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(54) **RECYCLABLE PLASTIC CONTAINER COMPRISING A LABEL**

(57) A container (1) suitable for recycling, wherein the container comprises at least one surface (2), wherein a label (3) comprising an ink area (4) and a no-ink area (5) is attached to the at least one surface via at least one attachment area (6), wherein the attachment area (6) and the ink area (4) have no overlap and the attachment area (6) and the no-ink area (5) have at least one overlap (7).

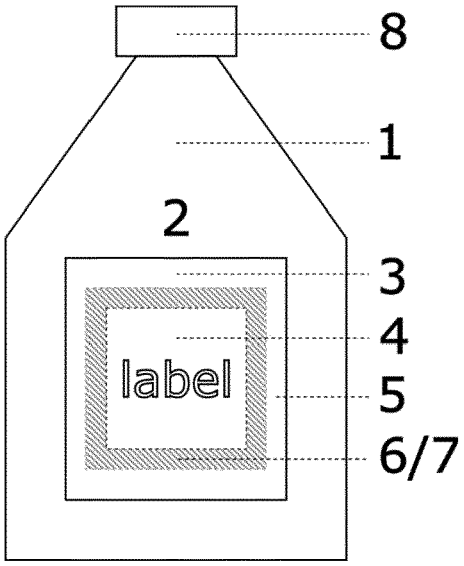

Figure 2

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Description

Technical field

[0001] The present invention relates to a plastic container including a label suitable for recycling, in particular to a medical bottle including a label suitable for recycling.

Background

[0002] Increase in global concern about plastic pollution and its impact on the environment has driven awareness about of the importance of sustainable practices among consumers, and they are seeking products and services that align with their values. The total plastic bottle recycling rate was about 27.2% in 2021. As of 2018, the recycling rate of PET (polyethylene terephthalate) plastic bottles in Norway was 97%, making it a world leader in recycling. In comparison, however, the recycling rate of such plastic bottles in the US was just 29%.

[0003] Recycling of plastics and in particular bottles made from plastics, is thus becoming more and more attractive in view of commercial interests, but also in view of improving acceptance of products made from plastics (cf. Figure 1). Hence, the general need for efficient plastic processes is generally high.

[0004] One of the key steps to insure efficient and high quality recyclate in plastic bottle recycling is the ability to separate the various plastic families. Infrared spectroscopy-based separation, flotation bath and elutration (air jet flow which separates particles by weight) are used to separate the different plastic from each other. Products made from multimaterial packaging complexify the process and impact the recyclability efficiency. Packaging should therefore target to be made as much as possible from the same material, i.e., monomaterial, and allow to discard easily all foreign components, such as ink, from the stream through the sorting processes.

[0005] Thus, several obstacles for such processes are already provided in products produced from plastics. Hence, future product design should consider recyclability of the product. In the field of plastic bottles, labels are typically used to decorate or identify containers. Generally, such labels are made from paper and are attached on the container with adhesives. In view of plastic recyclability, a paper label is not considered as recyclable, as it pollutes the recycling stream of the plastic for the following reasons. First, the paper itself is considered a contaminant and second the ink is also considered as such. These two components cannot be efficiently separated from the main plastic recycling stream. Therefore, in order to efficiently recycle the bottles, it is necessary to prevent contamination of the label and label ink in order to improve the purity of the recycled polymer.

[0006] For PET recycling streams, caustic baths at more than 60 °C are typically used to separate the printed labels from the stream by glue solubilization and/or ink dissolution. Due to the high demand and high volume coming from the beverage industry, recyclers have developed this expensive solution to increase recycling quality.

[0007] For high density polyethylene (**HDPE**) or polypropylene (**PP**) streams, however, such solutions are not available and would not be profitable. Hence, labels of bottles made from such plastics are currently only separated using a tap water bath at room temperatures.

[0008] Nevertheless, some label suppliers are providing solubilization of label glue or inks or both either in water at elevated temperatures or in a special bath (caustic or others for any kind of stream). For example, JP 2000/000874 A suggest providing a plastic bottle, wherein the label is attached to an intermediate layer, which removes the ink in hot alkaline water. Likewise, JP 2000/000879 A suggest providing a plastic bottle having an ink layer, which is removable in hot alkaline water. In a similar approach, in KR 2002/0049872 A it has been suggested to provide a label, which is soluble or swellable in a hot alkaline water bath.

Summary of the Invention

[0009] Still, all of these solutions provide certain disadvantages, as the labels have to be modified. Thus, complexity of the production process of such labels is further increased. Furthermore, negative impacts of the newly introduced features, such as modified intermediate layers, on the separation process still might not have been foreseeable. Finally, the suggested bottles cannot be used in alkaline environments as loss of the label has to be expected.

[0010] Hence, it is therefore the object of the present invention to provide a plastic container having a label, which allows for easy and efficient separation of the ink part from the container material during recycling of the container, and which does not afford a modification of the label itself.

[0011] It has now surprisingly been found out that above-mentioned object is achieved by a container suitable for recycling, wherein the container comprises at least one surface, wherein a label comprising an ink area and a no-ink area is attached to the at least one surface via at least one attachment area, wherein the attachment area and the ink area have no overlap, and wherein the attachment area and the no-ink area have at least one overlap.

[0012] The advantage of such a container is that the label construction is compatible with a recyclable plastic stream. The problem of separating materials of a labelled container during recycling is determined by two requirements: the need to have a monomaterial for IR detection and overall recycling ratio and the need to remove foreign components such as inks. The container of the present invention ensures that the part of the label, which is attached to the container, and which will be separated into the plastics recycling stream, does not comprise any ink. As during recycling the containers are shredded, the

label also will be shredded leaving parts of the label not comprising ink, which are still attached to parts of the container, and parts of the label including ink, which are not attached to parts of the container. These two different parts of the label can then be separated by material dependent separation methods such as by IR/Raman technique and subsequent blowing or by flotation.

Brief Description of the Figures

[0013]

Figure 1 shows a scheme of a plastic recycling process known in the prior art.

Figure 2 shows an embodiment of the present invention having a closed attachment area around the ink area.

Figure 3 shows an embodiment of the present invention having a directed attachment area alongside the edges of the ink area.

Figure 4 shows an embodiment of the present invention having attachment areas at the corners of the no-ink area.

Figure 5 shows an embodiment of the present invention having attachment areas and pre-cut lines at the corners of the no-ink area.

Definitions

[0014] The term *"label"* as used herein denotes a sheet on which information is printed. Thereby, the material of the ink for printing is usually different from the material of the sheet itself. The sheet usually has a thickness in the range of from 10 to 500 microns, preferably 20 to150 microns. The material can be chosen from any polymer suitable for making a film, preferably selected from the list consisting of polyethylene, polypropylene, polyethylene terephthalate, polyvinyl chloride, but also from aluminum, and/or paper. Typically, the label is attached by gluing or welding to the container surface. Preferably, the uppermost layer or surface of the label is suitable for being printed thereon. It should be noted that the suitability for printing of the label depends on the surface tension of the surface of the label. Generally, it can be assumed that increasing the surface tension improves the suitability of the label for printing thereon. Usually, surface tension is a parameter of reference for printability. A film is considered as printable with a surface tension af at least 32 dyn, preferably more than 38 dyn, most preferably more than 42 dyn. To increase the surface tension of plastic films standard processes like corona treatment, plasma treatment, flame treatment or radiation-treatment are known.

[0015] The term *"recycling"* as used herein denotes in particular the recycling of articles comprising plastic material such polyolefins. The first steps of plastic recycling usually are concerned with shredding and washing, thereby yielding shredded particles of the former article. These particles can be separated based on the main component comprised therein. Separation methods are gravity separation (e.g air elutration), electrostatic separation, magnetic density separation, flotation, and sensor-based sorting. After sorting the material, usually melting and additional cleaning steps or solving/precipitating and additional cleaning steps is carried out to achieve the final product.

[0016] The term *"additives"* as used herein denotes further components, which can be present in polymer compositions to modify their physical properties. Examples of additives antioxidant(s), stabilizer(s), such as process stabilizers and UV stabilizers, acid scavenger(s), metal deactivators, crosslinking agents, such as free radical generating agent(s), e.g., organic peroxide(s), scorch retarder(s) (SR), crosslinking booster(s), processing aid(s), flame retardant additive(s), water tree retardant additive(s), inorganic filler(s), and voltage stabilizer(s). These groups of additives and the individual additive compounds therein are usually well known in the polymer field.

[0017] The term *"irrigation"* or *"irrigation application"* as used herein denotes the process of mechanical cleansing of surgery objects during topical, intra- or postoperative surgical interventions using an irrigation solution. This is typically achieved by pouring the irrigation solution on the surgery object and rinsing it. Alternatively, such a process is achieved by pouring out liquid in an intermediate recipient (like a kidney bowl), from which the solution is then taken out with a syringe to be spread onto the object. The goal of the irrigation is to clear a surgical object from, e.g., blood and tissue to keep the surgery object sterile, prevent infections, moisten the surgery object, wound tamponades, cloths, bandages, and dressings, cleansing of operating instruments and accessories, and/or make the object visible for the surgeon. It is understood that prior to and/or during the process of irrigation, the container comprising the irrigation solution has to be put aside, at least one time.

[0018] The term *"irrigation solution"* as used herein denotes a liquid used in irrigation application. Irrigation solutions have to be sterile. An irrigating solution is suitable for killing microorganisms, disrupting the biofilm on surgery objects, inactivating virulence factors such as endotoxin, dissolving pulp-tissue remnants, removing hard-tissue debris and the smear layer created during instrumentation or prevent their formation, providing lubrication for instruments, and being biocompatible. Usually, an irrigation solution is based on water. Optionally, it can be mixed with an adjuvant. Adjuvants may be sodium chloride, sodium hypochlorite, potassium chloride, calcium chloride, chlorhexidine, ethylenediamine tetraacetic acid, citric acid, etidronic acid, maleic acid, sodium lactate, or mixtures thereof. Most preferably, irrigation solutions are selected from the list consisting

of 0.9% aqueous sodium chloride solution, Ringer's lactate solution, and distilled water.

[0019] The term *"infusion solutions"* as used herein denotes solutions, preferably aqueous solutions, suitable for being used in intravenous (IV) therapy. Thereby, the type of the fluid depends on the aim of intravenous therapy, which can be volume expansion, i.e., the administration of fluid-based solutions or suspensions to target specific areas of the body which need more water, or fluid replacement. Hence, preferably, infusion solutions are volume expander solutions or fluid replacement solutions. Volume expander solutions are preferably selected from crystalloids or colloids. Preferably, crystalloids are aqueous solutions of mineral salts or other small water-soluble molecules, preferably are selected from saline solution, most preferably 0.9% saline solution, Ringer's lactate solutions, and hypotonic solutions. Colloids are preferably aqueous solutions comprising macromolecules, wherein the macromolecules are preferably selected from the list consisting of gelatin, albumin, hydroxyethyl starch, gelofusine, and fresh frozen plasma.

[0020] The term *"sterile"* as used denotes the status of an object having a significantly reduced number of bacteria and/or viruses on its surface to reduce the risk of an infection. In particular, the term *"sterile"* denotes an object or substance, which has a bioburden load of lower than 10^{-6}. The bioburden load can be measured i.e., according to ISO 11737-1:2018.

[0021] The term *"sterilization"* as used herein denotes a method to destroy all forms of living microorganisms from a substance. As there is always a certain probability of at least one microorganism to survive such procedure, the aim of sterilization is the reduction of initially present microorganisms or other potential pathogens. Generally, sterilization is accepted to be achieved if the bioburden load of the substance of object to be sterilized is lower than 10^{-6}. The bioburden load can be measured i.e., according to ISO 11737-1:2018. Sterilization can be achieved using several methods. In one sterilization process the object is heated up to at least 105 °C to achieve a sterile object. Thereby, the object should not be deformed by the elevated temperature. Preferably, the heating step is performed in an autoclave. In another sterilization process, the object is brought into contact with toxic gases such as a mixture of ethylene oxide and carbon dioxide. Filtration methods are also used to sterilize liquids, i.e., by using membrane filters, Seitz filters, and/or candle filters. Finally, sterilization can be achieved by indirect energy import into or onto the object, e.g., by ultrasonic waves, ultraviolet light, as well as by high energy particles (such as electrons, gamma- or X-rays).

[0022] The term *"medical container"* as used herein denotes a container, which is suitable for being used in medical applications. Preferably, the medical container is suitable for enclosing irrigation solutions or infusion solutions. As irrigation solutions and in some cases also infusion solutions need sterilization, preferably, the medical container is suitable for sterilization applications.

[0023] The term *"cylindrical shape"* as used herein denotes also cylindrical shapes having varying diameter, i.e., a bottle having a smaller diameter in the middle part to allow for better handling.

Detailed Description of the Invention

[0024] The present invention is illustrated in Figures 2, 3, and 4. The most general embodiment of the present invention relates to a container (**1**) suitable for recycling, wherein the container (**1**) comprises at least one surface (**2**), wherein a label (**3**) comprising an ink area (**4**) and a no-ink area (**5**) is attached to the at least one surface (**2**) via at least one attachment area (**6**), wherein the attachment area (**6**) and the ink area (**4**) have no overlap and the attachment area (**6**), and the no-ink area (**5**) have at least one overlap (**7**).

[0025] The requirement that there is no overlap of the attachment area (**6**), and the ink area (**4**) has the advantage that upon shredding the container in a recycling process, particles including ink from the ink area (**4**) are not attached to parts of the surface (**2**) of the container (**1**)**.** These particles can be separated from the particles including parts of the surface of the container in a follow up separation process. Hence, a recycling stream, which is not contaminated by ink, can be prepared. Furthermore, a recycling stream, which has lower contaminations of the label material can also be provided.

[0026] Preferably, the ink area (**4**) and the no-ink area (**5**) having at least one overlap (**7**) are spaced apart by no-ink area (**5**) having no overlap at any point of the label by at least 1 mm, preferably 2 mm, and most preferably 3 mm. This embodiment has the advantage that it is ensured that no ink is still left on parts of the label still attached to the bottle after shredding. Hence, ink introduction into the recycling stream is further reduced.

[0027] The container (**1**) can be a bottle or a pouch. Preferably, the container (**1**) is a pharmaceutical container. Hence, more preferably, the container (**1**) is suitable for irrigation solutions, and/or infusion solutions, in particular for containing irrigation solutions, and/or infusion solutions, and/or for withstanding sterilization conditions. Most preferably, the container (**1**) is a bottle, more preferably a blow-molded bottle. In a most preferred embodiment of the present invention, the container is a blow-molded bottle suitable for irrigation solutions, and/or infusion solutions, in particular for containing irrigation solutions, and/or infusion solutions, and/or for withstanding sterilization conditions.

[0028] Preferably, the material of the container (**1**) is a polymer, more preferably a polymer selected from polyolefins, polyethylene terephthalate, polystyrene, polyvinyl chloride, or mixtures thereof, more preferably a polyolefin selected from the list consisting of polyethylene, polypropylene, or mixtures thereof. Such polymers can be efficiently processed in particular in a blow-molding process to produce said bottles. Furthermore, these polymers are inert in view of most of the liquids usually

used in the bottles, in particular to irrigation solutions, and/or infusion solutions.

[0029] Preferably, the material of the container comprises at least 90 wt.-% of the polymer with respect to the total weight of the material of the container, preferably at least 95 wt.-%, most preferably at least 98 wt.-%. This improves the recyclability of the material used in the container. Generally, the lower the amount of additives and the higher the amount of polymer, the better the recyclability. Hence, preferably, the amount of additives in the material of the container is 10 wt.-% or less with respect to the total weight of the material of the container, preferably 5 wt.-% or less, most preferably 2 wt.-% or less.

[0030] Preferably, the material of the container (**1**) of the present invention has a haze value measured according to ASTM D1003, Procedure B, of less than 60%, preferably less than 30%, more preferably less than 25%, and most preferably less than 15%. This ensures that unscattered light is transported through the surface (**2**) of the container (**1**), allowing the user to look inside the container (**1**) and estimate the filling status of the container (**1**)**.**

[0031] Typically, the present invention works with any shape of a container. Nevertheless, preferably, the container according to the present invention has a substantially cylindrical shape. Furthermore, the shape of the bottle preferably can comprise holding means such as grip areas and handles.

[0032] Furthermore, the container according to the present invention preferably has at least one outlet (**8**). More preferably, the container (**1**) has just one outlet (**8**)**.** Most preferably, the outlet (**8**) is positioned at one of the base areas of the cylindric shape of the container. More preferably, the base area comprising the outlet (**8**) has a conical shape with the outlet (**8**) at the top. Preferably, the outlet (**8**) is selected from the list consisting of a screw cap opening, a tear-off opening, a spout, a twist-off opening, a tube, a valve, an elastomeric pierceable closing, any other known suitable outlet for infusion or irrigation application.

[0033] Generally, the label (**3**) of the container (**1**) of the present invention can have any two-dimensional form, wherein the two-dimensional form is selected from the list consisting of circles, ellipses, triangles, squares, rectangles, generally polygons, but also Reuleaux polygons having circular arcs instead of straight lines as edges, as well as mixtures thereof. Nevertheless, due to advantages in view of material usage, processability and printability, rectangle or square shaped labels are preferred.

[0034] Hence, depending on the shape of the label (**3**), the label (**3**) might have just one edge, i.e., in case of a circle or an ellipsis. In case the label (**3**) comprises corners, i.e., in case of a square or a rectangle, it comprises more than one edge. Thus, the label is an area having at least one edge, preferably is a square or rectangle having four edges.

[0035] Generally, the shapes of the ink area (**4**) and the no-ink area (**5**) are independent of the shape of the label (**3**). However, preferably, the sum of the shapes of the ink area (**4**) and the no-ink area (**5**) equals the area of the label (**3**). Furthermore, preferably, in the container according to the present invention, the centroid of the ink area (**4**) and the centroid of the no-ink area (**5**) are at the same position. Also preferably, in the container according to the present invention, the centroid of the ink area (**4**) and the centroid of the label (**3**) are at the same position. Likewise, preferably, in the container according to the present invention, the centroid of the no-ink area (**5**) and the centroid of the label (**3**) are at the same position.

[0036] Preferably, the no-ink area (**5**) is located adjacent to the at least one edge of the label (**3**). This ensures that the attachment area (**6**) is not located at the center of the label, but rather at the outer parts of the label. If the attachment area is located at the center of the label, the label will not be attached to the surface of the bottle at its edges, which can lead to loss of the label during handling and transporting the bottle. Hence, more preferably, the no-ink area (**5**) is located along all edges of the label (**3**) thereby enclosing the ink-area (**4**). Most preferably, the ink area (**4**) is at least partially, preferably completely, surrounded by the no-ink area (**5**)**.**

[0037] The attachment between the label (**3**) and the surface (**2**) of the container by the attachment area (**6**) can be achieved by any means suitable for providing a durable connection between the materials thereof. Preferably, the attachment is achieved by gluing or welding. Preferably, the glue a recyclable glue. A recyclable glue is a glue, which is compatible with the recycling stream. Likewise, preferably, the welding comprises a recyclable welding layer, wherein a recyclable welding layer comprises, preferably consists of, the same material as the container (**1**). Such an embodiment has the advantage of maximizing the amount of recyclate and facilitates the sortability. However, the present invention already improves recyclability in the most general embodiment in this regard, as the reduction of glue quantity results in only a portion of the label surface being coated with glue.

[0038] Figure 2 shows a first preferred embodiment of the container (**1**) of the present invention. The container (**1**) is a cylindrical bottle with a conical base area at the top having an outlet (**8**) in form of a screw cap at the top of the cone. The label (**3**) is located at the surface (**2**) of the bottle (**1**), in particular in the non-conical, i.e., cylindrical part. This has the advantage that the label (**3**) can be attached by processing means while rolling the bottle. The label (**3**) itself has a rectangular shape. The shape of the ink area (**4**) is also rectangular, but smaller than the shape of the label (**3**). The centroids of the label (**3**) and the ink area (**4**) are at the same position. The no-ink area (**5**) has the same outer boundaries such as the label (**3**), wherein the inner boundaries of the no-ink area (**5**) match the outer boundaries of the ink area (**4**). In Figure 2, the attachment area is smaller than the no-ink area (**5**), is located adjacent to all edges of the ink area (**4**) and encloses the ink area (**4**). However, preferably, the at-

tachment area (**6**) has the same shape as the no-ink area (**5**) or is adjacent to the outer edges of the no-ink area (**5**). This prevents accidentally peel-off and loss of the label by non-attached edges. Generally, the first preferred embodiment has the advantage of a strong connection of the label (**3**) to the bottle (**1**) due to the circulating shape of the attachment area (**6**). However, the disadvantage is that during automatic labelling, in which the label (**3**) is usually applied by a roll to the rolling bottle (**1**), the attachment is complicated, as the part of the attachment area (**6**), which extends alongside the axis of the cylindrical part of the bottle (**1**), has to be applied in exact synchronous mode to the edges of the label (**3**).

[0039] Hence, preferably, in the container (**1**) according to the present invention the attachment area (**6**) is adjacent to the at least one outer edge of the no-ink area (**5**). More preferably, the at least one outer edge of the label (**3**) and the no-ink area (**5**) is identical, and the attachment area (**6**) is adjacent to the at least one outer edge of the no-ink area (**5**).

[0040] Figure 3 refers to a second preferred embodiment of the bottle (**1**) of the present invention, which has most features in common with the first preferred embodiment of Figure 2. However, the attachment area does not enclose the ink area (**4**) anymore. Rather, the rectangular shapes of the attachment area (**6**) extend along the rolling direction of the cylindrical part of the bottle (**1**)**.** This embodiment has the advantage that during automatic labelling of the bottle (**1**), which is usually applied by a roll to the rolling bottle (**1**), the attachment area can be applied in continuous mode, e.g., by further rolls, to the label (**3**) before attaching it to the bottle (**1**)**.** The disadvantage of the second preferred embodiment is that the connection between the label (**3**) and the bottle (**1**) is less strong in comparison to the first preferred embodiment of Figure 2.

[0041] Hence, preferably, the container (**1**) has a substantially cylindrical shape, and the attachment area (**6**) has a shape, which comprises at least one rectangle, wherein the direction of the longer edges of the at least one rectangle extends perpendicular to the axis of the cylindrical shape of the container (**1**).

[0042] Figure 4 depicts a third preferred embodiment of the present invention, in which the attachment area (**6**) is located at the corners of the label (**3**), and thus at the corners of the no-ink area (**5**). Due to the circle shape of the attachment area (**6**), the overlap (**7**) is smaller than the attachment area (**6**)**.** However, preferably, the overlap (**7**) and the attachment area (**6**) have the same shape. Thus, preferably, in the third preferred embodiment of Figure 4, the attachment area (**6**) has the shape of the overlap (**7**), i.e., a section of a circle. This embodiment has the advantage that the attachment area (**6**) without sacrificing the overall strength of the attachment of the label (**3**) to the container (**1**) too much. This is in particular useful, if the attachment area (**6**) also comprises material, which is not considered recyclable, such as a specific glue. Hence, the third preferred embodiment helps minimizing entrainment of such material into the recycling stream.

[0043] Hence, preferably, the label (**3**) has a rectangular shape, and the attachment area (**6**) comprises four areas in the shape of a circle section matching each corner of the label (**3**). More preferably, the ratio of the area of the label (**3**) to the attachment area (**6**) is not lower than 90:10, preferably not lower than 99:1.

[0044] Figure 5 shows a fourth preferred embodiment of the third preferred embodiment as depicted in Figure 4. In this fourth preferred embodiment, the label (**3**) comprises precut lines (**9**) at the corners. Thereby, precut lines (**9**) are areas in the label (**3**), in which the material of the label (**3**) has been weakened. This can be achieved by either perforation of the material or thinning of the material, e.g., by stamping. This fourth preferred embodiment has the advantage that the label (**3**) can be more efficiently removed from the corners including the attachment area (**6**) before or during recycling.

[0045] Hence, preferably, the label (**3**) has a rectangular shape, the attachment area (**6**) comprises four areas in the shape of a circle section matching each corner of the label (**3**), and the label (**3**) comprises precut lines (**9**) in at least one of the corners, preferably all corners, of the label (**3**)**.**

[0046] In another preferred embodiment of the invention, the material of the container (**1**) has a lower density than the material of the label (**3**)**.**

[0047] The requirement that the density of the material of the container (**1**) has to be lower than the density of the material of the label (**3**) results in the advantage that these materials can be separated by flotation techniques after shredding.

[0048] More preferably, the material of the container (**1**) has a density of lower than 1.3 g/cm^3, preferably lower than or equal to 1.2 g/cm^3, more preferably lower than or equal to 1.1 g/cm^3, and most preferably lower than or equal to 1.0 g/cm^3. Usually, polyethylene (and also high density polyethylene) and polypropylene have densities below 1.0 g/cm^3. Hence, it is preferred that the material of the container (**1**) comprises a polymer selected from polyethylene or polypropylene.

[0049] Likewise, preferably, the material of the label (**3**) comprises, preferably consists of, a polymer, preferably a polymer selected from polyethylene terephthalate, polyvinyl chloride, or mixtures thereof. More preferably, the material of the label (**3**) has a density of higher than or equal to 1.3 g/cm^3, more preferably higher than or equal to 1.35 g/cm^3. Usually, i.e., polyethylene terephthalate has a density of more than 1.3 g/cm^3. Hence, most preferably, the material of the label comprises polyethylene terephthalate. Such an embodiment is depicted in Figure 6.

[0050] In particular when using polyethylene terephthalate as the base material of the layer, it can happen that other means preceding the flotation process step and in particular the shredding step could identify the material as belonging to a PET container. This can occur,

e.g., during IR/Raman material detection and preselection into certain streams. A container comprising a comparably large label (**3**) (such as more than 50% of the surface (**2**) of the container (**1**)) could be identified as a PET container.

[0051] To solve this problem, the present invention provides multilayer labels. Hence, the label (**3**) of the container according to present invention preferably is a multilayer of at least one layer made from a material having a density of higher than or equal to 1.3 g/cm^3, more preferably higher than or equal to 1.35 g/cm^3., and at least one layer made from a material having a density of lower than 1.3 g/cm^3, preferably lower than or equal to 1.2 g/cm^3, more preferably lower than or equal to 1.1 g/cm^3, and most preferably lower than or equal to 1.0 g/cm^3, wherein the overall density of the label (**3**) is higher than the density of the material of the container (**1**), preferably is higher or equal to 1.3 g/cm^3. Thereby, preferably, the label (**3**) is attached to the surface of the container in that the layer having the largest distance to the surface of the container. Hence, in a specific embodiment, the multilayer label (**3**) of the container (**1**) comprises at least one layer comprising polyethylene terephthalate and at least one layer comprising a polymer selected from polyethylene or polypropylene, wherein the overall density of the label (**3**) is higher than the density of the material of the container (**1**), preferably is higher or equal to 1.3 g/cm^3 and wherein the at least one layer comprising a polymer selected from polyethylene or polypropylene has the largest distance to the surface (**2**) of the container (**1**)**.** Such an embodiment is depicted in Figure 7.

Claims

1. A container (**1**) suitable for recycling,

wherein the container (**1**) comprises at least one surface (**2**),
wherein a label (**3**) comprising an ink area (**4**) and a no-ink area (**5**) is attached to the at least one surface (**2**) via at least one attachment area (**6**),
wherein the attachment area (**6**) and the ink area (**4**) have no overlap and the attachment area (**6**), and the no-ink area (**5**) have at least one overlap (**7**)**.**

2. Container according to claim 1, wherein the container (**1**) is suitable for irrigation solutions, and/or infusion solutions.

3. Container according to claim 1 or 2, wherein the container (**1**) is a bottle, preferably a blow-molded bottle.

4. Container according to any of the preceding claims, wherein the material of the container (**1**) is a polymer, preferably a polymer selected from polyolefins, polyethylene terephthalate, polystyrene, polyvinyl chloride, or mixtures thereof, more preferably a polyolefin selected from the list consisting of polyethylene, polypropylene, and mixtures thereof.

5. Container according to claim 4, wherein the material of the container comprises at least 80 wt.-% of the polymer with respect to the total weight of the material of the container, preferably at least 90 wt.-%, most preferably at least 95 wt.-%.

6. Container according to any of the preceding claims, wherein the material of the container has a haze value measured according to ASTM D1003, Procedure B, of less than 60%, preferably less than 30%, more preferably less than 25%, and most preferably less than 15%.

7. Container according to any of the preceding claims, wherein the container (**1**) has a cylindrical shape.

8. Container according to any of the preceding claims, wherein the container (**1**) has at least one outlet (**8**).

9. Container according to claim 8, wherein the outlet (**8**) is selected from the list consisting of a screw cap opening, a tear-off opening, a spout, a twist-off opening, a tube, a valve, an elastomeric pierceable closing, and any other known suitable outlet for infusion or irrigation application.

10. Container according to any of the preceding claims, wherein the label is an area having at least one edge, preferably is a rectangle, preferably square, having four edges.

11. Container according to claim 10, wherein the no-ink area (**5**) is located adjacent to the at least one edge, preferably is located along all edges of the label (**3**) thereby enclosing the ink-area (**4**)**.**

12. Container according to any of the preceding claims, wherein the attachment area (**6**) is adjacent to at least one outer edge of the no-ink area (**5**), preferably wherein the at least one outer edge of the label (**3**) and the no-ink area (**5**) is identical, and the attachment area (**6**) is adjacent to the at least one outer edge of the no-ink area (**5**).

13. Container according to any of the preceding claims, wherein the container (**1**) has a substantially cylindrical shape, and the attachment area (**6**) has a shape, which comprises at least one rectangle, wherein the direction of the longer edges of the at least one rectangle extends perpendicular to the axis of the cylindrical shape of the container (**1**)**.**

14. Container according to any of the preceding claims, wherein the label (**3**) has a rectangular shape, and the attachment area (**6**) comprises four areas, preferably in the shape of a circle section, matching each corner of the label (**3**), and/or wherein the label (**3**) comprises precut lines (**9**) in at least one of the corners, preferably all corners, of the label (**3**)**.**

15. Container according to any of the preceding claims, wherein the ink area (**4**) and the no-ink area (**5**) having at least one overlap (**7**) are spaced apart by no-ink area (5) having no overlap at any point of the label by at least 1 mm, preferably 2 mm, and most preferably 3 mm.

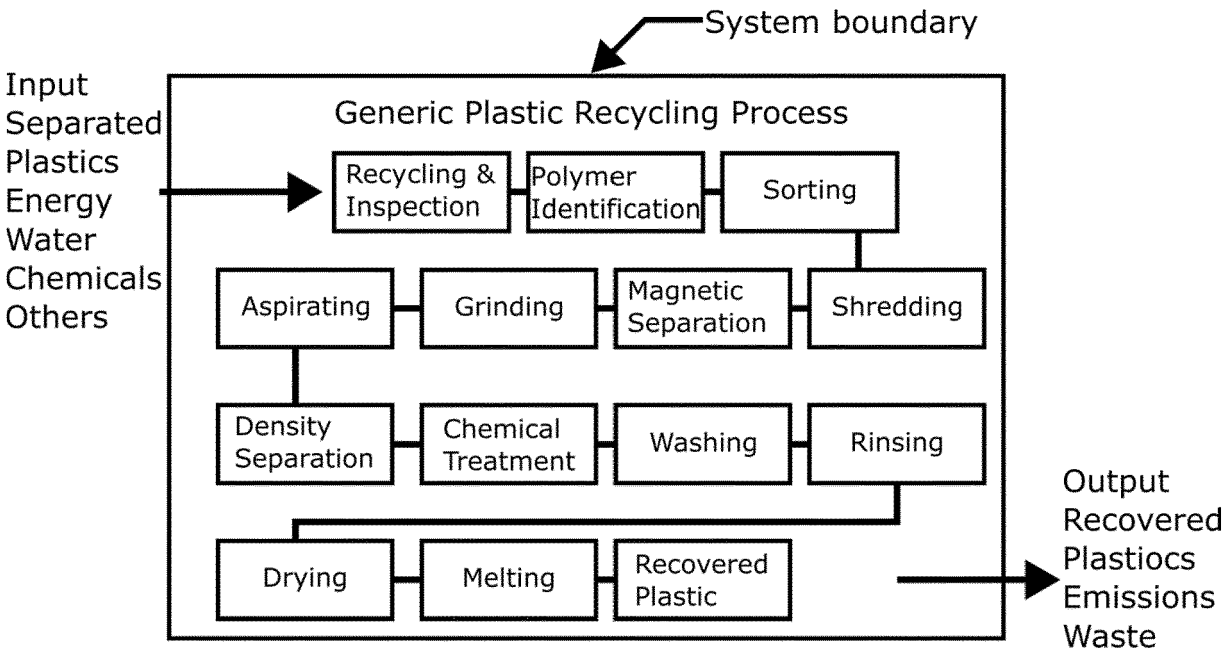

Figure 1

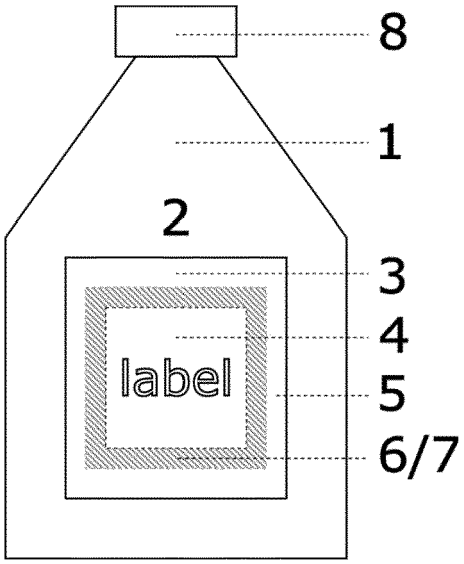

Figure 2

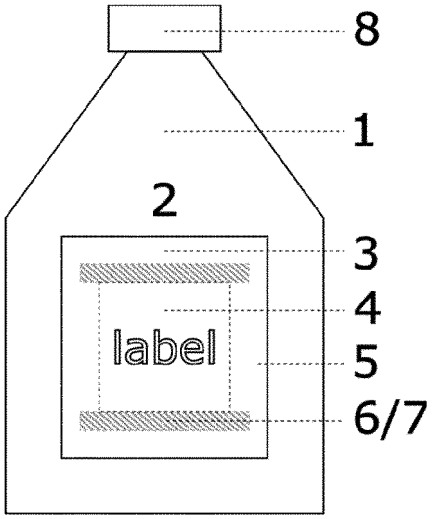

Figure 3

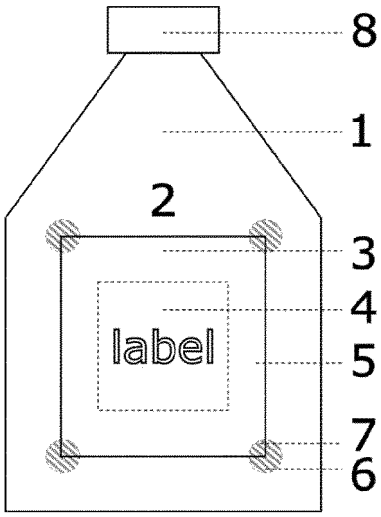

Figure 4

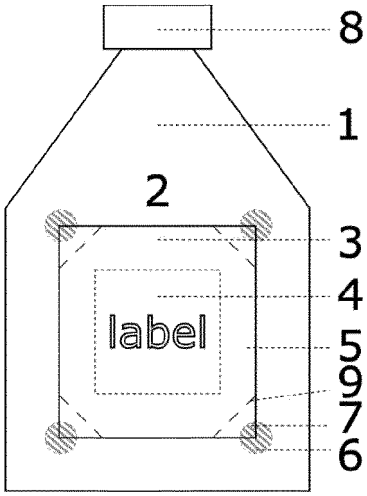

Figure 5

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 3253

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 January 2024	Bridault, Alain

CATEGORY OF CITED DOCUMENTS

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19-01-2024

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