

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

To:

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Date of mailing
(day/month/year)

07.07.2025

Applicant's or agent's file reference
067481-00286-23-P-0064-WO

IMPORTANT NOTIFICATION

International application No.
PCT/US2024/023234

International filing date (day/month/year)
05.04.2024

Priority date (day/month/year)
06.04.2023

Applicant
Berry Global, Inc.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 067481-00286-23-P-0064-WO	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/US2024/023234	International filing date (day/month/year) 05.04.2024	Priority date (day/month/year) 06.04.2023	
International Patent Classification (IPC) or national classification and IPC INV. D04H1/4291			
Applicant Berry Global, Inc.			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>12</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ a total of <u>18</u> sheets, as follows: ☐ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☒ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ a separate electronic file containing a sequence listing (<i>sent to the International Bureau only</i>)			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement ☒ Box No. VI Certain documents cited ☒ Box No. VII Certain defects in the international application ☒ Box No. VIII Certain observations on the international application			
Date of submission of the demand 06.02.2025		Date of completion of this report 07.07.2025	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0		Authorized officer Saunders, Thomas Telephone No. +49 89 2399-4425 	

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-17 as originally filed

Claims, Numbers

1-19 filed in electronic form on 25-04-2025

Drawings, Sheets

1/1 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☒ the claims, Nos. 1, 19
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/US2024/023234

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 20.06.2025 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>3, 10, 14, 15, 18, 19</u>
	No: Claims	<u>1, 2, 4-9, 11-13, 16, 17</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-19</u>
Industrial applicability (IA)	Yes: Claims	<u>1-19</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

see separate sheet

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/US2024/023234

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item I

Basis of the report

1. The amendments filed with the letter received on 25-04-2025 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following:

1.1 "an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1" [claim 1]

The intended support for this amendment would be originally filed claim 9, however, the lower limit for this ratio is about 1.5. No lower limit of about 1.4 is disclosed. No support for this lower limit can be found in the description (cf. page 10, line 30 to page 11, line 1) or examples either.

Changing the lower limit to about 1.5 would overcome this objection.

1.2 "wherein the nonwoven fabric has a bonding pattern comprising a plurality of discrete bond sites" [claim 19]

The Applicant has not indicated the support for this amendment, but it appears to be based on page 10, lines 25-27. However, this feature is only disclosed explicitly in combination with the additional feature that the nonwoven fabric is thermally bonded. By omitting the thermally bonded feature, an unallowable intermediate generalisation has taken place.

Amending claim 19 to read "The nonwoven fabric of claim 1, wherein the nonwoven fabric is thermally bonded and has a bonding pattern comprising a plurality of discrete bond sites" would overcome this objection.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2. Novelty (Article 33(2) PCT)

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claims 1, 2, 4-9, 11-13, 16 and 17 is not new with respect to D3 and D5.

2.1 D1 discloses (cf. Examples 1-3) meltblown nonwovens made from a polymer composition comprising 50 wt.% PLA. The average diameter of the fibres is preferably from about 1 μm to about 3 μm (cf. page 10, lines 1-3).

The hydrohead and air permeability are not disclosed, nor is there any indication that the nonwovens are intended to be relatively waterproof and/or air-impermeable.

The subject-matter of claim 1 therefore differs from D1 in that (i) the first polymer component consists of rPP alone or blended with a virgin PP and/or virgin elastomeric polymer and (ii) the hydrohead/basis weight ratio is ca. 2:1 to 3.5:1 and/or the air permeability/basis weight ratio is ca. 1.4:1 to 3.5:1.

2.2 D2 discloses meltblown nonwovens with fibres that preferably have a diameter of from about 15 μm to about 25 μm , e.g. 18-22 μm (cf. page 13, first paragraph; Examples).

The hydrohead and air permeability are not disclosed, nor is there any indication that the nonwovens are intended to be relatively waterproof and/or air-impermeable.

The subject-matter of claim 1 therefore differs from D2 due to the aforementioned distinguishing feature (ii) and additionally in that (iii) the fibres have an average diameter of 0.2-12 μm .

2.3 D3 discloses (cf. Tables 2, 3) meltblown nonwovens comprising a PP homopolymer which has been subjected to a visbreaking step using a sterically hindered hydroxylamine ester as a viscosity reducing agent, which will inherently increase the MFR of the polymer.

The fact that rPP is used in claim 1 does not distinguish the subject-matter of this claim over the disclosure of D3, given that quite often rPP will be of a higher grade than many virgin PP materials. The recycled nature of the PP used in present claim 1 can not therefore be used as a distinguishing feature over the subject-matter of D3.

The meltblown fibres preferably have an average fineness of not more than 5 μm (cf. page 32, lines 1-3). The upper limit of 5 μm is therefore explicitly disclosed.

Table 2 discloses a hydrohead value of 65.7 to 147.8 cm H_2O and an air permeability of 350-994 mm/s in combination with a basis weight of 4.6-9.9 gsm. If 1 cm H_2O is equal to 0.980665 mbar, this gives a hydrohead/basis weight ratio of 7:1 to 24.7:1. The lower limit of 7:1 for Example CE1-1 falls within the vaguely defined range of from about 2:1 to about 3.5:1.

D3 is concerned with providing nonwoven fabrics having improved barrier properties, so a relatively low air permeability/basis weight ratio can be expected. Given that barrier properties are linked to both waterproof properties and air permeability, it can also be expected that the air permeability/basis weight ratio would fall within the vaguely defined range of from about 1.4:1 to about 3.5:1.

D3 therefore remains novelty-destroying with respect to claims 1, 4, 6-9, 16 and 17.

Deleting the "abouts" from the hydrohead/basis weight and air permeability/basis weight ratio ranges in claim 1 would restore novelty over D3.

2.4 D4 is silent about the average diameter of the meltblown nonwovens.

The hydrohead and air permeability are not disclosed, nor is there any indication that

the nonwovens are intended to be relatively waterproof and/or air-impermeable.

The subject-matter of claim 1 therefore differs from D4 due to the aforementioned distinguishing features (ii) and (iii).

2.5 D5 discloses SMMS nonwovens with two meltblown layers of metallocene PP fibres having an average diameter of 1.06 μm .

The fact that the first fibres in claim 1 comprise rPP comprising a visbroken spunbond grade PP does not distinguish the subject-matter of claim 1 over conventional meltblown or melt-fibrillated nonwovens made from PP, as disclosed in e.g. D5 (cf. Examples).

There is no restriction on the amount of visbroken spunbond grade PP, which can be infinitesimally small, such that fibres comprising as little as 1 ppm visbroken spunbond grade PP and the remainder virgin PP are covered. Nonwovens comprising these fibres would be indistinguishable from the meltblown nonwovens disclosed in the examples of D5.

The fact that the rPP used in D5 is recycled spunbond grade PP does not distinguish claim 1 over D5 either, since very often a given PP material can be used to produce both spunbonds and meltblowns.

It needs to be repeated that the recycled nature of a polymer can not be used to distinguish over a virgin polymer of the same type. Normally recycled polymer is of a lower grade, but this grade of polymer is subjective - depending on the standards employed by the producer, a polymer recycled to a high standard from one producer may well be of a superior grade to a virgin producer from another producer. This is shown in D7 (cf. claims 11-14), where a spunbond comprising 100% rPP has the same physical properties as one made from virgin PP.

According to Table 1, Inventive Example 1 has a hydrohead of 158 mbar and a basis weight of 71 gsm, providing hydrohead/basis weight ratio values of 2.2:1.

Given that D5 aims to provide a nonwoven fabric having improved barrier properties, it can be expected that the air permeability/basis weight ratio will be within the range of about 1.4:1 to about 3.5:1.

D5 therefore remains novelty-destroying with respect to claims 1, 4-7, 9, 11-13, 16 and 17.

2.6 D6 discloses (cf. pages 17, 18) PP meltblowns made from recycled spunbond grade PP, which can be blended with virgin PP. The meltblown webs produced from 1000 MFR PP have an average fibre diameter of 1.85-2.47 μm .

Samples 1-4 have a basis weight of 33.93-36.0 gsm and an air permeability of 0.24-0.51 $\text{m}^3/\text{s}/\text{m}^2$. Multiplying the air permeability by 35.3147 converts the air permeability into cfm values, resulting in an air permeability/basis weight ratio of 0.2:1 to 0.6:1, which lie within the vaguely defined range of from about 1.4:1 to about 3.5:1.

The recycled spunbond grade PP for producing meltblowns has a first MFR of 48 g/10 min and a second MFR of 266 g/10 min.

D6 therefore remains novelty-destroying against claims 1, 2, 4, 6, 7, 9, 16 and 17.

Deleting the "abouts" from the air permeability/basis weight ratio range in claim 1 would restore novelty over D6.

2.7 D7 discloses (cf. claim 1; Example 1) spunbonds made from 100% recycled spunbond grade PP.

The subject-matter of claim 1 differs from D7 at least in that (iv) a nonwoven layer comprising meltblown and/or melt-fibrillated fibres is present.

3. Inventive Step (Article 33(3) PCT)

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 3, 10, 14, 15, 18 and 19 does not involve an inventive step in the sense of Article 33(3) PCT.

3.1 The objections against dependent claims 3 and 10 raised in the first Written Opinion are maintained.

3.2 The inventive step objections against claim 14, based on any one of D1, D2, D3 or D4 as the closest prior art, are also maintained.

3.3 Claims 18 and 19 both seem to relate to trivial modifications of the method according to claim 14 which would be readily anticipated, based on the common general knowledge of the skilled person. Consequently, claims 18 and 19 also lacks inventive step.

3.4 The inventive step objections against claim 15, based on D1 as closest prior art, are maintained too.

Re Item VI

Certain documents cited

4. Certain published documents

Application No Patent No	Publication date (day/month/ year)	Filing date (day/month/ year)	Priority date(<i>valid claim</i>) (day/month/year)
WO 2023/101940	08-06-2023	29-11-2022	30-11-2021

4.1 D8 discloses (cf. claims 1, 6-8) a meltblown nonwoven comprising 75-100 wt.% rPP having first and second MFR values of 10-300 g/10 min and 10-2500 g/10 min, respectively, which can be bonded to e.g. a spunbond nonwoven layer.

The average diameter of the meltblown fibres is from about 3 µm to about 12 µm (cf. page 8, lines 29-30).

However, the hydrohead and air permeability are not disclosed, nor is there any indication that the nonwovens are intended to be relatively waterproof and/or air-impermeable.

D8 would therefore not be novelty-destroying for the present claims during the European regional phase.

Re Item VII

Certain defects in the international application

5. The units "cfm" (i.e. cubic feet per square foot per minute) and "mbar" employed in claims 1 and 9 are not recognised in international practice, contrary to the requirements of Rule 10.1(d) PCT.

Re Item VIII

Certain observations on the international application

6. Clarity (Article 6 PCT)

The application does not meet the requirements of Article 6 PCT, because claims 1, 9, 14 and 15 are not clear.

6.1 It is unclear as to how the first nonwoven layer can comprise both meltblown fibres and melt-fibrillated fibres. It does not seem possible to produce such a nonwoven.

Deleting "or both" from claim 1 would overcome this objection.

6.2 The absence of any reference method used to determine the hydrohead, air permeability and LSTST values in claims 1 and 9 renders the values in this claim essentially meaningless and therefore unclear.

Amending claims 1 and 9 to refer to the hydrohead being determined according to standard test method IST 80.8, the air permeability being determined according to ASTM D737-96 and the LSTST being determined according to WSP 70.3(05), utilising a 32 dyne N/m surface tension fluid (5 ml volume), would overcome this objection - support is provided on page 11, lines 1-10 of the present description.

6.3 The term "fine fibers" used in claim 14 is a relative one and therefore unclear. Amending claim 14 to specify an average diameter of 0.2-12 μm , as has been done with present claim 1, would overcome this objection.

6.4 The term "pull-up" used on its own in claim 15 is unclear. Possibly the intention is to refer to a pull-up pants-type diaper.

IN THE EUROPEAN PATENT OFFICE
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

APPLICANT:	BERRY GLOBAL, INC.
INTERNATIONAL APPLICATION NO.:	PCT/US2024/023234
INTERNATIONAL FILING DATE:	05 APRIL 2024
TITLE:	NONWOVEN FABRICS INCLUDING RECYCLED POLYPROPYLENE

Authorized Officer: Thomas Saunders

European Patent Office
D-80296 Munich

RESPONSE TO THE FIRST
WRITTEN OPINION ON PRELIMINARY EXAMINATION

Dear Officer Saunders:

This communication is in response to the Written Opinion, dated 02 July 2024, from the International Search Authority (ISA). Applicants have submitted herewith amendments under Article 34, as described more fully below, to correct certain defects in the claims and to more particularly distinguish the claimed invention from the cited references. In addition and as also described more fully below, Applicants have provided remarks explaining the patentability of the claimed invention to overcome the defects noted in the Written Opinion. Applicants respectfully request reconsideration in light of these amendments and remarks and issuance of a favorable International Preliminary Report on Patentability.

In accordance with the Article 34 amendments, independent claim 1 has been amended to recite (i) that the first plurality of fine fibers comprising meltblown fibers, melt-fibrillated fibers, or both; (ii) the first plurality of fine fibers have an average diameter from 0.2 to 12 microns; and (iii) the first polymeric material including (i) a first polymer component consisting of a first recycled-polypropylene (rPP) alone or blended with a virgin polypropylene and/or a virgin elastomeric polymer. Support for these amendments can be found throughout the present application including, for example, page 7, lines 12-13; page 9, lines 13-14; and page 8, lines 11-14.

New dependent claim 16 has been added and recites that the first polymer component has from 10% to 70% by weight of the first rPP. New dependent claim 17 has been added and recites that the first polymer component consists of a blend of the first rPP and a virgin polypropylene. New dependent claim 18 has been added and recites that the elevated

temperature is from 250°C to 300°C. Support for these claims can be found throughout the present application including, for example, page 8, lines 7-11; page 8, lines 11-14; and page 15, lines 7-8.

A “marked-up” copy of the claims has been provided to easily identify the claim amendments. A clean copy of the amended claims is also provided with this response.

For the reasons provided below, Applicants respectfully submit that all claims as set forth in the clean copy of the amended claims, as submitted under Article 34 on even date herewith, are patentable over the cited references.

REMARKS

The Written Opinion finds that claims 1-2, 4-8 and 11-13 lack novelty, while all claims (i.e., claims 1-15) lack inventive step. In particular, the Examiner has asserted the following rejections:

- (i) Claims 1, 2, 4, 6, 7, and 11-13 lack novelty in view of WO 2015/112844 (D1);
- (ii) Claims 1, 2, and 4-7 lack novelty in view of WO 2000/40789 (D2);
- (iii) Claims 1, 4, and 6-8 lack novelty in view of WO 2021/110815 (D3);
- (iv) Claims 1, 4, 6, and 7 lack novelty in view of CN 112 625 341 (D4);
- (v) Claims 1, 4-7, and 11-13 lack novelty in view of WO 2021/101751 (D5);
- (vi) Claims 1, 2, 4, 6, and 7 lack novelty in view of Wadsworth et al. (D6); and
- (vii) Claims 1 and 4 lack novelty in view of WO 2021/252750 (D7).

Applicant notes that the Written Opinion has acknowledged that the method claim (i.e., claim 14) is novel, but contends that this claim lacks inventive step without any substantive analysis. As noted above, independent claim 1 has been amended to clarify that the “fine fibers” are meltblown fibers and/or melt-fibrillated fibers along with a range for the average diameter of these fine fibers. Independent claim 1 has also been amended to specify that the first polymer component consists of a first recycled-polypropylene (rPP) alone or blended with a virgin polypropylene and/or a virgin elastomeric polymer. In addition to these amendments, a few additional dependent claims have been added and further define the invention and further distinguish several of the currently cited prior art.

D1 is directed to a process of preparing meltblown fibers that are reclaimed from a starting material of a polypropylene component and a sustainable polymer component. The method includes blending starting fibers of a polypropylene component and a sustainable polymer component under heat to form a molten stream, and then vis-breaking the components to obtain a polymeric blend that is suitable for use in meltblowing applications. The molten stream of the vis-broken polymer components are extruded through a meltblowing die to form a stream of meltblown fibers that is then collected on a collection surface to form a coherent meltblown web. D1, in this regard, requires the presence of a sustainable polymer (e.g., PLA) in the meltblown fibers.

Accordingly, D1 does not teach or suggest the fine fibers as recited in proposed independent claim 1.

D2 is directed to nonwoven filaments having improved melt spinning process characteristics and are prepared using a visbroken single-site catalyzed propylene polymer. The nonwoven filaments exhibit less filament tension during spinning, and permit higher line speeds before breaking, than similar filaments prepared using a single-site catalyzed propylene polymer having the second MFR straight out of the reactor, and which has not been visbroken. The Written Opinion notes that D2 teaches such fibers having an average diameter from 18-22 microns.

Accordingly, D2 does not teach or suggest visbroken rPP in fine fibers having an average diameter from 0.2 to 12 microns. In fact, D2 does not disclose the use of rPP at all.

D3 is directed to meltblown webs having no shots and improved barrier properties, whereby the meltblown webs are made of a visbroken metallocene-catalyzed propylene homopolymer composition with specified melting temperature T_m , content of 2,1 erythro regiodefects, and molecular weight distribution (MWD).

Similar to D2, D3 does not disclose the use of rPP at all.

D4 is directed to degradable and recyclable meltblown materials including from 90-99% of a polymer matrix and from 1-10% of a modifier, which comprises a catalyst and/or an oxidizing agent. Applicant notes that the disclosure of D4 relates to the material that is

suitable for being recycled, not including or starting with rPP. For instance, D4 teaches that “the degradable melt-blown material provided by the invention is put into a reaction kettle when being recovered, is treated by an oxidative degradation/catalytic degradation method at high temperature, breaks a molecular chain, namely, completes the recovery treatment, can be reused, and has the advantages of good performance of a regeneration material, simple recovery process and low cost”.

Accordingly, D4 suffers from the same deficiencies of D2 and D3.

D5 is directed to nonwoven materials subjected to area bonding to form a microporous film-like outer surface (e.g., spunbond fibers melt, flow, and fuse to form the film-like outer surface), while the internal meltblown fibers effectively maintain their non-deformed shape.

D5 fails to teach all aspects of any of the claims.

D6 is an academic paper generally describing the conversion of recycled polymers into meltblown and spunbond nonwovens. The Written Opinion acknowledges that D6 does not disclose the properties associated with certain embodiments of the currently claimed invention. D6 simply does not teach or suggest using a visbroken spunbond rPP at any point.

D7 is directed to a process for making a spunmelt nonwoven web including the steps of providing a mixture of recycled polypropylene, extruding the recycled polypropylene mixture to form a molten recycled polypropylene mixture, filtering the molten recycled polypropylene mixture through a filter to form recycled polypropylene filtrate, dosing the recycled polypropylene filtrate into the spunmelt production line by an amount of 80% to 100% by weight, passing the recycled polypropylene filtrate through at least one spinneret of the spunmelt production line to form filaments at a spinning speed of greater than 1200 meters per minute, cooling and drawing the filaments, and depositing the filaments on a moving belt to form at least one layer of the spunmelt nonwoven web made up of 80% by 100% by weight of recycled polypropylene fibers. More specifically, D7 teaches that the formation of spunbond fibers having at least 80% by weight of rPP. See paragraph [0051]. In this regard, D7 teaches that increasing the amount of rPP above 15% by weight

leads to undesirable properties of the resulting spunbond fibers until the amount of rPP reaches or exceeds 80% by weight.

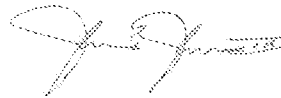
D7, however, does not teach or suggest meltblown and/or melt-fibrillated fibers having an average diameter from 0.2 to 12 microns. We note that new dependent claim 16 further distinguishes this reference.

Applicant submits that all rejections have been overcome and request withdrawal thereof.

CONCLUSION

All of the points raised by the ISA and Written Opinion have now been addressed by clear and proper amendments to the claims of the pending application. Accordingly, Applicants respectfully request that a favorable International Preliminary Report on Patentability indicate the same.

Respectfully Submitted,



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Docket No.: 067481/00286/23-P-0064-WO

CLEAN CLAIMS

THAT WHICH IS CLAIMED:

1. A nonwoven fabric, comprising: a first nonwoven layer comprising a first plurality of fine fibers comprising meltblown fibers, melt-fibrillated fibers, or both, the first plurality of fine fibers have an average diameter from 0.2 to 12 microns and comprise a first polymeric material including (i) a first polymer component consisting of a first recycled-polypropylene (rPP) alone or blended with a virgin polypropylene and/or a virgin elastomeric polymer, and (ii) optionally one or more first additives, wherein the first rPP comprises a visbroken spunbond grade polypropylene having a first melt flow rate (MFR) before visbreaking and second MFR after visbreaking, and wherein the second MFR is larger than the first MFR.
2. The nonwoven fabric of claim 1, wherein the second MFR is from about 50 to about 800 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), such as at least about any of the following: 50, 60, 80, 100, 120, 140, 150, 180, 200, 250, 300, 350, and 400 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), and/or at most about any of the following: 800, 750, 700, 650, 600, 550, 500, 450, and 400 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg); and wherein the first MFR is from about 20 to about 60 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), such as at least about any of the following: 20, 25, 30, 35, and 40 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), and/or at most about any of the following: 60, 55, 50, 45, and 40 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg).
3. The nonwoven fabric of claim 1, wherein the first rPP has a first molecular weight distribution prior to visbreaking and a second molecular weight distribution after visbreaking, wherein the second molecular weight distribution is not greater than 3.5, such as at most about any of the following: 3.5, 3.2, 3, 2.8, 2.5, 2.2, and 2, and/or at least about any of the following: 1, 1.2, 1.4, 1.6, 1.8, 2.

CLEAN CLAIMS

4. The nonwoven fabric of claims 1-3, wherein the first polymer component comprises from 10% to 100% by weight of the first rPP, such as at least about any of the following: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 60% by weight of the first rPP, and/or at most about any of the following: 100, 99, 98, 96, 95, 94, 92, 90, 85, 80, 75, 70, 65, and 60% by weight of the first rPP.

5. The nonwoven fabric of claims 1-4, wherein the first plurality of fine fibers has an average diameter from 0.2 to 11 microns, such as at least about any of the following: 0.2, 0.4, 0.5, 0.6, 0.8, 1, 1.2, 1.4, 1.5, 1.6, 1.8, 2, 2.2, 2.5, 2.8, and 3 microns, and/or at most about any of the following: 11, 10, 9, 8, 7, 6, 5, 4, and 3 microns.

6. The nonwoven fabric of claims 1-5, wherein the first plurality of fine fibers consist of meltblown fibers.

7. The nonwoven fabric of claim 1, wherein the first plurality of fine fibers comprises from 10% to 100% by weight of meltblown fibers, such as at least about any of the following: 10, 20, 30, 40, 50, and 60% by weight of meltblown fibers, and/or at most about any of the following: 100, 99, 98, 96, 95, 94, 92, 90, 85, 80, 75, 70, 65, and 60% by weight of meltblown fibers

8. The nonwoven fabric of claim 1, wherein the first polymeric material includes the one or more first additives, the one or more first additives comprising a first viscosity reducing agent, such as a sterically hindered hydroxylamine ester, a peroxide, or combinations thereof.

9. The nonwoven fabric claims 1-9, wherein the first nonwoven layer has one or more of the following: (i) a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1; (ii) an air permeability-to-basis weight ratio (cfm:gsm) from about 1.5:1 to about 3.5:1; and (iii) an LSTST-to-basis weight ratio (s:gsm) from about 0.75:1 to about 1.8:1.

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10. The nonwoven fabric of claims 1-10, wherein the first nonwoven layer has one or more of the following: (i) a machine direction (MD) tensile strength at break (N/ 5cm)-to-basis weight ratio (N/5cm / gsm) from about 1.5:1 to about 3:1, (ii) a MD elongation at break from 20 to 60%, (iii) a cross-direction (CD) tensile strength at break (N/ 5cm)-to-basis weight ratio (N/5cm / gsm) from about from about 0.75:1 to about 1.5:1, and (iv) a CD elongation at break from 20 to 60%.

11. The nonwoven fabric of claims 1-10, further comprising a second nonwoven layer bonded to the first nonwoven layer, wherein the second nonwoven layer comprises a spunbond layer, a meltblown layer, a bonded carded web of staple fibers, a mechanically consolidated layer, or any combination thereof.

12. The nonwoven fabric of claim 11, further comprising a third nonwoven layer comprising a spunbond layer, a meltblown layer, a bonded carded web of staple fibers, a mechanically consolidated layer, or any combination thereof, and wherein the third nonwoven layer is bonded to the first nonwoven layer, wherein the second nonwoven layer is a first outermost nonwoven layer of the nonwoven fabric and the third nonwoven layer is a second outermost nonwoven layer of the nonwoven fabric.

13. The nonwoven fabric of claim 12, wherein the second nonwoven layer and the third nonwoven layer each comprise a respective spunbond layer.

14. A method of making a nonwoven fabric, comprising:

(a) forming a first polymeric melt comprising (i) a first polymer component, wherein the first polymer component comprises a first spunbond grade recycled-polypropylene (rPP)

CLEAN CLAIMS

having a first melt flow rate (MFR); and (ii) one or more first additives, wherein the one or more first additives comprises a first viscosity reducing agent;

(b) forming a first vis-broken polymeric melt comprising a step of subjecting the first spunbond grade rPP to a visbreaking operation via extruding the first polymer melt at an elevated temperature, the first spunbond grade rPP has a second MFR after the visbreaking operation, and wherein the second MFR is larger than the first MFR;

(c) producing a first nonwoven layer comprising a first plurality of fine fibers via a meltblowing operation or a melt-film fibrillation operation; and

(d) consolidating the plurality of plurality of fine fibers to form the nonwoven fabric.

15. An article, comprising: a personal hygiene article including a nonwoven fabric according to claim 1, wherein the personal hygiene article comprises a diaper or pull-up having a barrier leg cuff (BLC), and the BLC is formed at least in part by the nonwoven fabric.

16. The nonwoven fabric of claims 1-3, wherein the first polymer component has from 10% to 70% by weight of the first rPP, such as at least about any of the following: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 60% by weight of the first rPP, and/or at most about any of the following: 70, 65, and 60% by weight of the first rPP.

17. The nonwoven fabric of claims 1-3, wherein the first polymer component consists of a blend of the first rPP and a virgin polypropylene.

18. The method of making a nonwoven fabric according to claim 14, wherein the elevated temperature is from 250°C to 300°C.

IN THE EUROPEAN PATENT OFFICE
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

APPLICANT:	BERRY GLOBAL, INC.
INTERNATIONAL APPLICATION NO.:	PCT/US2024/023234
INTERNATIONAL FILING DATE:	05 APRIL 2024
TITLE:	NONWOVEN FABRICS INCLUDING RECYCLED POLYPROPYLENE

Authorized Officer: Thomas Saunders

European Patent Office
D-80296 Munich

RESPONSE TO THE SECOND
WRITTEN OPINION ON PRELIMINARY EXAMINATION

Dear Officer Saunders:

This communication is in response to the Written Opinion, dated 25 February 2025, from the International Preliminary Examining Authority (IPEA). Applicants have submitted herewith amendments under Article 34, as described more fully below, to correct certain defects in the claims and to more particularly distinguish the claimed invention from the cited references. In addition and as also described more fully below, Applicants have provided remarks explaining the patentability of the claimed invention to overcome the defects noted in the Written Opinion. Applicants respectfully request reconsideration in light of these amendments and remarks and issuance of a favorable International Preliminary Report on Patentability.

In accordance with the Article 34 amendments, independent claim 1 has been amended to recite that the first nonwoven layer has a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1, and/or an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1. New dependent claim 19 has been added and recites that the nonwoven fabric has a bonding pattern comprising a plurality of discrete bond sites.

Support for these claims can be found throughout the present application including, for example, page 10, lines 30 through page 11, line 6; and the working examples of the specification.

A “marked-up” copy of the claims has been provided to easily identify the claim amendments. A clean copy of the amended claims is also provided with this response.

For the reasons provided below, Applicants respectfully submit that all claims as set forth in the clean copy of the amended claims, as submitted under Article 34 on even date herewith, are patentable over the cited references.

REMARKS

The Examiner finds that claims 1, 4-8, 11-13, and 16-17 lack novelty, while claims 2-3, 9-10, and 14-15 lack inventive step. In particular, the Examiner relies on the following cited art in the present lack of novelty rejections: WO 2021/110815 (D3); WO 2021/101751 (D5); and Wadsworth et al. (D6).

As noted above, independent claim 1 has been amended to expressly capture desirable physical properties per given unit of weight (e.g., property per basis weight). In particular, independent claim 1 has been amended to recite that the first nonwoven layer has a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1, and/or an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1. In this regard, Applicant respectfully submits that the Examiner has not provided any substantive analysis or pointed to any prior art of such a nonwoven layer having these properties per basis weight.

D3 is directed to meltblown webs having no shots and improved barrier properties, whereby the meltblown webs are made of a visbroken metallocene-catalyzed propylene homopolymer composition with a specified melting temperature T_m , content of 2,1 erythro regiodefects, and molecular weight distribution (MWD).

D3 does not disclose the use of rPP at all, much less a nonwoven layer of fine fibers having a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1, and/or an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1. D3 also fails to disclose a MWD associated with rPP that is below 3.5 as recited in dependent claim 3.

D5 is directed to nonwoven materials subjected to area bonding to form a microporous film-like outer surface (e.g., spunbond fibers melt, flow, and fuse to form the film-like outer surface), while the internal meltblown fibers effectively maintain their non-deformed shape.

D5 simply fails to teach all aspects of any of the claims.

D6 is an academic paper generally describing the conversion of recycled polymers into meltblown and spunbond nonwovens. D6 does not disclose the properties associated with certain embodiments of the currently claimed invention. Accordingly, D6 does not teach or suggest a nonwoven layer of fine fibers having a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1, and/or an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1.

With regard to claim 14, the Examiner has acknowledged that this method claim is novel, but contends that this claim lacks inventive step without any substantive analysis. In this regard, Applicant notes that claim 14 appears is inventive in view of the currently cited art.

Applicant submits that all rejections have been overcome and request withdrawal thereof.

CONCLUSION

All of the points raised by the IPEA and Written Opinion have now been addressed by clear and proper amendments to the claims of the pending application. Accordingly, Applicants respectfully request that a favorable International Preliminary Report on Patentability indicate the same.

Respectfully Submitted,



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Docket No.: 067481/00286/23-P-0064-WO

CLEAN CLAIMS

THAT WHICH IS CLAIMED:

1. A nonwoven fabric, comprising: a first nonwoven layer comprising a first plurality of fine fibers comprising meltblown fibers, melt-fibrillated fibers, or both, the first plurality of fine fibers have an average diameter from 0.2 to 12 microns and comprise a first polymeric material including (i) a first polymer component consisting of a first recycled-polypropylene (rPP) alone or blended with a virgin polypropylene and/or a virgin elastomeric polymer, and (ii) optionally one or more first additives, wherein the first rPP comprises a visbroken spunbond grade polypropylene having a first melt flow rate (MFR) before visbreaking and second MFR after visbreaking, and wherein the second MFR is larger than the first MFR; wherein the first nonwoven layer has a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3.5:1, and/or an air permeability-to-basis weight ratio (cfm:gsm) from about 1.4:1 to about 3.5:1.

2. The nonwoven fabric of claim 1, wherein the second MFR is from about 50 to about 800 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), such as at least about any of the following: 50, 60, 80, 100, 120, 140, 150, 180, 200, 250, 300, 350, and 400 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), and/or at most about any of the following: 800, 750, 700, 650, 600, 550, 500, 450, and 400 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg); and wherein the first MFR is from about 20 to about 60 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), such as at least about any of the following: 20, 25, 30, 35, and 40 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg), and/or at most about any of the following: 60, 55, 50, 45, and 40 g/ 10 min as determined by ASTM D1238 (230C°/2.16 kg).

3. The nonwoven fabric of claim 1, wherein the first rPP has a first molecular weight distribution prior to visbreaking and a second molecular weight distribution after visbreaking, wherein the second molecular weight distribution is not greater than 3.5, such as at most about any of the following: 3.5, 3.2, 3, 2.8, 2.5, 2.2, and 2, and/or at least about any of the following: 1, 1.2, 1.4, 1.6, 1.8, 2.

CLEAN CLAIMS

4. The nonwoven fabric of claims 1-3, wherein the first polymer component comprises from 10% to 100% by weight of the first rPP, such as at least about any of the following: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 60% by weight of the first rPP, and/or at most about any of the following: 100, 99, 98, 96, 95, 94, 92, 90, 85, 80, 75, 70, 65, and 60% by weight of the first rPP.

5. The nonwoven fabric of claims 1-4, wherein the first plurality of fine fibers has an average diameter from 0.2 to 11 microns, such as at least about any of the following: 0.2, 0.4, 0.5, 0.6, 0.8, 1, 1.2, 1.4, 1.5, 1.6, 1.8, 2, 2.2, 2.5, 2.8, and 3 microns, and/or at most about any of the following: 11, 10, 9, 8, 7, 6, 5, 4, and 3 microns.

6. The nonwoven fabric of claims 1-5, wherein the first plurality of fine fibers consist of meltblown fibers.

7. The nonwoven fabric of claim 1, wherein the first plurality of fine fibers comprises from 10% to 100% by weight of meltblown fibers, such as at least about any of the following: 10, 20, 30, 40, 50, and 60% by weight of meltblown fibers, and/or at most about any of the following: 100, 99, 98, 96, 95, 94, 92, 90, 85, 80, 75, 70, 65, and 60% by weight of meltblown fibers

8. The nonwoven fabric of claim 1, wherein the first polymeric material includes the one or more first additives, the one or more first additives comprising a first viscosity reducing agent, such as a sterically hindered hydroxylamine ester, a peroxide, or combinations thereof.

9. The nonwoven fabric claims 1-9, wherein the first nonwoven layer has one or more of the following: (i) a hydrohead-to-basis weight ratio (mbar:gsm) from about 2:1 to about 3:1;

CLEAN CLAIMS

- (ii) an air permeability-to-basis weight ratio (cfm:gsm) from about 1.5:1 to about 2:1; and/or
- (iii) an LSTST-to-basis weight ratio (s:gsm) from about 0.75:1 to about 1.8:1.

10. The nonwoven fabric of claims 1-10, wherein the first nonwoven layer has one or more of the following: (i) a machine direction (MD) tensile strength at break (N/ 5cm)-to-basis weight ratio (N/5cm / gsm) from about 1.5:1 to about 3:1, (ii) a MD elongation at break from 20 to 60%, (iii) a cross-direction (CD) tensile strength at break (N/ 5cm)-to-basis weight ratio (N/5cm / gsm) from about from about 0.75:1 to about 1.5:1, and (iv) a CD elongation at break from 20 to 60%.

11. The nonwoven fabric of claims 1-10, further comprising a second nonwoven layer bonded to the first nonwoven layer, wherein the second nonwoven layer comprises a spunbond layer, a meltblown layer, a bonded carded web of staple fibers, a mechanically consolidated layer, or any combination thereof.

12. The nonwoven fabric of claim 11, further comprising a third nonwoven layer comprising a spunbond layer, a meltblown layer, a bonded carded web of staple fibers, a mechanically consolidated layer, or any combination thereof, and wherein the third nonwoven layer is bonded to the first nonwoven layer, wherein the second nonwoven layer is a first outermost nonwoven layer of the nonwoven fabric and the third nonwoven layer is a second outmost nonwoven layer of the nonwoven fabric.

13. The nonwoven fabric of claim 12, wherein the second nonwoven layer and the third nonwoven layer each comprise a respective spunbond layer.

14. A method of making a nonwoven fabric, comprising:

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(a) forming a first polymeric melt comprising (i) a first polymer component, wherein the first polymer component comprises a first spunbond grade recycled-polypropylene (rPP) having a first melt flow rate (MFR); and (ii) one or more first additives, wherein the one or more first additives comprises a first viscosity reducing agent;

(b) forming a first vis-broken polymeric melt comprising a step of subjecting the first spunbond grade rPP to a visbreaking operation via extruding the first polymer melt at an elevated temperature, the first spunbond grade rPP has a second MFR after the visbreaking operation, and wherein the second MFR is larger than the first MFR;

(c) producing a first nonwoven layer comprising a first plurality of fine fibers via a meltblowing operation or a melt-film fibrillation operation; and

(d) consolidating the plurality of plurality of fine fibers to form the nonwoven fabric.

15. An article, comprising: a personal hygiene article including a nonwoven fabric according to claim 1, wherein the personal hygiene article comprises a diaper or pull-up having a barrier leg cuff (BLC), and the BLC is formed at least in part by the nonwoven fabric.

16. The nonwoven fabric of claims 1-3, wherein the first polymer component has from 10% to 70% by weight of the first rPP, such as at least about any of the following: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, and 60% by weight of the first rPP, and/or at most about any of the following: 70, 65, and 60% by weight of the first rPP.

17. The nonwoven fabric of claims 1-3, wherein the first polymer component consists of a blend of the first rPP and a virgin polypropylene.

18. The method of making a nonwoven fabric according to claim 14, wherein the elevated temperature is from 250°C to 300°C.

CLEAN CLAIMS

19. The nonwoven fabric of claim 1, wherein the nonwoven fabric has a bonding pattern comprising a plurality of discrete bond sites.

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