner, Art Unit 1748	17 November 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	---

Issue Classification 	Application/Control No. 16/869,156	Applicant(s)/Patent Under Reexamination Giuste et al.
	Examiner MARK HALPERN	Art Unit 1748

INTERNATIONAL CLASSIFICATION			
CLAIMED			
D21H	/	19	/ 58
NON-CLAIMED			
/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
162	136

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	23	
/MARK HALPERN/ Primary Examiner, Art Unit 1748	17 November 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	----

Issue Classification 	Application/Control No. 16/869,156	Applicant(s)/Patent Under Reexamination Giuste et al.
	Examiner MARK HALPERN	Art Unit 1748

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		12		23		34		45		56	4	67	15	78
2	2		13		24		35		46		57	5	68	16	79
3	3		14		25		36		47		58	6	69	17	80
	4		15		26		37		48		59	7	70	18	81
	5		16		27		38		49		60	8	71	19	82
	6		17		28		39		50		61	9	72	20	83
	7		18		29		40		51		62	10	73	21	84
	8		19		30		41		52		63	11	74	22	85
	9		20		31		42		53		64	12	75	23	86
	10		21		32		43		54		65	13	76		
	11		22		33		44		55		66	14	77		

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 23	
/MARK HALPERN/ Primary Examiner, Art Unit 1748 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure ----

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8	giuste.in. near2 sergio	US-PGPUB; USPAT	OR	ON	2021/11/17 11:00
L2	1	giuste.in. near2 sergio and paperboard and calender	US-PGPUB; USPAT	OR	ON	2021/11/17 11:00
L3	13	parker.in. near steven and paperboard and calender	US-PGPUB; USPAT	OR	ON	2021/11/17 11:01
L4	13	green.in. near2 terrell and paperboard and calender	US-PGPUB; USPAT	OR	ON	2021/11/17 11:01
L5	37	162/136 and paperboard and calender	US-PGPUB; USPAT	OR	ON	2021/11/17 11:02

11/17/2021 11:03:46 AM

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
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P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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66061 7590 11/30/2021

WESTROCK COMPANY
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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

Sharon R. Dunn	(Typed or printed name)
/Sharon R. Dunn/	(Signature)
28-February-2022	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	05/07/2020	Sergio A. Giuste	23509-USORD1	1626

TITLE OF INVENTION: SMOOTH AND LOW DENSITY PAPERBOARD STRUCTURES AND METHODS FOR MANUFACTURING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	02/28/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
HALPERN, MARK	1748	162-136000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. Neil G. Cohen
2. _____
3. _____

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. Use of a Customer Number is required.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

WESTROCK MWV, LLC

Atlanta, Georgia (US)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first resupply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 132500

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Neil G. Cohen/ Date 28-February-2022

Typed or printed name Neil G. Cohen Registration No. 35100



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/869,156	04/05/2022	11293142	23509-USORD1	1626

66061 7590 03/16/2022
WESTROCK COMPANY
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501 South 5th Street, 3rd Floor
Richmond, VA 23219-0501

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Sergio A. Giuste, Midlothian, VA;
Steven Parker, Raleigh, NC;
Terrell J. Green, Raleigh, NC;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

WestRock MWV, LLC, Atlanta, GA

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