



(51) International Patent Classification:
B65B 69/00 (2006.01)

(21) International Application Number:

PCT/EP2024/068448

(22) International Filing Date:

01 July 2024 (01.07.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

23185196.5 13 July 2023 (13.07.2023) EP

(71) Applicant (for all designated States except US):
UNILEVER IP HOLDINGS B.V. [NL/NL]; Weena 455,
3013 AL Rotterdam (NL).

(71) Applicant (for US only): **CONOPCO, INC., D/B/A
UNILEVER** [US/US]; 700 Sylvan Avenue, Englewood
Cliffs, New Jersey 07632 (US).

(72) Inventor: **KALASIC, Vladimir**; Unilever Innovation Cen-
tre Wageningen B.V. Bronland 14, 6708 WH Wageningen
(NL).

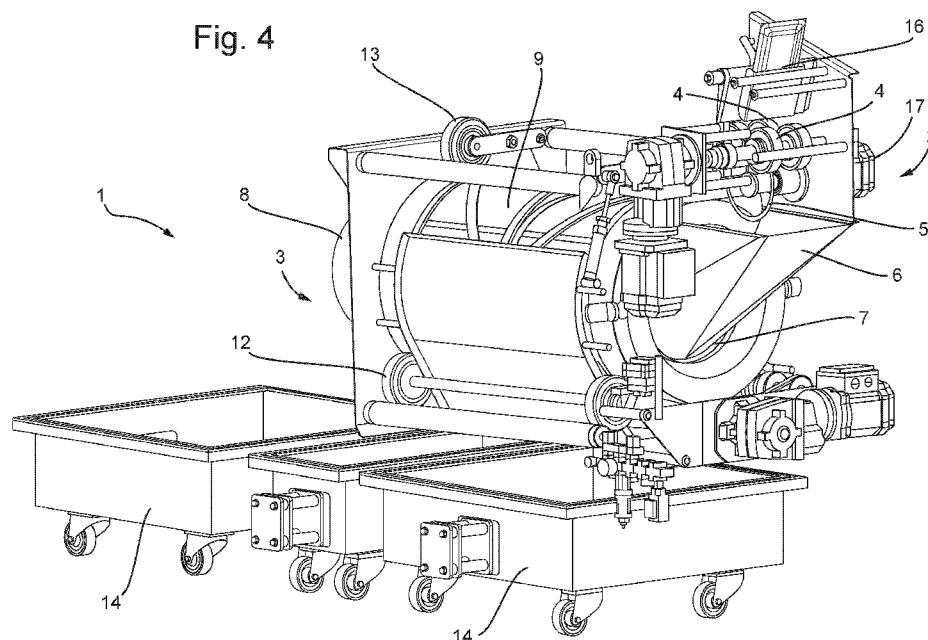
(74) Agent: **FIJNVANDRAAT, Arnoldus, Cornelis**; Unilever
Patent Group, Bronland 14, 6708 WH Wageningen (NL).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,
MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,
TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,

(54) Title: WASTE SEPARATOR DEVICE

Fig. 4



(57) Abstract: The invention relates to an apparatus (1) for separating flexible packaging material from packaged consumer product, preferably dry food products in powdery form, wherein the apparatus comprises a cutting system (2) comprising one round knife blade (5), and a separator system (3) comprising at least one separator drum (8) comprising a sieve wall (9).



RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *of inventorship (Rule 4.17(iv))*

Published:

- *with international search report (Art. 21(3))*
- *with amended claims (Art. 19(1))*

WASTE SEPARATOR DEVICE

The present invention relates to an apparatus to separate flexible packaging material from its contents and a process to separate packaged content from its packaging material.

Background

Consumer goods such as for example dry food products are typically packaged in flexible packaging material such as a sachet. The packaging material may be paper based or comprise polymer material. Packaged consumer products, such as dry food products, are often produced in an amount that exceeds the envisioned demand or are filled in a packaging with too much or too little product ending up in the sachet. Indeed, issues like supply chain irregularities, seasonal consumer preferences, variation in filling procedures are factors that may result in stocks of the packaged consumer product that will not be used anymore and are left to be discarded or in products that are filled with an amount of product that was not intended. Discarding these non-used products clearly could result in complications in recyclability, for example where the content of the packaging allows for organic recycling but the packaging itself requires a different recycling regime. In case the consumer product is not expired and is still of excellent quality to be consumed or used otherwise, destruction of the excess of packaged product results in unnecessary waste of material, such as unnecessary waste of food, that could result in significant avoidable costs.

A complication is that once the consumer product, such as a dry food product, has been packaged, it is very time consuming to open the individual packages again to separate the packaging material from the consumer product. This task becomes even more complicated when the amount of excess product is high, such as faced on an industrial scale in a factory for producing packaged food products. The need for automating the separation of packaging material, at least to some extent, from the packaged product is eminent. Complications in this process are, however, diverse. For example, the individual units of packaged material can differ in size and type of material. The packaging material is typically not food-grade, and in case the consumer product to be separated from its packaging is a food product, no traces of packaging material should be mixed with the food product. The packaged consumer product may be inhomogeneous. For example, in the case of a dry food product, the food product may comprise a base mixture, typically in powder form, and particulate ingredients of a bigger size, such as for example dried noodles, dried pieces of vegetables, mushroom etc. Ideally, the process should allow for opening of the packaging, emptying the packagings, separating the consumer product from the remaining of the packaging without leaving much content in the packaging and

creating a packaging material stream to be discarded or recycled and one or more dry consumer product streams, to be discarded, recycled or optimally, to be reused in a food-safe manner.

A need therefore was recognized for an apparatus that allows for high-volume separation of packaged consumer product, in particular packaged dry food product, from its flexible packaging. In addition, there is a need for a process to separate packaged consumer product, in particular packaged dry food product, from its packaging.

US 4543029 relates to a device for cutting flexible containers containing fungible material. It discloses a device for cutting of bags of paper, synthetic material, jutes, or the like, containing powdery up to granular and/or granulated or flocculent materials, as well as for loosening or separation of the goods from the bags or its parts.

GB1235721 relates to improvements in and relating to handling bags containing powdered and other particulate material and discloses an apparatus for emptying bags of powdered or particulate materials comprising a slitter unit in which the filled bags are fed between spaced rotary cutters for slitting the bag walls into a multiplicity of strips to release the contents and from which strips and content are delivered to a separator unit.

US5193753 relates to an apparatus for disintegrating flexible packaging materials and discloses an apparatus for reprocessing, *i.e.* disintegrating, used packing materials, for example unsorted domestic waste paper.

US2005/0019141A1 relates to a separation device and discloses a device for separating a sheet-shaped packaging from the material packaged therein, particularly bulk goods, comprising a drum, and a driver adapted for driving the drum about a center line thereof, wherein the drum forms an accommodation space for the packaged material and is provided at the inside with blades for ripping apart the packaging.

US9174755 relates to a sack cutting means for offshore emptying of content from a packaging comprising means for cutting up the package, means for separating the package from its content and means for removing the emptied package from the cutting means.

Although separation devices to separate material mixes have been described in the art, the inventors of the apparatus and process of the present invention are not aware of any device suited for separation of consumer product, such as dry food product, that is packaged in flexible

packaging material such as in sachets, from the sachet material in an efficient, food grade manner that is suitable to be applied on industrial scale.

Summary of the invention

5 Surprisingly, this problem was solved, in a first aspect, by an apparatus (1) for separating flexible packaging material from packaged consumer product, the apparatus comprising:

- A cutting system (2),
- A separator system (3),

wherein the cutting system comprises:

- 10
- one circular cutting blade (5),
 - guiding means comprising two sets of guidance rolls (4), located at both sides and parallel to the cutting blade,

wherein the cutting system is connected to the separator system to feed the separator system, wherein the separator system comprises:

- 15
- at least one separator drum (8) comprising a sieve wall (9),
 - a driving mechanism (12) to rotate the drum.

and wherein the separator drum is positioned with an entrance area (7) higher than an exit area (11) of the drum, preferably to form an angle of between 0.5 and 10 degrees.

20 In a further aspect, the invention relates to a process to separate a consumer product packaged in a flexible packaging from its packaging, the process comprising the steps of:

- a) Feeding consumer product packaged in flexible packaging into the cutting system of the apparatus of the invention.
 - b) Cutting the packaging to result in two parts of the initial flexible packaging,
 - 25 c) Feeding the parts of flexible packaging and the initially packaged consumer product, resulting from step b), into the entry side of the separator drum of the separator system of the apparatus of the invention,
 - d) Separating the consumer product from the packaging material, wherein the separation involves rotating of the separator drum,
 - 30 e) Allowing the consumer product to escape the separator drum through the sieve wall,
 - f) Allowing the packaging material to leave the separator drum at the exit side of the drum,
- thereby separating flexible packaging material from the consumer product.

35 In a further aspect, the invention relates to the use of an apparatus according to the invention to separate consume product, preferably dry food product, from flexible packaging material.

Figures

Figure 1 shows a cutting system according to the invention, including guidance means, motors and cutting means.

Figure 2 shows a perspective view of a separator system of the invention.

5 Figure 3 shows a cross sectional view of a separator system according to the invention.

Figure 4 shows a perspective view of the inside of a separator apparatus according to the invention. Several parts of the housing are removed in this picture to show the relevant parts inside of the apparatus.

10 Detailed description of the invention

The present invention relates in a first aspect to an apparatus for separating flexible packaging material from the consumer product that was packaged by this flexible packaging material. In a preferred situation, this consumer product comprises, or is, a food product. The consumer product is typically a dry product, preferably in granular and/or powdery form. The consumer
15 product, preferably a food product, typically packaged in the flexible packaging material is preferably a dry food product, preferably in granular and/or powdery form. Examples of such dry food products in powdery or granular form, are food products selected from the group consisting of soup, bouillon, sauce, gravy, dressing. As the skilled person is aware of, these food products are typically used by a consumer upon mixture of said dry food product with water,
20 to result in a bouillon, soup, sauce, gravy or dressing product that is ready to be consumed, possibly after heating. The dry food product is preferably in the form of a powder or in the form of granules, preferably with a highest diameter of below 3 mm, and may further comprise food particles with a longest diameter of from 3 to 40 mm. Such further particles may comprise particles of dry noodle, dry vegetable, dry mushroom, dry meat, or mixtures thereof.

25 To maintain the quality aspects in terms of for example taste, texture (e.g. powdery texture), or colour, the consumer product, such as a dry food product, is packaged in a flexible packaging, typically in the form of a sachet. The packaging, e.g. the sachet, is preferably rectangular. preferably has a longest dimension (height) of preferably 7 to 25 cm, more preferably 10 to 21
30 cm, and even more preferably 15 to 20 cm. The width of the packaging, second-longest dimension rectangular to the height and in the same plane, is preferably of from 8 to 11 cm, more preferably of from 13 to 16 cm.

With reference to the figures, the apparatus (1) to separate the consumer product from its
35 packaging comprises a cutting system (2) and a separator system (3) connected thereto.

Cutting system

Inlet

The cutting system may contain an inlet (16). The inlet is dedicated to feed the flexible packaging comprising consumer product, like flexible sachets, into the cutting system. To this extend, the inlet preferably could have a rectangular form, like a slit, to provide access to the cutting system for a sachet. The inlet can suitably be adapted to the format of the pouch or sachet to be fed. The dimension of the inlet therefore is preferably adaptable. It can be preferred, that the inlet is removably connected to the cutting system, to allow replacement of the inlet by an inlet with another dimension to accommodate packagings with a different dimension. Proper feeding of the flexible packaging into the cutting system results in optimal presentation of the packaging to the cutting blade. If a dedicated inlet is present, a sachet cannot be inserted incorrectly. It is preferred that the packaging is cut open centrally, through a height or width dimension, preferably through the height (longest) dimension, to allow optimal discharge of the content and reduce the risk of formation of small pieces of packaging material, like splinters, that end up in the resulting separated consumer product. The dimension of the inlet therefore preferably allows for inserting of flexible packagings containing consumer product in a manner that one edge of the packaging is presented forming an angle of substantially 90° with the plane of the cutting blade. Preferably the dimension of the inlet allows for inserting of one flexible packaging at a time. Feeding of the inlet is suitably done by hand. Alternatively, feeding of the inlet is carried out automatically wherein flexible sachets are fed one by one into the inlet (16). The inlet is preferably adaptable to the largest dimension of the packaging sachet. Accordingly, the length of the opening of the inlet (longest dimension) is preferably from 7 to 25 cm, more preferably of from 10 to 21 cm, more preferably of from 15 to 20 cm, to optimally accommodate a packaging sachet containing consumer product.

Guidance means

Guidance means (4) guide a packaging which contains consumer product to the cutting blade (5). The guiding means preferably comprise guiding rollers. Guiding rollers grab the packaging after entry into the cutting system via the inlet area and transport it towards and over the cutting blade. In a preferred situation, the guiding means comprise two sets of rollers, wherein each set comprises two rollers that turn in opposite direction. Preferably there are in total four rollers. It can be preferred that one roller in each set is driven and the other roller is a non-activated castor, but it is preferred that the two rollers in a set are activated and rotate in opposite directions. In the latter situation, four rollers are activated. Preferably, one or more rollers, preferably all, of a set of rollers are mounted coaxially with corresponding rollers of the other set. This allows driving of the corresponding rollers at both sides of the cutting device with the same speed.

The guiding means, preferably in combination with the positioning and shape of the inlet (16), facilitate positioning of the packaging to be opened in the desired position v.à.v. the cutting blade, to allow proper opening of that packaging. For example, it is typically desired that the packaging is cut over its full width or full length to separate it in two parts, wherein the cut is made essentially parallel to the width or length, respectively of the packaging, when the packaging is in a rectangular or square shape, or put differently, the cut is made essentially perpendicular to the edge of the packaging to be cut. The sets of guiding rollers are located on each side of the cutting blade, preferably at equal distance from the knife, *i.e.* in a mirrored position. In this manner, the cut is preferably made centrally in the flexible packaging, to result in halves of essentially equal size. Preferably the distance can be varied, to accommodate flexible packagings of different dimensions.

Cutting means

The cutting system further comprises a cutting means (5). This is typically a cutting blade. It is essential in the context of the present invention that the risk to produce small particles of packaging material that mix with the contents of the packaging is as low as possible. The cutting means therefore preferably is a round knife blade, typically a rotating round knife blade. The diameter of the cutting blade is preferably of between 5 and 20 cm, more preferably between 7 and 15 cm. It is preferred that the cutting blade such as a rotating round knife blade has a circular circumference. A circular circumference contributes to providing a smooth cut. A dented, *e.g.* saw-like, circumference is not desired, and preferably absent, as this easily results in small particles of packaging material, like saw dust, becoming separated from the packaging during the cutting process and becoming mixed with the consumer product. A food safe separated consumer product cannot be prepared in this manner. Several waste separator devices described in the art comprise a cutting device that has the shape of a screw. Such screw knives are not desired and preferably absent of the device of the present invention, as they are not suitable for the purpose of the invention, wherein a small flexible packaging such as a sachet is cut and wherein no traces of packaging material should end up in the separated consumer product. In the preferred situation, that the guiding means (4) comprise sets of guiding rollers, the cutting means, such as a cutting blade (5) is preferably rotationally positioned halfway between the sets of guiding rollers. The cutting blade is preferably mounted on a different axis than the guiding rollers. This allows for adjusting the speed of the cutting device independently from the speed of the guidance means. The center point of the cutting means, *e.g.* the circular knife is preferably below the center point of the guidance means, *e.g.* that of the guiding rolls. The guidance means facilitate guidance of a sachet towards the cutting means and facilitate guidance of the partially cut package over the cutting blade during the process of cutting, to allow proper cutting, and may further help in transporting the cut parts of the packaging in the

direction of the separator system (3). In the context of the invention, *i.e.* to minimize the risk of traces of packaging material in the separated consumer product, and to allow optimal transportation during cutting of the flexible packaging material, it is preferred that there is a total of one circular cutting blade. The cutting blade is preferably exchangeable and therefore preferably removably mounted in the cutting system, preferably between the two sets of guiding rollers.

Motor

The guidance means (4), such as preferably guiding rollers, are typically driven by a motor (17), preferably a single motor, that drives the guidance means. The cutting means, preferably comprising a rotating cutting blade, is also driven by a motor. It is preferred that the cutting blade and the guiding rollers are driven by separate motors, to facilitate adjusting the speeds independently, but it can also be preferred that a single motor is used for the cutting blade and to drive the guidance means. The rotation speed of the guidance means can preferably be varied and is preferably of between 10 and 80 rpm, more preferably of between 15 and 40 rpm. The speed of the cutting blade, such as a rotating knife blade is preferably between 20 and 200 rpm, preferably between 50 and 100 rpm. The speed of the cutting means can preferably be adjusted, preferably independently from the speed of the guidance means. The rotation speed of the cutting blade is preferably higher than that of the driving rollers, to provide the cleanest cut and lowest risk on production of remnants of packaging material in the consumer product to be separated.

Collection means

The apparatus of the invention may further comprise a collection means for collecting the cut packaging and consumer product immediately after cutting of packaging. Typically, the cut packaging falls by gravity in the collection means. The collection means (6) can for example comprise a chute or a slide. The collection means is connected to the cutting system (2) of the apparatus of the invention. The collection means helps to transport the cut packaging and the consumer product towards the separator system (3) and typically feeds into the entry part (7) of the separator drum (8). The material resulting from the cutting process is transported towards the separator system (3), which is conveniently arranged via gravity. To this end, the collection means (6) is preferably mounted in an inclined manner, to allow gravity to transport the material into the separator drum (8).

Separator system

Separator drum

The separator system (3) comprises at least one separator drum (8). The packaging material which is cut in the cutting system is fed, with its content, into the separator drum (8), typically via a collection means (6). The separator drum (8) comprises a sieve wall (9). In Fig. 2 and Fig. 4 the mesh of the sieve wall is not depicted, to allow showing the insides of the drum. The sieve wall allows separation of the packaging material from its contents, *i.e.* the consumer product. The size of the mesh is sufficiently dimensioned to allow the contents of the packaging to passage and to leave the packaging material within the sieving drum. To this end, especially if one sieve drum is used, the mesh size of the sieve wall is preferably less than 40 mm, preferably less than 20 mm, and can be of from 2 to 40 mm, preferably from 3 to 40 mm, more preferably of from 3 to 10 mm and more preferably from 3 to 5 mm. Especially in the situation that the separator drum comprises a total of one sieve wall, the mesh size is preferably of from 2 to 15 mm, and more preferably from 5 to 10 mm.

Driving ribs

The inside wall of the separator drum (8) shows at least one driving rib (10). A width of a rib typically extends radially from the inner surface of the separator drum in the direction of the midline of the separator drum. The width of the rib is preferably of from 2 to 10 cm, preferably from 3 to 7 cm. The edge of the rib, *i.e.* the side directed towards the midline of the separator drum is preferably blunt. It is preferably not a knife or sharpened. In this manner the risk to cut the packaging material in the separator drum, potentially resulting in traces of packaging material in the consumer product to be separated, is minimized. It is preferably blunt. The rib extends over the length of the separator drum, preferably over 50 to 100%, more preferably over 75 to 100% of the length of the separator drum. A driving rib may for example have a length of between 80 and 150 cm, preferably of from 90 to 130 cm. The one or more ribs are preferably mounted parallel to the midline of the separator drum. It is preferred that the separator drum comprises 1 to 6 ribs, preferably 2 to 5 ribs and more preferably 3 or 4 ribs. When in action, the separator drum rotates and the packaging material and its contents are moved upwards by the ribs within the rotating separator drum and tumble down, typically by gravity. In this manner the packaging material is separated from its content, allowing the content to passage through the mesh of the sieve wall (9) of the separator drum (8). The separator drum is preferably removably mounted in the separator system (3), to allow the drum to be removed from the apparatus *e.g.* for cleaning purposes.

Inclination

Preferably, the separator drum is mounted within the apparatus of the invention in an inclined manner, *i.e.* not level, wherein the entry part (7) of the separator part is positioned higher than the exit part (11) of the separator drum. Preferably, the separator drum is mounted under an

angle of between 0.5° and 10° , preferably from 0.8° to 5° , more preferably from 1° to 2° . This non-level orientation helps to transport the packaging material towards the exit area of the separator drum during rotation of the drum. The inclination is preferably adjustable, to adjust for example the dwelling time of material or to adjust the throughput speed of material through the separator drum. This may for example be required to allow complete emptying of the packaging material, e.g. to adapt to feeding volume, packaging size, type of consumer product to be separated, the volume of individual packagings, etc.

Motor

The separator drum is typically driven by a motor. The separator drum preferably rotates with a speed of from 1 to 40 rpm, more preferably from 5 to 25 rpm. Rotation of the drum can be done conveniently via a driving mechanism (12), such as for example one of more driving rolls (12). The one or more driving roles may contact the inner or outer circumference of the drum, thereby driving the rotation of the drum. It is preferred, that the driving mechanism, e.g. the driving rollers, contact the outside circumference of the drum. Preferably the driving mechanism (12) comprises 1 to 4, preferably 2 to 4 driving rollers. In addition to the driving mechanism, the separator system (3) may comprise 1 or more, e.g. 1 to 4, idler rollers (13) that do not drive the rotation of the drum. For example, the system may comprise 2 driving rollers and 2 idler rollers, and preferably 4 driving rollers and 4 idler rollers. The idler rollers merely function to stabilize the drum during rotation and rotate as a consequence of the rotation of the drum. The driving mechanism typically comprises a motor. The motor activates the driving mechanism, such as for example the driving rolls (12).

Collection containers separated material

A collection means (14) is preferably present to collect the consumer product material that passes the sieve wall of the separator drum. The collection means can be a slide to allow gravity to collect the consumer product. After sieving, the consumer product has been separated from its packaging material and can be reused, or properly recycled. The packaging material is collected at the exit part (11) of the separator drum, and can be discarded or properly recycled. Another container can be present as collection means to collect the separated packaging material.

Further drum

It can be preferred, that the separator system (3) comprises a further separator drum (15) in addition to a first separator drum (8). In this situation, the further separator drum is located concentrically v.à.v. the first separator drum (8), and can thereby essentially form a double walled cylinder. The further separator drum is positioned radially outwards from the first drum.

The first separator drum (8) and the further separator drum (15) are connected to each other, preferably are removably connected to each other, but it may be preferred that they are connected to each other in a fixed manner. Accordingly, it is preferred that the drums rotate with the same speed. The further separator drum (15) may comprise a sieve wall. This configuration can be desired for example when the consumer product, such as a dry food product, comprises ingredients with different dimensions that need to be separated from each other. For example, a dry soup mixture can contain powdery ingredients and bigger particles such as dried mushroom or noodles. It can be preferred therefore that the first (inner) separator drum (8) comprises a sieve wall with a mesh size that is bigger than the mesh size of the sieve wall of the second (outer) separator drum (15). In the case of more concentric sieve drums, such as 2 drums, the most concentric, inner, drum comprises a sieve wall with a mesh size of preferably from 10 to 40 mm, more preferably of from 10 to 20 mm. This mesh size is typically suitable to trap the packaging material within the first drum. The further drum, positioned more outer than the inner drum, comprises a sieve wall with a mesh size preferably of from more than 2 mm and less than 10 mm, preferably more than 3 mm and less than 5 mm. This size is typically suitable to maintain pieces larger than powder or small granules, such as pieces of mushroom or noodles or dried vegetable, within the second drum.

When the separation process is carried out, the driving mechanism (12) activates rotation of the combination of the separation drums. A mixture of packaging material that is cut in half and its content is fed in the entry part (7) of the first separator drum (8). By the rotation of the drums, the packaging material becomes separated from the consumer product. The powder material and the bigger particles pass the first sieving wall whereas the packaging material stays in the first separation drum (8), the bigger particles are trapped by the sieving wall of the further separator drum (15), whereas the powdery material that is finer than the bigger particles passes the mesh of the further separator drum. The consumer product material that passes the sieve wall of the further separating drum (15) is collected in collection means (14) and can be reused or recycled. The same holds for the bigger particles that can be collected from the second sieve wall wherein they were trapped, preferably at the exit part of the drum, where they are transported to via inclination of the drum. The packaging material is collected at the exit area of the first separator drum, as it is retained by the most coarse, inner mesh wall.

Miscellaneous

The separated consumer product is preferably more than 99 wt%, preferably 100 wt% free from packaging material. It may be preferred, that the apparatus of the invention further comprises a metal detector. This may be of value when packaging material is metal-coated, and allows for a check if the separated consumer product is free from traces of packaging material.

The elements of the apparatus of the invention are typically mounted in a main frame. As described above, it contains preferably three motors, to drive the cutting means, the guidance means, and the separator drum. These are preferably driven by a sequency inverter. The apparatus of the invention allows to process more than 20 packages, e.g. sachets, per minute, preferably from 20 to 100, more preferably from 20 to 75 per minute.

Process

In a further aspect, the present invention relates to a process to separate a consumer product packaged in a flexible packaging from its packaging. In a first step a), consumer product which is packaged in a flexible packaging, such as sachets, is fed into the cutting system (2) of the apparatus of the invention, preferably via a inlet area (16), the dimensions of which are preferably adjusted to accommodate the dimensions of the flexible packaging filled with consumer product. The consumer product is typically in granular, powdery or particulate form, or be a combination of materials in one or more of these forms. It is preferably a dry food product, such as for example instant soup, sauce, gravy or dressing, and preferably comprises food product in the form of powder. The sachets are preferably paper based sachets but may be polymer based and may contain laminated material comprising metal, polymer, lacquer or mixtures thereof. In a next step b), the packaging is cut through to result in two parts of the initial flexible packaging. The resulting parts of the packaging are typically bigger in longest diameter than the mesh size of the first (inner) sieve wall. Cutting is preferably done via a rotating cutting device, preferably a rotating knife. The rotation speed of the guiding rolls (4) is preferably lower than that of the knife blade (5), to minimize the formation of small pieces of packaging material during cutting and to allow for optimal cutting of the packaging material. In a step c), the resulting parts of flexible packaging and the initially packaged consumer product are fed into the separator system of the apparatus of the invention. In step d), the consumer product is separated from the packaging material, wherein the separation process typically involves rotation of the separator drum. As described above, the separator drum is driven via driving system that preferably comprises driving rollers (12). The speed of the drum or the most concentric drum is preferably from 1 to 40 rpm, preferably of from 5 to 20 rpm. During the rotation of the drum, in step e) of the process the consumer product is allowed to escape the separator drum through the sieve wall (8) and possibly (15). The cut packaging material is allowed to leave the separator drum at the exit side (11), of the separator drum, thereby separating packaging material from the consumer product.

Use

In a further aspect, the invention relates to the use of an apparatus of the invention to separate dry food product from flexible packaging material.

Example

- 5 The invention is exemplified by the non-limiting example as depicted in figure 4. A packaging sachet (green) comprising a dry food product in powder form is fed in inlet area(16) of the device, where it enters the cutting system (2) of the device. The packaging is received by the guiding means comprising two sets of rollers, turning in opposite directions with two rollers on two axes, and driven by one motor. The packaging is guided towards a circular knife (5) that rotates, driven
- 10 by a separate motor, at a rotation speed that is higher than that of the guidance rollers, and cuts the packaging half. Packaging pieces and content fall in a chute (6) that transports it to the entrance (7) of the separator system (3), where it enters the separator drum (8) that is adjustable in angle and is positioned under a declining angle of 1 degree for optimal residence time. The separator system (3) comprises a sieve wall (9) and rotates driven by a motor that drives two
- 15 axes with rollers (one axis shown in Figure 4). Two idler rollers (13) balance the drum within the frame (one visible in Figure 4). Food product in powder form is sieved through the sieve wall (9) of separator drum (8) and is collected in a container (14). Halved packaging sachet is transported through the drum and collected in a container (14), to be recycled.

Claims

1. Apparatus (1) for separating flexible packaging material from packaged consumer product, the apparatus comprising:

- A cutting system (2),
- A separator system (3),

wherein the cutting system comprises:

- A total of one circular cutting blade (5),
- a guiding means comprising two sets of guidance rolls (4), located at both sides parallel to the cutting blade,

wherein the cutting system is connected to the separator system to feed the separator system, wherein the separator system comprises:

- at least one separator drum (8) comprising a sieve wall (9),
- a driving mechanism (12) to rotate the drum,

and wherein the separator drum is positioned with an entrance area (7) higher than an exit area (11) of the drum.

2. The apparatus according to claim 1, wherein the separator system comprises a second separator drum that is located concentric v.a.v. the at least one separator drum.

3. The apparatus according to any one of the preceding claims, wherein the apparatus comprises two concentric drums that are in a fixed position v.à.v. each other.

4. The apparatus according to any one of the preceding claims, wherein the cutting blade has a smooth circumference.

5. The apparatus according to any one of the preceding claims, wherein the separator drum or in case of concentric separator drums, the most central separator drum, comprises at least one driving rib that extends over the length of the drum, preferably wherein the drum or the most concentric drum, comprises from 3 to 4 driving ribs.

6. The apparatus according to anyone of the preceding claims, wherein the apparatus comprises a total of one separator drum, wherein the mesh size of the sieve wall of the drum or most concentric drum is from 2 to 40 mm, preferably from 3 to 20 mm, even more preferably from 3 to 10 mm.

- 5 7. The apparatus according to any one of claims 2 to 6, wherein the outer concentric drum comprises a sieve wall with a mesh size that is smaller than that of the more concentric drum and preferably with a mesh size of more than 2 and less than 10 mm, preferably more than 3 and less than 5 mm, and wherein the most inner concentric drum comprises a sieve wall with a mesh size of from 10 to 40 mm, preferably of from 10 to 20 mm.
- 10 8. The apparatus according to any one of the preceding claims, wherein the entry area (7) of the separator drum is positioned higher than the exit area (11) of the drum, wherein the separator drum is oriented under an angle of between 0.5 and 10°, preferably of 1 to 2°.
- 15 9. A process to separate a consumer product packaged in a flexible packaging from its packaging, the process comprising the steps of:
- 20 a) Feeding consumer product packaging in flexible packaging into the cutting system (2) of the apparatus (1) according to any one of the preceding claims,
- b) Cutting the packaging through to result in two parts of the initial flexible packaging,
- c) Feeding the parts of flexible packaging and the initially packaged consumer product into entry side (7) of the separator drum (8) of the separator system (3) of the apparatus according to any one of the preceding claims,
- 25 d) Separating the consumer product from the packaging material, wherein the separation involves rotating of the separator drum,
- e) Allowing the consumer product to escape the separator drum through the sieve wall (9),
- 30 f) Allowing the flexible packaging material to leave the separator drum at the exit side (11) of the drum,
- thereby separating packaging material from the consumer product.
10. The process according to claim 9, wherein the rotation speed of the separator drum or the most concentric drum is from 1 to 40 rpm, preferably of from 5 to 25 rpm.
11. The process according to claim 9 or 10, wherein the consumer product is in the form of a powder, granulate, or particulate or mixtures thereof.
- 35 12. The process according to claim 11, wherein the consumer product is a dry food product and comprises food product in the form of powder.

15

13. The process according to claim 12, wherein the food product further comprises food particles with a longest dimension of from 3 to 40 mm, and comprising dry noodle, dry vegetable, dry mushroom, dry meat, or mixtures thereof.

5 14. The process according to any one of claims 9 to 13, wherein the cutting system of the apparatus comprises driving rollers and the rotation speed of the guiding rolls (4) is lower than the rotation speed of the cutting blade (5).

10 15. Use of an apparatus according to any one of claims 1 to 8 to separate dry consumer product, preferably dry food product, from flexible packaging material.

AMENDED CLAIMS

received by the International Bureau on 12 November 2024 (12.11.2024)

Claims

1. Apparatus (1) for separating flexible packaging material from packaged consumer product, the apparatus comprising:
 - A cutting system (2),
 - A separator system (3),wherein the cutting system comprises:
 - A total of one circular cutting blade (5), which is rotationally driven,
 - a guiding means comprising two sets of guidance rolls (4), located at both sides parallel to the cutting blade,wherein the cutting system is connected to the separator system to feed the separator system, wherein the separator system comprises:
 - at least one separator drum (8) comprising a sieve wall (9),
 - a driving mechanism (12) to rotate the drum,and wherein the separator drum is positioned with an entrance area (7) higher than an exit area (11) of the drum.
2. The apparatus according to claim 1, wherein the separator system comprises a second separator drum that is located concentric v.a.v. the at least one separator drum.
3. The apparatus according to any one of the preceding claims, wherein the apparatus comprises two concentric drums that are in a fixed position v.à.v. each other.
4. The apparatus according to any one of the preceding claims, wherein the cutting blade has a smooth circumference.
5. The apparatus according to any one of the preceding claims, wherein the separator drum or in case of concentric separator drums, the most central separator drum, comprises at least one driving rib that extends over the length of the drum, preferably wherein the drum or the most concentric drum, comprises from 3 to 4 driving ribs.
6. The apparatus according to anyone of the preceding claims, wherein the apparatus comprises a total of one separator drum, wherein the mesh size of the sieve wall of the drum or most concentric drum is from 2 to 40 mm, preferably from 3 to 20 mm, even more preferably from 3 to 10 mm.

7. The apparatus according to any one of claims 2 to 6, wherein the outer concentric drum comprises a sieve wall with a mesh size that is smaller than that of the more concentric drum and preferably with a mesh size of more than 2 and less than 10 mm, preferably more than 3 and less than 5 mm, and wherein the most inner concentric drum comprises a sieve wall with a mesh size of from 10 to 40 mm, preferably of from 10 to 20 mm.
8. The apparatus according to any one of the preceding claims, wherein the entry area (7) of the separator drum is positioned higher than the exit area (11) of the drum, wherein the separator drum is oriented under an angle of between 0.5 and 10°, preferably of 1 to 2°.
9. A process to separate a consumer product packaged in a flexible packaging from its packaging, the process comprising the steps of:
 - a) Feeding consumer product packaging in flexible packaging into the cutting system (2) of the apparatus (1) according to any one of the preceding claims,
 - b) Cutting the packaging through to result in two parts of the initial flexible packaging,
 - c) Feeding the parts of flexible packaging and the initially packaged consumer product into entry side (7) of the separator drum (8) of the separator system (3) of the apparatus according to any one of the preceding claims,
 - d) Separating the consumer product from the packaging material, wherein the separation involves rotating of the separator drum,
 - e) Allowing the consumer product to escape the separator drum through the sieve wall (9),
 - f) Allowing the flexible packaging material to leave the separator drum at the exit side (11) of the drum,thereby separating packaging material from the consumer product.
10. The process according to claim 9, wherein the rotation speed of the separator drum or the most concentric drum is from 1 to 40 rpm, preferably of from 5 to 25 rpm.
11. The process according to claim 9 or 10, wherein the consumer product is in the form of a powder, granulate, or particulate or mixtures thereof.
12. The process according to claim 11, wherein the consumer product is a dry food product and comprises food product in the form of powder.

13. The process according to claim 12, wherein the food product further comprises food particles with a longest dimension of from 3 to 40 mm, and comprising dry noodle, dry vegetable, dry mushroom, dry meat, or mixtures thereof.
14. The process according to any one of claims 9 to 13, wherein the cutting system of the apparatus comprises driving rollers and the rotation speed of the guiding rolls (4) is lower than the rotation speed of the cutting blade (5).
15. Use of an apparatus according to any one of claims 1 to 8 to separate dry consumer product, preferably dry food product, from flexible packaging material.

Fig. 1

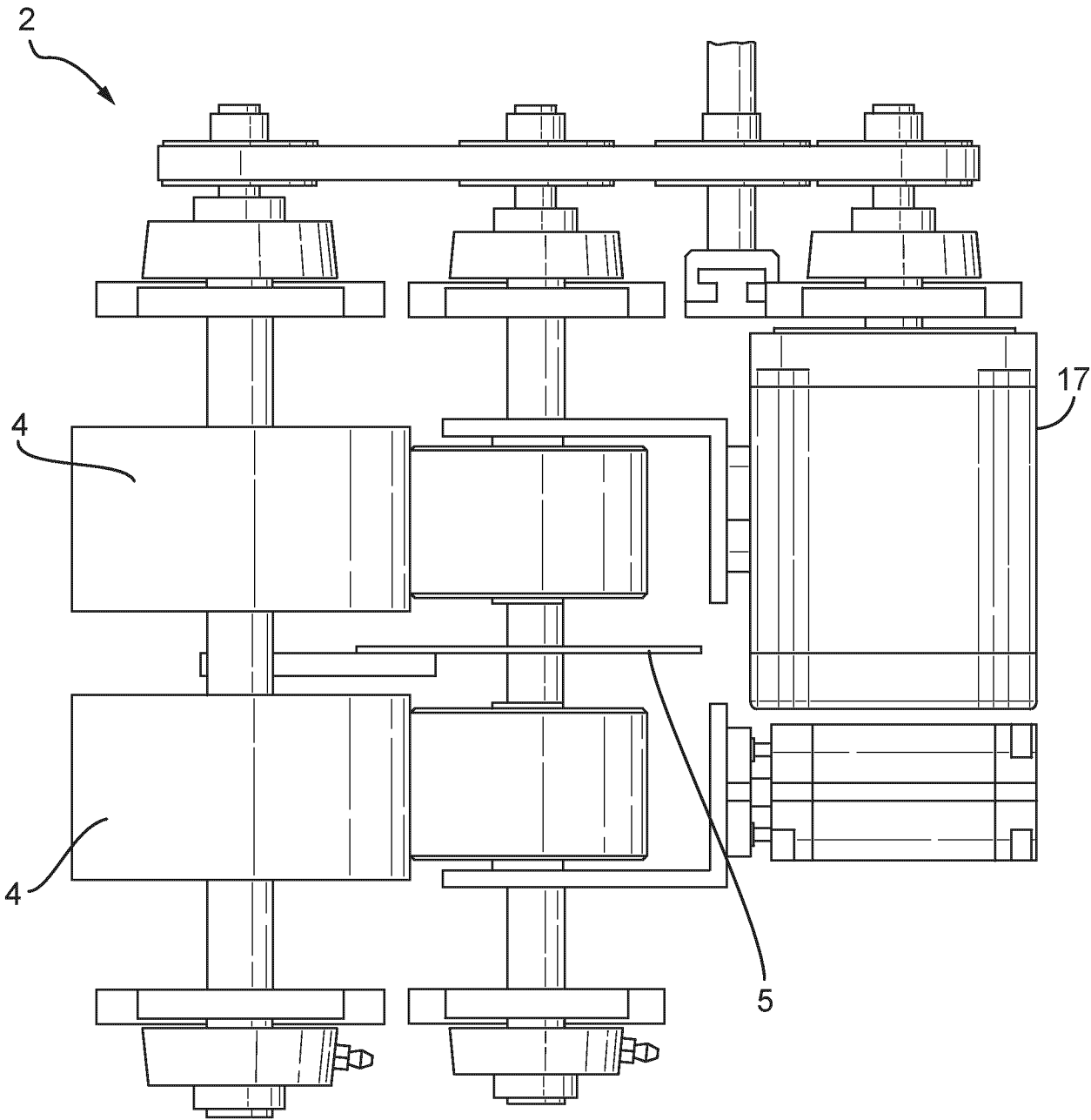


Fig. 2

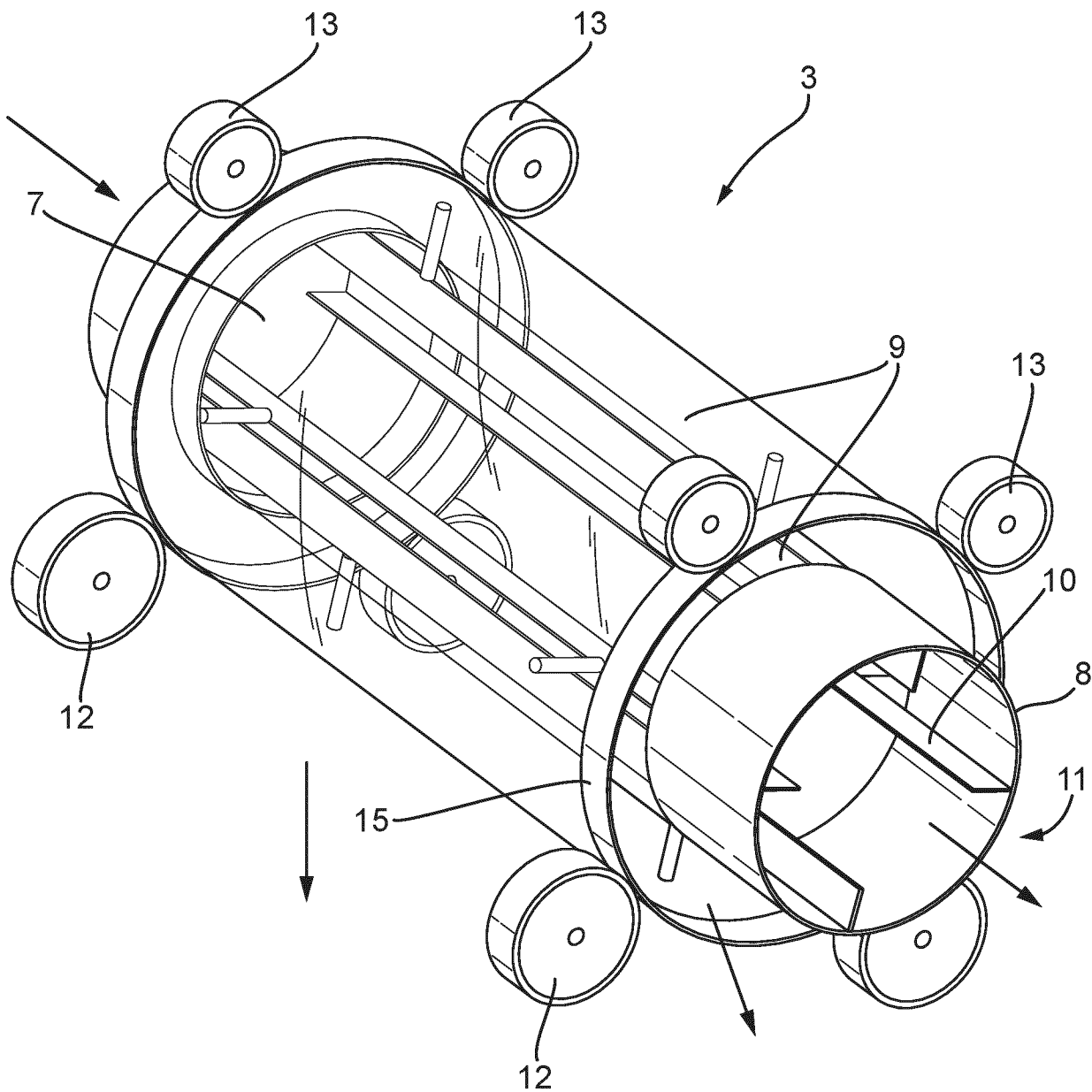
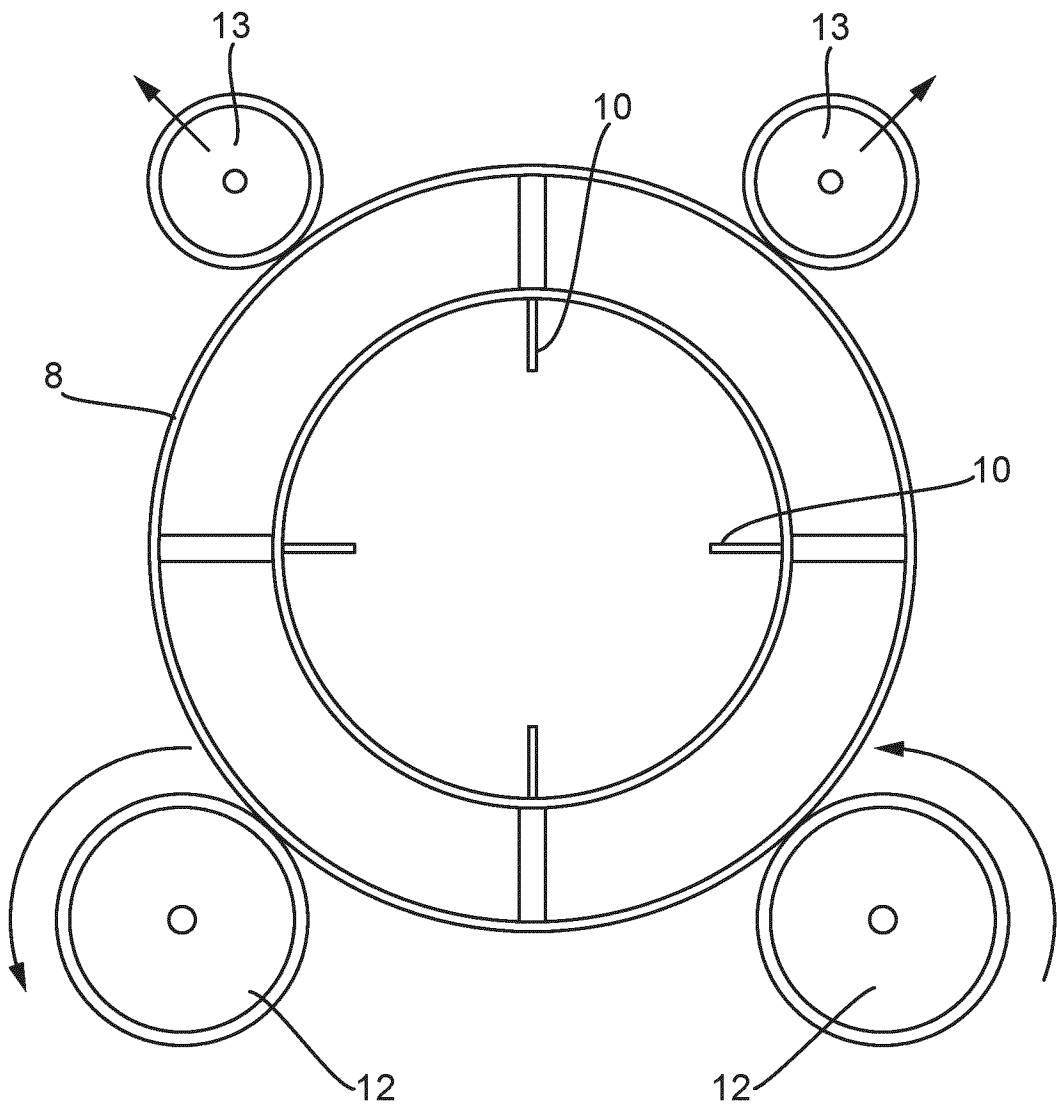


Fig. 3



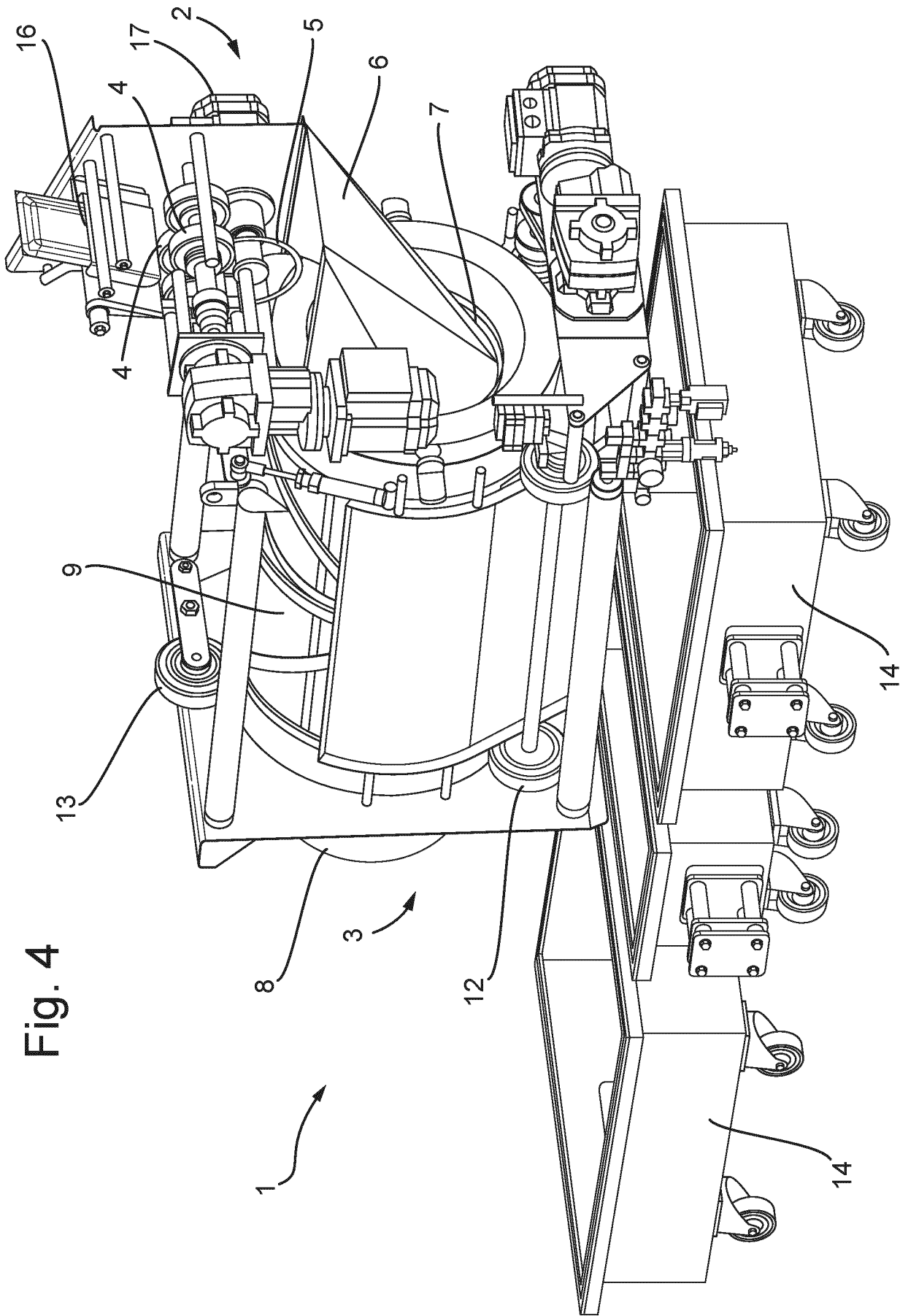


Fig. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/068448

A. CLASSIFICATION OF SUBJECT MATTER INV. B65B69/00 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B65B B26D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 543 029 A (GRUEN GUSTAV [DE] ET AL) 24 September 1985 (1985-09-24) column 6, lines 48-51; figures 1-12 -----	1 - 15
A	US 3 386 602 A (KANAREK JOSEPH S) 4 June 1968 (1968-06-04) column 3, lines 51-63; claims 10-11; figures 1-7 -----	1 - 15
A	US 5 870 882 A (LOWE BYRON L [US]) 16 February 1999 (1999-02-16) figures 1-5 -----	5
A	US 2005/019141 A1 (DE BAAT MARIUS CORNELIS [NL]) 27 January 2005 (2005-01-27) paragraph [0050] ----- - / - -	8
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 27 September 2024		Date of mailing of the international search report 10/10/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Garlati, Timea

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2024/068448

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RU 2 608 893 C1 (OBSCHESTVO S OGRANICHENNOJ OTVETSTVENNOSTYU NPO VTORM [RU]) 26 January 2017 (2017-01-26) abstract; figure 1 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2024/068448

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4543029	A	24-09-1985	EP 0104323 A2 US 4543029 A	04-04-1984 24-09-1985
US 3386602	A	04-06-1968	NONE	
US 5870882	A	16-02-1999	NONE	
US 2005019141	A1	27-01-2005	CA 2472389 A1 EP 1491450 A1 NL 1023756 C2 US 2005019141 A1	26-12-2004 29-12-2004 28-12-2004 27-01-2005
RU 2608893	C1	26-01-2017	NONE	