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(54) **FLEXIBLE INTERMEDIATE BULK CONTAINER FOR THE TRANSPORT AND STORAGE OF BULK GOODS**

(57) There is described a flexible intermediate bulk container (100), or "FIBC", for the transport and storage of bulk goods comprising at least a bottom part (10) and a sidewall (15) made of pieces of flexible fabric material. The sidewall (15) includes a woven fabric (20) comprising woven strands produced out of recycled polypropylene (rPP). An exterior side (15A) of the sidewall (15) comprises a coloured polypropylene (PP) coating (21) that is

extruded onto an outer side of the woven fabric (20), which coloured PP coating (21) is preferably substantially opaque. Preferably, the bottom part (10) likewise includes a woven fabric (20) comprising woven strands produced out of recycled polypropylene (rPP). Even more preferably, an interior side (15B) of the sidewall (15) and an interior side (10A) of the bottom part (10) each comprise a further PP coating (25) that is extruded onto an inner side of the woven fabric (20), which further PP coating (25) may especially be a food-grade film.

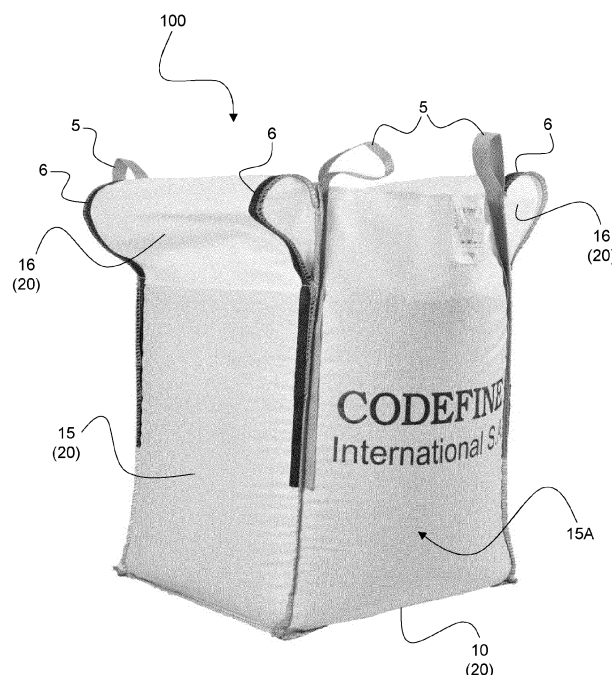


Fig. 1

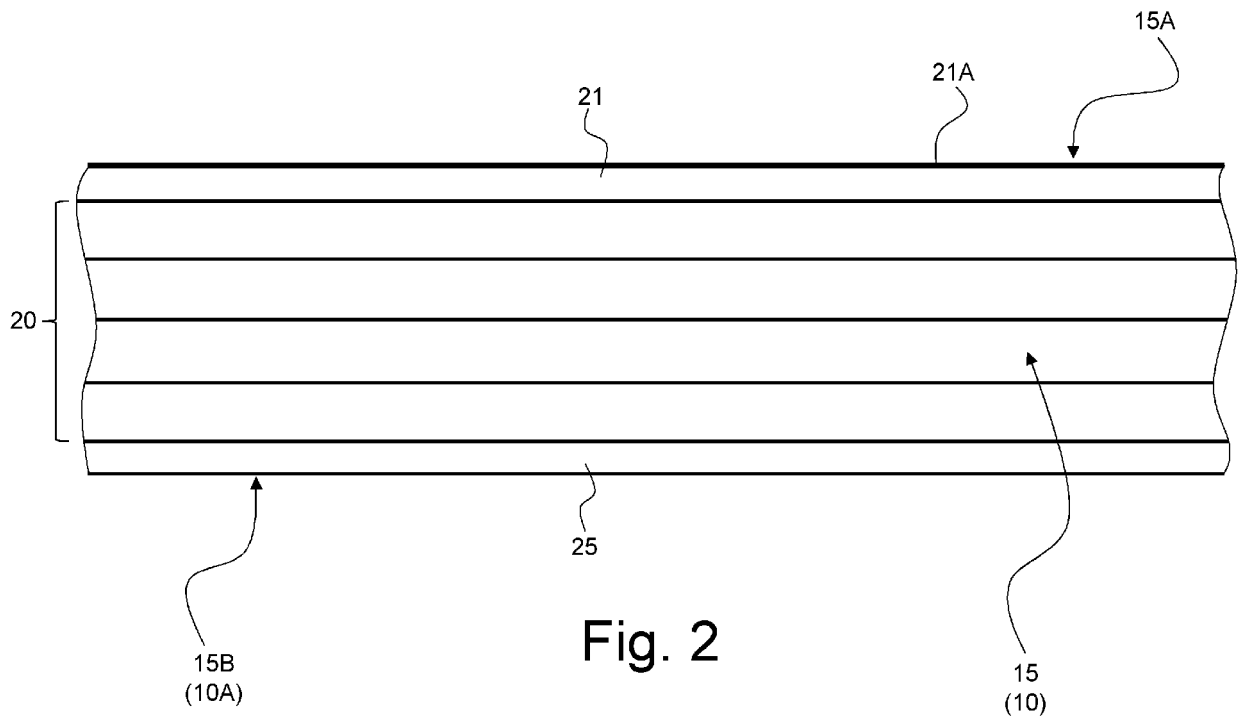


Fig. 2

Description

TECHNICAL FIELD

[0001] The present invention generally relates to a flexible intermediate bulk container, or "FIBC", for the transport and storage of bulk goods.

BACKGROUND OF THE INVENTION

[0002] International (PCT) Publication No. WO 98/54070 A1 in the name of the present Applicant, which publication is incorporated herein by reference in its entirety, discloses a flexible intermediate bulk container in accordance with the preamble of independent claims 1 and 6. Different embodiments of the flexible intermediate bulk container are disclosed in WO 98/54070 A1. Such flexible intermediate bulk containers are also commonly referred to in the art as "big bags".

[0003] Flexible intermediate bulk containers are conventionally made of pieces of flexible fabric material consisting of one or multiple layers of a woven fabric comprising woven strands produced out of polypropylene (PP).

[0004] Nowadays, legislations and/or tax initiatives are being introduced in various countries to incite manufacturers to produce flexible intermediate bulk containers having a certain minimum percentage of recycled polymer and ensure that such flexible intermediate bulk containers can adequately be processed with a view to be recycled.

[0005] One recent initiative was incorporated in the UK Finance Act 2021 which introduced a tax on plastic packaging (the "plastic packaging tax") which does not use at least 30% recycled polymer by weight in its composition, which tax came into force on April 1st, 2022. Similar other directives are being taken or contemplated by other countries, including e.g. by the European Union. This creates new challenges for the FIBC industry, especially in that the flexible intermediate bulk containers must still meet specific customer demands as well as stringent regulatory requirements (in particular when it comes to handling food and agricultural products) despite the fact that they must at least partly be made of recycled material the properties and quality of which may be difficult to determine and guarantee in practice.

[0006] A solution that has been contemplated in the art is to put in place a fully circular approach, creating a circular economy in which FIBCs are produced, used and recycled in a closed-loop system to produce new FIBCs. One such approach is disclosed in Issue No. 252 of Dry Cargo International (<https://www.drycargomag.com/>), November 2021, "Closed-loop technology for FIBCs: Starlinger's green solution", pp. 113-117. A fundamental requirement for this approach to be applicable in practice hinges on the recycling of the FIBCs which must be designed to facilitate recycling in the first place. The real challenge is however to ensure complete traceability of

the FIBCs throughout the lifecycle to create a uniform material stream to ensure the required quality of the material to be recycled. The aforementioned approach thus contemplates an important and essential step, namely, the generation of a material passport for each FIBC in which the entire lifecycle of the FIBC is documented, from the materials used for its production, up to the last filling operation and the nature of the filled products. While traceability can thereby be ensured, this inevitably generates and imposes additional logistical and practical constraints that can hardly be maintained in practice. This furthermore requires all stakeholders to commit to ensuring that absolute traceability is guaranteed throughout the FIBC lifecycle. It is only at this cost that one can guarantee that the FIBCs that are being recycled are similar in composition and show the lowest possible degrees of contamination.

[0007] Used FIBCs can be collected and prepared for recycling by being scrupulously sorted and cleaned, before the relevant constituents thereof can be segregated, if necessary, into different types of plastic materials that may potentially require different recycling steps. Polypropylene (PP) material, which is predominantly used in the industry to produce FIBCs, can suitably be recycled by shredding the relevant PP constituents, after cleaning and sorting, before being compounded using e.g. an extruder which melts down the shredded particles and creates recycled plastic pellets, or granulate, namely, recycled polypropylene (rPP) - also referred to as polypropylene regranulate - that can be used again to produce new products.

[0008] New FIBCs may be produced using recycled polypropylene (rPP) but - unless a fully circular, closed-loop approach is applied as previously discussed - one cannot ensure in practice that the rPP material being used suitably meets customer and/or regulatory demands, be it from an aesthetic perspective and/or functional perspective. Care should furthermore be taken that the rPP material being used does not negatively impact structural requirements that could be detrimental to the robustness and life expectancy of the FIBCs. In particular, rPP material may come in varying colour grades and qualities. In practice, a large number of FIBCs are typically provided with prints and like coloured markings, resulting in black or dark-coloured rPP material, which forms the largest source of rPP material on the market. The inherent properties and characteristics of rPP materials, which may fluctuate, typically cannot be guaranteed with absolute certainty, which impacts the use thereof for the production of FIBCs that would be destined for storage and transport of food and agricultural products especially.

[0009] Other solutions have been contemplated in the art, including solutions that do not rely on the use of polypropylene material (PP) to produce the FIBCs. One such solution is disclosed e.g. in U.S. Patent No. US 10,112,769 B2 and related International (PCT) Publication No. WO 2015/121042 A1. In such case, the sidewall

of the FIBC (and lifting straps) are made of woven fabric produced from uniaxially-drawn PET tape having a density greater than 1.333 g/cm³. This solution is not fully satisfactory however in that polypropylene (PP) remains a favoured material which is still predominantly used in the FIBC industry.

[0010] There therefore remains a need for an improved solution.

SUMMARY OF THE INVENTION

[0011] A general aim of the invention is to provide a flexible intermediate bulk container for the transport and storage of bulk goods that obviates the problems and limitations of known flexible intermediate bulk containers.

[0012] More specifically, an aim of the invention is to provide such a flexible intermediate bulk container that can be produced at least partly out of recycled polypropylene (rPP) material without compromising practical usability thereof.

[0013] A further aim of the invention is to provide such a flexible intermediate bulk container that can suitably meet customer demands and/or regulatory requirements, despite the use of recycled polypropylene (rPP) material.

[0014] Yet another aim of the invention is to provide such a flexible intermediate bulk container whose construction does not negatively impact its ability to be recycled into recycled polypropylene (rPP), especially into polypropylene regranelate.

[0015] These aims are achieved thanks to the solutions defined in the claims.

[0016] In accordance with a first aspect of the invention, there is provided a flexible intermediate bulk container for the transport and storage of bulk goods the features of which are recited in claim 1, namely, such a flexible intermediate bulk container comprising at least a bottom part and a sidewall made of pieces of flexible fabric material. According to this first aspect of the invention, the sidewall includes a woven fabric comprising woven strands produced out of recycled polypropylene (rPP). Furthermore, an exterior side of the sidewall comprises a coloured polypropylene (PP) coating that is extruded onto an outer side of the woven fabric.

[0017] The coloured PP coating is preferably substantially opaque, thereby efficiently covering and masking the underlying fabric material and imparting a defined visual appearance irrespective of the underlying woven fabric which is partly made of recycled polypropylene (rPP) and may come up in varying colour grades.

[0018] By way of preference, the coloured PP coating acts as a printable layer that may be provided, if desired, with printed motifs.

[0019] The bottom part may likewise include a woven fabric comprising woven strands produced out of recycled polypropylene (rPP). In this latter context, an interior side of the sidewall and an interior side of the bottom part each preferably comprise a further PP coating that is ex-

truded onto an inner side of the woven fabric.

[0020] In accordance with a second aspect of the invention, which may be applied independently of the aforementioned first aspect of the invention, there is further provided a flexible intermediate bulk container for the transport and storage of bulk goods the features of which are recited in independent claim 6, namely, such a flexible intermediate bulk container comprising at least a bottom part and a sidewall made of pieces of flexible fabric material. According to this second aspect of the invention, one or both of the bottom part and sidewall each include a woven fabric comprising woven strands produced out of recycled polypropylene (rPP). Furthermore, an interior side of the relevant bottom part and/or sidewall comprises a polypropylene (PP) coating that is extruded onto an inner side of the woven fabric.

[0021] The PP coating that is extruded on the inner side of the woven fabric may in particular be a food-grade coating.

[0022] Each PP coating may advantageously be applied with a weight per unit area of approximately 10 to 30 g/m², preferably of the order of 15 g/m².

[0023] By way of preference, the woven fabric is made at more than 30% in weight of woven strands produced out of recycled polypropylene (rPP) and/or the woven fabric comprises less than 70% in weight of woven strands produced out of pure, non-recycled polypropylene (PP).

[0024] The recycled polypropylene (rPP) may in particular be non-white, non-food grade recycled polypropylene (rPP).

[0025] The flexible intermediate bulk container of the invention may especially be constructed such that an entirety thereof is recyclable into polypropylene regranelate.

[0026] In one embodiment, the sidewall includes four side panels connected in pairs (for instance by sewing, glueing and/or welding) along adjacent edges to form vertical ridges at four corners of the flexible intermediate bulk container.

[0027] The flexible intermediate bulk container may furthermore comprise one or more lifting straps each secured to the sidewall so as to rise above a top surface of the flexible intermediate bulk container and/or project outwards from the sidewall, each lifting strap being preferably made of reinforced woven bands produced out of pure, non-recycled polypropylene (PP). In this latter context, the flexible intermediate bulk container may especially include at least one set of four lifting straps that are interconnected in pairs by two sleeves to form tubings or ducts extending longitudinally along the top surface of the flexible intermediate bulk container or along a top portion of the sidewall to allow lifting of the flexible intermediate bulk container by means of a forklift. In such case, the two sleeves are preferentially made of flexible fabric material including a woven fabric comprising woven strands produced out of polypropylene (PP), preferably woven strands produced out of recycled polypropyl-

ene (rPP).

[0028] Further advantageous embodiments of the invention are discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Other features and advantages of the present invention will appear more clearly from reading the following detailed description of embodiments of the invention which are presented solely by way of non-restrictive examples and are illustrated by the appended drawings in which:

Figure 1 is a photographic illustration of a flexible intermediate bulk container showing one possible configuration that could be contemplated in accordance with the invention; and

Figure 2 schematically shows a partial cross-sectional view of a piece of flexible fabric material as preferably used to form, in particular, a sidewall of the flexible intermediate bulk container of Figure 1 in accordance with a preferred embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0030] The present invention will be described in relation to various illustrative embodiments as shown in particular in Figures 1 and 2. It shall be understood that the scope of the invention encompasses all combinations and subcombinations of the features of the invention disclosed herein as defined by the appended claims.

[0031] Figure 1 is a photographic illustration of a flexible intermediate bulk container - or FIBC - that is generally designated by reference numeral 100. FIBC 100 exhibits one possible, illustrative configuration that could be contemplated in accordance with the invention, which configuration in essence matches that shown e.g. in Figure 6 of International (PCT) Publication No. WO 98/54070 A1.

[0032] FIBC 100 illustrated in Figure 1 comprises a bottom part 10 and a sidewall 15 made of pieces of flexible fabric material, the precise nature of which will be described hereafter. In the illustrated example, sidewall 15 includes four side panels connected in pairs along adjacent edges to form vertical ridges at four corners of the flexible intermediate bulk container 100. The side panels may be connected together by any appropriate means, including sewing, glueing, welding, or any combination thereof. FIBC 100 further comprises two sets of four lifting straps 5, 6 (only part of which are visible in Figure 1) that are positioned in an upper portion of the FIBC 100 and adequately secured to the sidewall 15. In the illustrated example, a first set of four lifting straps 5 is provided that are secured in such a way as to rise above a top surface of the FIBC 100. Such lifting straps 5 are typically used for lifting of the FIBC 100 by means of a four-point lifting

device. A second set of four lifting straps 6 is provided that are secured to the sidewall 15 in such a way as to project outwards from the sidewall 15, here along two opposite side panels. The lifting straps 6 are interconnected in pairs, as shown, by two sleeves 16 to form tubings or ducts extending longitudinally or along a top portion of the sidewall 15 to allow lifting of the FIBC 100 by means of a forklift (see e.g. Figure 4 of International (PCT) Publication No. WO 98/54070 A1). The sleeves 16 may each be formed of a part of the relevant side panel which is looped back on and secured to itself, in which case the sleeves 16 will be understood to be made of the same flexible fabric material as the relevant side panels. The sleeves 16 may alternatively be made of entirely separate pieces of fabric material that may then be secured or otherwise attached to the sidewall 15. Another illustrative FIBC configuration is disclosed in that regard in International (PCT) Publication No. WO 2022/123445 A1 in the name of the present Applicant, which is likewise incorporated by reference in its entirety. Such other FIBC configuration could perfectly be adopted in the context of the present invention, it being noted that the sleeves would extend in this case along the top surface of the FIBC 100, rather than along two opposite sides of the FIBC 100.

[0033] The lifting straps 5, 6 are preferably made of reinforced woven bands produced out of polypropylene (PP) but other materials could potentially be contemplated. The use of polypropylene (PP) to produce the lifting straps 5, 6 is however favoured in that the lifting straps 5, 6 may adequately be recycled into polypropylene regranulate, along with other parts of the FIBC 100 made of polypropylene (PP). By way of preference, the lifting straps 5, 6 are made exclusively of pure, non-recycled polypropylene (PP) to ensure that these lifting straps 5, 6 meet desired structural specifications, especially in terms of strength and resistance.

[0034] The upper portion of the FIBC 100 may be open or closed by a top part (not shown) provided with a suitable filling spout (as shown e.g. in Figure 6 of International (PCT) Publication No. WO 98/54070 A1). In such case, the top part may advantageously be designed in accordance with substantially the same principles as discussed below with regard to the sidewall 15 and bottom part 10.

[0035] Referring to Figure 2, one will now describe a preferred embodiment of the invention, it being noted that Figure 2 schematically shows a partial, cross-sectional view of a piece of flexible fabric material as used to produce the sidewall 15. The bottom part 10 is likewise produced, in comparable fashion, of a similar piece of flexible fabric material as explained hereafter.

[0036] More specifically, the piece of flexible fabric material depicted in Figure 2 includes a woven fabric 20 comprising woven strands produced out of recycled polypropylene (rPP). By way of preference, the woven fabric 20 is made at more than 30% in weight of woven strands produced out of recycled polypropylene (rPP) and/or

comprises less than 70% in weight of woven strands produced out of pure, non-recycled polypropylene (PP).

[0037] In accordance with the first aspect of the invention, an exterior side 15A of the sidewall 15 comprises a polypropylene (PP) coating, as designated in Figure 2 by reference numeral 21, that is extruded onto the woven fabric 20, namely, on its outer side. It is to be understood in that regard that the coloured PP coating 21 is applied directly onto the outer side of the woven fabric 20 by extrusion coating, which process is known as such in the art. This PP coating 21 is preferably substantially opaque and may further advantageously act as a printable layer that can at least partly be provided with printed motifs, if so desired. The provision of a substantially opaque PP coating 21 on the exterior side 15A of the sidewall 15 is particularly advantageous in that this obviates the potentially negative visual appearance of the underlying woven fabric 20 which is partly made of recycled polypropylene (rPP) and may come up in varying colour grades. Any desired visual appearance can therefore be guaranteed and imparted to the FIBC 100 thanks to the provision of a substantially opaque, coloured PP coating 21, irrespective of the actual nature and visual appearance of the underlying woven fabric 20. The use of a PP coating 21 applied by extrusion coating is furthermore particularly advantageous in that this does not negatively impact the ability for the FIBC 100 to be recycled into polypropylene regranulate. Recycling may not therefore require separation of the PP coating 21 which could be shredded along with the woven fabric 20.

[0038] By way of preference, as further illustrated in Figure 2, an interior side 15B of the sidewall 15 is likewise provided with a further PP coating, as designated by reference numeral 25, that is extruded onto the woven fabric 20, namely, on its inner side. It is again to be understood that the PP coating 25 is applied directly onto the inner side of the woven fabric 20 by extrusion coating in a manner known as such in the art. While the extrusion of a substantially opaque PP coating 25 is not excluded, such opacification of the PP coating 25 is not absolutely necessary. It is however particularly advantageous that the PP coating 25 be a food-grade coating in that this will ensure meeting regulatory requirements for storage of any food or agricultural product within the storage volume of the FIBC 100.

[0039] With regard to the bottom part 10 of the FIBC 100, such bottom part 10 may likewise advantageously include a woven fabric comprising woven strands produced out of recycled polypropylene (rPP), like the woven fabric 20 shown in Figure 2. In such case, at least the interior side, designated 10A, of the bottom part 10 may likewise be provided with the PP coating 25, namely, that PP coating that is extruded onto the inner side of the woven fabric 20, similarly to the sidewall 15. As far as the bottom part 10 of the FIBC 100 is concerned, an exterior side thereof (namely, that side exposed on the underside of the FIBC 100) does not need to be provided with any PP coating, such as the coloured PP coating 21

depicted in Figure 2, which may be omitted in such case. A coloured PP coating 21 may nevertheless be provided, if required or desired, to ensure a substantially uniform visual appearance, including on the underside of the FIBC 100.

[0040] Each of the PP coatings 21, 25 is preferably applied by extrusion coating with a weight per unit area of approximately 15 g/m². Grammage may however vary, especially from 10 to 30 g/m².

[0041] In the context of the present invention, the recycled polypropylene (rPP) material used to form part of the sidewall 15 and/or bottom part 10 may especially be a non-white, non-food grade recycled polypropylene (rPP) material, it being understood that the provision of the first and/or second PP coatings 21, 25 obviates the negative impact that the use of such recycled polypropylene (rPP) material might have on the visual appearance of the FIBC 100 and/or on its ability to be used for storage and transport of food and agricultural products, especially.

[0042] One will further appreciate that the FIBC 100 may advantageously be constructed in such a way that an entirety thereof can be recycled into polypropylene regranulate, which greatly simplifies recycling operations.

[0043] Various modifications and/or improvements may be made to the above-described embodiments without departing from the scope of the invention as defined by the appended claims. For instance, while the bag is shown as being of generally cubic form, the bag could exhibit a more elongated shape in one direction, for instance be taller or wider, depending on the relevant application. The sidewall could furthermore exhibit a substantially cylindrical form in other embodiments. In addition, any suitable number of lifting straps or like lifting points could be contemplated to provide for the ability for the flexible intermediate bulk container to be lifted by adequate lifting means.

[0044] Moreover, each of the sidewall and the bottom part of the flexible intermediate bulk container of the invention do not necessarily both have to be made of the same fabric material or include the same proportion of rPP strands, if any. For instance, the bottom part 10 could perfectly be made of a piece of woven fabric produced exclusively out of pure, non-recycled polypropylene (PP), while the sidewall 15 is made in accordance with the invention, including a woven fabric comprising a certain proportion by weight of woven strands produced out of recycled polypropylene (rPP) that is sufficient to meet regulatory demands. In effect, the invention provides for the ability to reach an optimal compromise between regulatory requirements regarding the use of a minimum amount of recycled materials - in this case recycled polypropylene (rPP) - and customer demands, as well as functional, structural and/or aesthetic requirements.

[0045] One will also appreciate that the woven fabric may in effect be made of a combination of strands produced out of pure, non-recycled polypropylene (PP) and

strands produced out of recycled polypropylene (rPP) or be made exclusively of strands produced out of recycled polypropylene (rPP).

LIST OF REFERENCE NUMERALS AND SIGNS USED THEREIN

[0046]

100	flexible intermediate bulk container, or « FIBC »	10
5	(first) set of four lifting straps	
6	(second) set of four lifting straps	
10	bottom part of flexible intermediate bulk container 100	
10A	interior side of bottom part 10 (side located within inner storage volume of flexible intermediate bulk container 100)	15
15	sidewall of flexible intermediate bulk container 100	
15A	exterior side of sidewall 15	20
15B	interior side of sidewall 15 (side located within inner storage volume of flexible intermediate bulk container 100)	
16	sleeves interconnecting lifting straps 6 in pairs	
20	woven fabric comprising woven strands produced out of recycled polypropylene (rPP)	25
21	coloured polypropylene (PP) coating (exterior coating) provided by extrusion coating on outer side of woven fabric 20 (exterior side 15A of sidewall 15)	30
21A	printed motifs (if desired) provided on coloured PP coating 21	
25	PP coating (interior coating) provided by extrusion coating on inner side of woven fabric 20 (interior side 10A of bottom part 10 / interior side 15B of sidewall 15) / food-grade coating	35

Claims

1. A flexible intermediate bulk container (100) for the transport and storage of bulk goods comprising at least a bottom part (10) and a sidewall (15) made of pieces of flexible fabric material, **characterized in that** the sidewall (15) includes a woven fabric (20) comprising woven strands produced out of recycled polypropylene (rPP) and **in that** an exterior side (15A) of the sidewall (15) comprises a coloured polypropylene (PP) coating (21) that is extruded onto an outer side of the woven fabric (20).
2. The flexible intermediate bulk container (100) according to claim 1, wherein the coloured PP coating (21) is substantially opaque.
3. The flexible intermediate bulk container (100) according to claim 1 or 2, wherein the coloured PP coat-

ing (21) acts as a printable layer.

4. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein the bottom part (10) likewise includes a woven fabric (20) comprising woven strands produced out of recycled polypropylene (rPP).
5. The flexible intermediate bulk container (100) according to claim 4, wherein an interior side (15B) of the sidewall (15) and an interior side (10A) of the bottom part (10) each comprise a further PP coating (25) that is extruded onto an inner side of the woven fabric (20).
6. A flexible intermediate bulk container (100) for the transport and storage of bulk goods comprising at least a bottom part (10) and a sidewall (15) made of pieces of flexible fabric material, **characterized in that** one or both of the bottom part (10) and the sidewall (15) each include a woven fabric (20) comprising woven strands produced out of recycled polypropylene (rPP), and **in that** an interior side (10A, 15B) of the relevant bottom part (10) and/or sidewall (15) comprises a polypropylene (PP) coating (25) that is extruded onto an inner side of the woven fabric (20).
7. The flexible intermediate bulk container (100) according to claim 5 or 6, wherein the PP coating (25) that is extruded on the inner side of the woven fabric (20) is a food-grade coating.
8. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein each PP coating (21, 25) is applied with a weight per unit area of approximately 10 to 30 g/m², preferably of the order of 15 g/m².
9. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein the woven fabric (20) is made at more than 30% in weight of woven strands produced out of recycled polypropylene (rPP).
10. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein the woven fabric (20) comprises less than 70% in weight of woven strands produced out of pure, non-recycled polypropylene (PP).
11. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein the recycled polypropylene (rPP) is non-white, non-food grade recycled polypropylene (rPP).
12. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein

the flexible intermediate bulk container (100) is constructed such that an entirety thereof is recyclable into polypropylene regranelate.

13. The flexible intermediate bulk container (100) according to any one of the preceding claims, wherein the sidewall (15) includes four side panels connected in pairs along adjacent edges to form vertical ridges at four corners of the flexible intermediate bulk container (100). 5 10
14. The flexible intermediate bulk container (100) according to any one of the preceding claims, further comprising one or more lifting straps (5, 6) each secured to the sidewall (15) so as to rise above a top surface of the flexible intermediate bulk container (100) and/or project outwards from the sidewall (15), wherein each lifting strap (5, 6) is preferably made of reinforced woven bands produced out of pure, non-recycled polypropylene (PP). 15 20
15. The flexible intermediate bulk container (100) according to claim 14, wherein the flexible intermediate bulk container (100) includes at least one set of four lifting straps (6) that are interconnected in pairs by two sleeves (16) to form tubings or ducts extending longitudinally along the top surface of the flexible intermediate bulk container (100) or along a top portion of the sidewall (15) to allow lifting of the flexible intermediate bulk container (100) by means of a forklift, and wherein the two sleeves (16) are preferentially made of flexible fabric material including a woven fabric (20) comprising woven strands produced out of polypropylene (PP), preferably woven strands produced out of recycled polypropylene (rPP). 25 30 35

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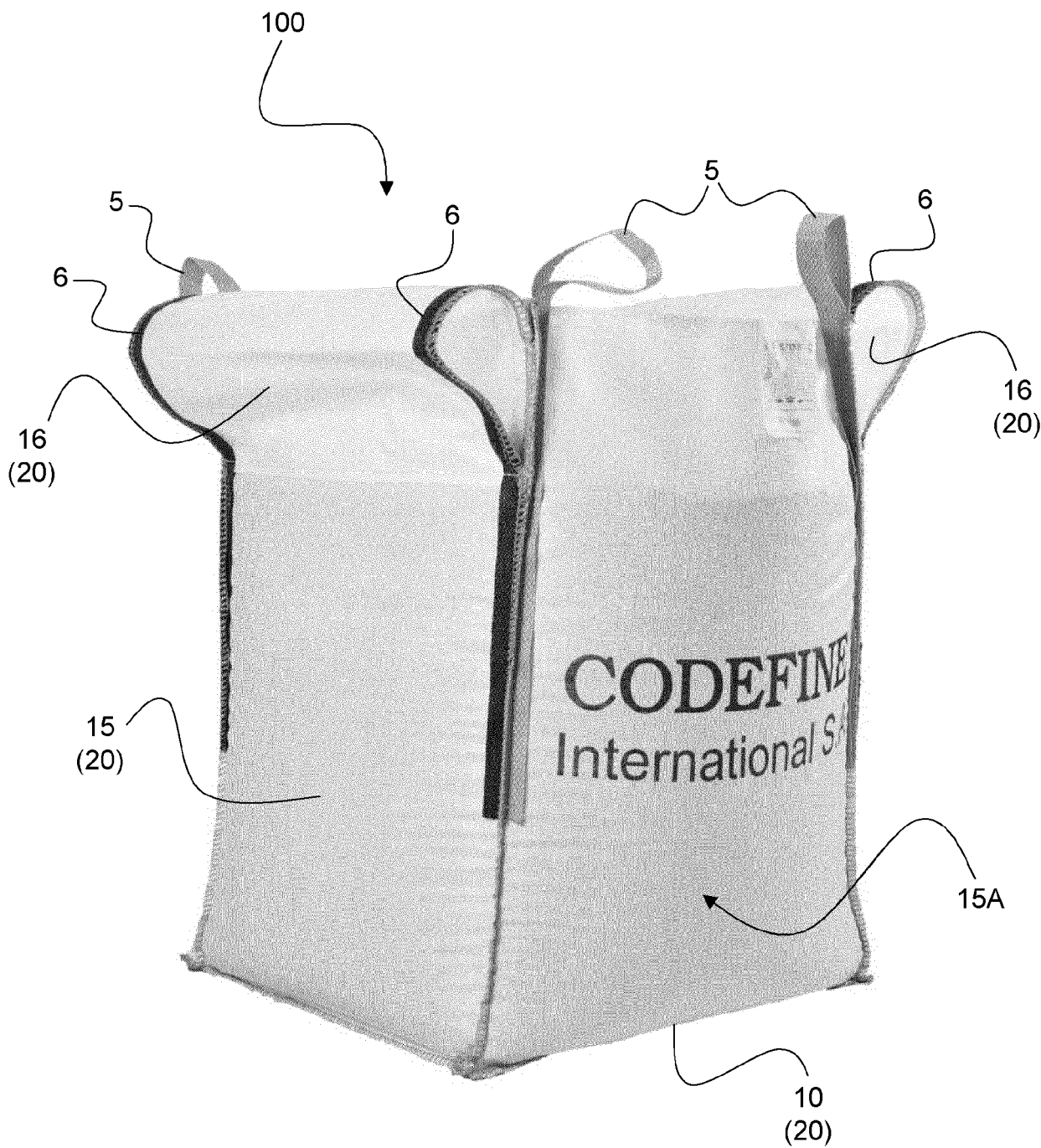


Fig. 1

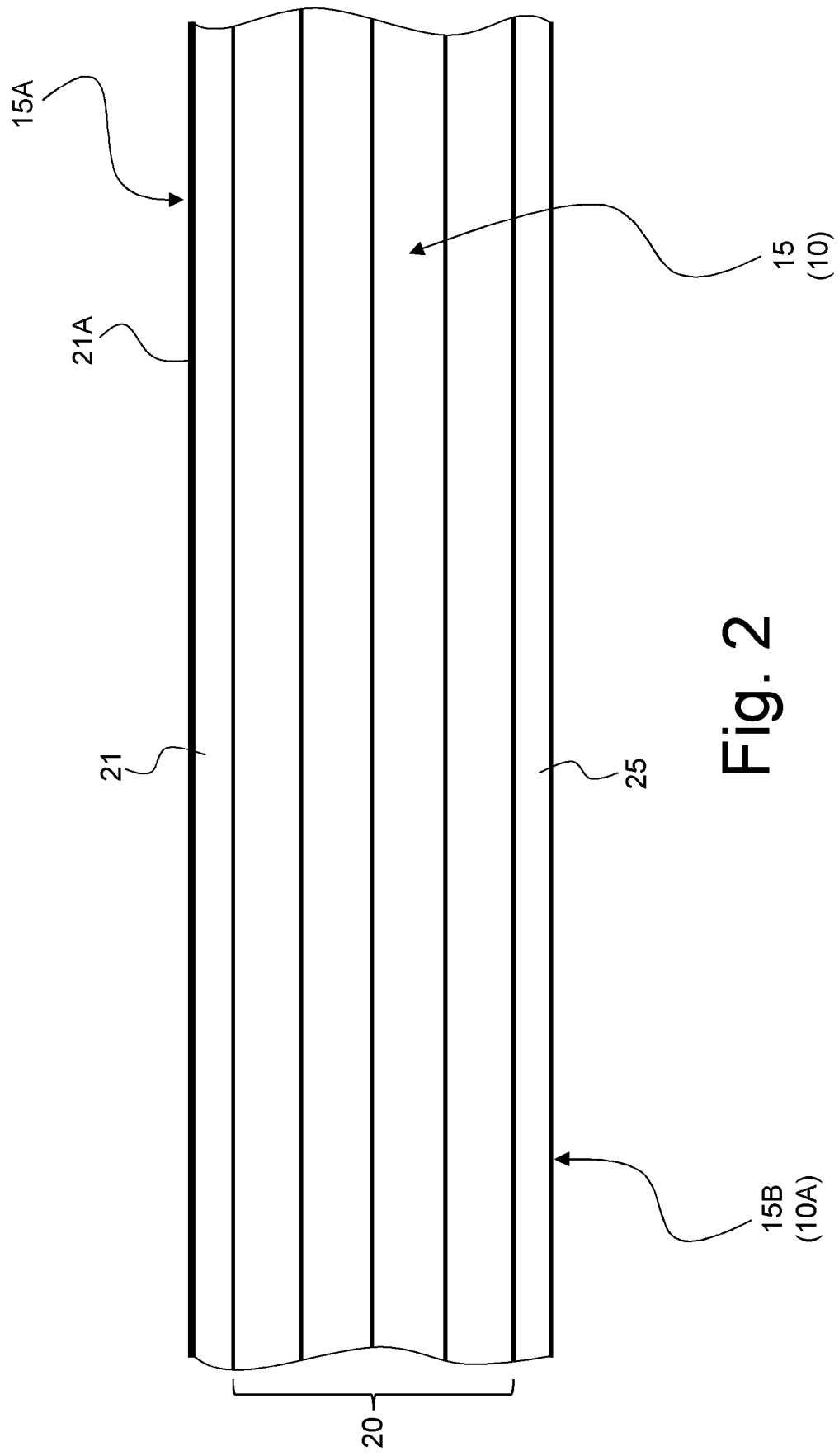


Fig. 2



EUROPEAN SEARCH REPORT

Application Number

EP 23 16 2474

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 071 699 A (PAPPAS ROBERT J [US] ET AL) 10 December 1991 (1991-12-10) * column 2, line 64 - column 3, line 36 * * column 4, lines 20-53 * * column 5, lines 27-35 * * figure 3 *	1-15	INV. B65D88/16
X	JP 2013 049444 A (DIATEX KK) 14 March 2013 (2013-03-14) * page 9, paragraph 56 - page 11, paragraph 73 * * figures 1, 8-10 *	1-15	
A	DE 298 18 049 U1 (EUREA VERPACKUNGSGESELLSCHAFT [DE]) 12 May 1999 (1999-05-12) * page 4, line 29 - page 6, line 11 * * figure 1 *	1, 6, 8	
A	CN 106 480 527 A (KUNMING XIANZHI PLASTICS CO LTD; YUNNAN PACKAGE IND ASS) 8 March 2017 (2017-03-08) * the whole document *	1, 6, 9-11	TECHNICAL FIELDS SEARCHED (IPC) B65D
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 August 2023	Examiner Piolat, Olivier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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

EP 23 16 2474

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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22-08-2023

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REFERENCES CITED IN THE DESCRIPTION

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