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(54) DYNAMIC SHAKING DEVICE FOR EMPTYING BAGS

(57) The present invention refers to a dynamic shaking device for bags emptying. It has an inlet for the full bags (A), a discharge for the product contained inside the bags (B), and an outlet for the empty bags (C). The bags opening is made on the cutting zone by means of a cutting disc (2) with blade on the outer edge, located on the rotary shaft (1). This cutting disk is placed in a perpendicular direction in relation to the direction of the

displacement of the bags. The present invention allows the simultaneous linear and circular motion as well as the motion in different planes of the bags to be emptied, since it has shakers composed of serpentine-shaped shaker elements (5), which may have central shafts (4). These shakers are arranged in parallel position in relation to the shafts (2) of the cutting zone. Shakers can be driven by motors (3).

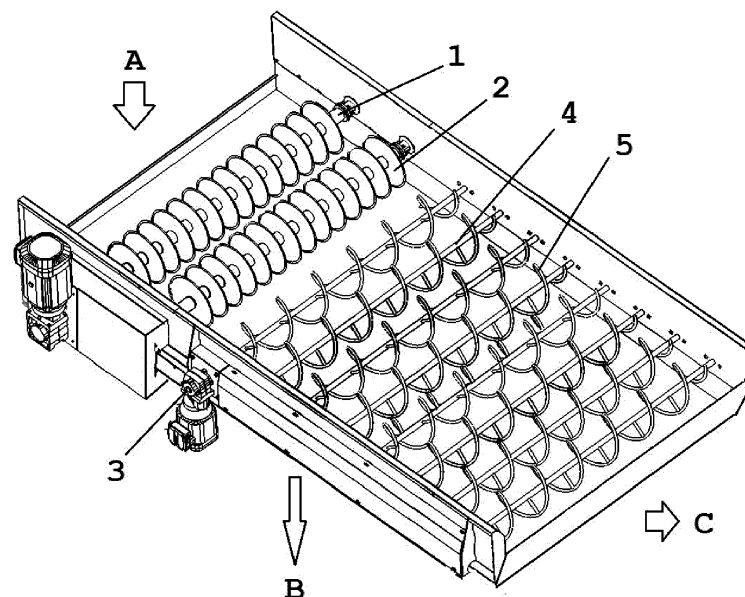


Figure 1

EP 3 409 602 A1

Description

FIELD OF THE INVENTION

[0001] The present invention fits in the area of the devices for shaking and emptying bags. It's a device that enables bags to be shaken dynamically by means of circular and linear movements in different planes and directions and, thus, emptying them.

BACKGROUND OF THE INVENTION

[0002] The present invention finds its closer backgrounds in equipment for the automatic emptying of bags which are not dynamic, that is, that only provide linear or circular movement while shaking the bags, thus, never doing it in a simultaneous and integrated way. Such devices, known in the present state of the art, are not sufficiently configurable for each particular application, i.e. they do enable the increase or decrease of the frequency of the linear or circular motion transferred to the bags but they do not allow increasing the intensity or the amplitude of such movement.

[0003] Patent application EP 3070014 A1 and patent EP 1838582 B1 are examples of the present state of the art devices that are closest to the present invention.

TECHNICAL PROBLEMS SOLVED

[0004] The present invention has been envisaged to provide an automatic bags emptying equipment that would improve the efficiency of this process. Ideally, it would be able to empty 100% of the content of the bags in a very short time. In other words, it's intended to empty the bags as much as possible in the shortest time, improving the results obtained when compared to the manual accomplishment of this task and, also, when compared to the use of the presently known automatic bag emptying devices.

[0005] Doing the task correctly it in a shorter time means more efficiency, e.g., spending less time and energy to achieve the desired result. It was also intended to be a simple to build device, thus, and with a competitive cost.

[0006] In order to achieve these goals, it was necessary to take into account that the device is intended to:

- shake and empty any type of bag, regardless the material that the bag is made of, and regardless its geometry and size. In fact, there are many types of bags requiring different actions to empty them. The bags are not only different in their material type (e.g. bags made of different plastics, jute, paper, combinations of different materials, etc.) but they also differ in sizes, shape, thickness, flexibility, more or less internal zones within which the product to be emptied stays housed inside, etc. This technical details of the bags will have a strong impact on the performance

of the device intended to shake and empty them completely;

- wag and remove from the bag any type of object or product that the bag is carrying. The products that may be carried inside the bags differ in their physical details and chemical composition. Depending on these characteristics, the products are easier or harder to be discharged from the bags. Some products are very adhesive thus requiring bags to be shaken with more intensity and/or more amplitude. But, for other products, additional intensity or shaking amplitude results badly as it applies unnecessary energy to the bags and causes product to be thrown away from the collecting bin or results in breaking the product inside the bags or even in the formation of a dust cloud (wasted energy and creation of an air contamination problem). This excess of shaking intensity or shaking amplitude may also result in product contamination with sections of torn bags shattered by the excessive mechanical action of the shakers, besides of the wasted energy itself.

[0007] In order to achieve the above mentioned goals, the present invention solves the following technical problems:

- moving the bags in various directions in linear and circular paths simultaneously, thus, promoting a dynamic movement of the bags being emptied to increase the effectiveness and the efficiency of this action;
- Not only sets the frequency of the shaking action, which depends on the speed of movement (as found in the existing solutions), but also allows to configure the intensity of the movement (i.e., more or less shaking action) and the amplitude of motion (i.e., more or less "opening" of the interior of the bag to be emptied).

[0008] Consequently, regardless of the type of bag or the type of product/objects contained inside the bag, it is granted for each situation that the bag shaking will be performed in order to guarantee that the whole content of the bag is discharged efficiently.

[0009] The present existing technical solutions to perform this task, including those on the aforementioned patent documents cited as the state of the art devices closest to this invention, are less effective and less efficient. The fact that these solutions only produce linear movements (forward and backward, or left and right, or up and down) or, in alternative but not simultaneously, circular movements (always carried out in the same plane, and so, without the same efficiency) implies that there are always internal zones of the bag that resist to be discharged). These zones are more numerous in case of thicker bags, which are less flexible and require more dynamism in the shaking action to obtain good results (effective and fast emptying).

SUMMARY OF THE INVENTION

[0010] The subject of the present invention is a dynamic shaking device for emptying bags that enables the simultaneous linear and circular movement and also in different planes of the bags to be emptied, since it has shakers composed of serpentine-shaped agitating elements (5) that causes the bags to be shaken in all directions at the same time (up, down, left, right, front, back) resulting in a dynamic shaking. This dynamic system introduces movement in several directions at the same time, due to the circular movement of the shakers which is transformed into ascending / descending actions and left / right displacement applied on the opened bags.

BRIEF DESCRIPTION OF THE FIGURES

[0011] Figure 1 - Representation of the present invention where it can be identified the inlet for the full bags (A); the discharge for the product contained inside the bags (B), and an outlet for the empty bags (C). Figure 1 also shows the components of the bags opening zone: the rotary shaft (1) and the cutting disc (2); as well as the components of the bags shaking zone: central shaft (4), serpentine-shaped shaker element (5) and motor (3).

[0012] Figure 2 - Representation of the present invention where it can be identified the alternate position of the serpentine-shaped shaker elements (5) and counter-shaker elements (5a).

DETAILED DESCRIPTION OF THE INVENTION

[0013] The present invention comprises three central elements:

- inlet (A) of the full bags to be emptied, in which the bags filled with product/objects begin to be emptied as they are hanging by means of proper devices (hooks, suction cups, forks, or other devices that hang the bags in just one of their sides) and moving horizontally towards the outlet;
- discharge (B) of product/objects contained inside the bags, unloaded by gravity or by vacuum;
- outlet (C) of the empty bags.

[0014] All this central elements - inlet (A), discharge (B) and outlet (C) - are placed by this order. After the inlet (A) of the loaded bags, the invention presents the bags opening zone, in which bags are opened by cutting their bottom. This action is carried out by at least one rotary shaft (1) disposed perpendicularly in relation to the direction of the movement of the bags. Each rotary shaft (1) supports at least one cutting disc (2) with blade at the outer edge, responsible for opening the bags during its horizontal displacement. The number of rotary shafts (1) and cutting discs (2) is configurable.

[0015] As previously mentioned, the present invention enables the simultaneous linear and circular motion in

different planes of the bags to be emptied, this being the main innovation of this device. After the bags cutting zone, follows the bags shaking zone, in which one can find at least one shaker driven by proper means (for example an electric motor) that comprises a serpentine-shaped shaker element (5) where the serpentine development is perpendicular to the direction of the movement of the bags, e.g. parallel to the rotating shafts (1) of the cutting zone.

[0016] In a preferred arrangement, the invention may have a central shaft (4) inside the serpentine-shaped shaker element (5) and these two parts may be interconnected by means of plates, bars or rods.

[0017] The serpentine-shaped shakers (5) can be built from a round rod, a squared rod, a strip of sheet metal, or from any other material as long as they develop in the form of a serpentine.

[0018] In one preferred embodiment of the present invention, the serpentine-shaped shaker elements (5) have various diameters in their serpentine development, and/or different diameters between shakers (5) providing that the device has, at least two of these.

[0019] The device can also present, alternatively, serpentine-shaped elements developed in clockwise and counter-clockwise direction, being those called as shaker elements (5) and counter-shaker elements (5a). In this case, the period of the geometrical development of the serpentine is done alternately and the maximum amplitude of the serpentine curve of one shaker element (5) occurring symmetrically to the maximum of the amplitude of the serpentine curve of the counter-shaker (5a). These configurations allow control over the amplitude of the opening of the bags to be emptied.

[0020] The design and application of the serpentine-shaped shaker elements (5) and, in a specific arrangement, of the counter-shaker elements (5a) enables the movement of the bags in all directions at the same time (up, down, left, right, front, rear) resulting in a dynamic shaking. Moreover, the present invention provides the possibility of controlling the frequency/speed of the shaker elements (5) and counter-shaker elements (5a), as well as the intensity of their rotation by means of controlling the shakers drive, thus adjusting the intensity of the movement to the type of bag and product to be emptied.

[0021] In another preferred embodiment (Figure 1), the present invention has two rotary shafts (1), each with fourteen cutting discs (2), followed by eight shakers driven by an electric motor (3). These rotary shafts (1) and the central shafts (4) are secured in a metal frame at their ends.

[0022] As it is clear to an expert, the invention is not limited to the particular execution modes described herein as it is possible to make several different arrangements within the scope of the present invention.

[0023] Clearly, the preferred modes shown above are combinable in different arrangements that will not be repeated here.

Claims

1. Dynamic shaking device for bags emptying, consisting of:
 - a) an inlet (A) for the full bags to be emptied;
 - b) a discharge (B) of the product contained within the bags;
 - c) an outlet (C) of the empty bags;
 - d) at least one rotary shaft (1) disposed in a perpendicular way in relation to the direction of the displacement of the hanging bags, and supporting, at least, one cutting disk (2) with a blade at the outer edge;
 - e) at least one shaker; and

characterized in that the shaker consists of serpentine-shaker element (5) (5a) shaped coil, shaking the bag in both circular and linear directions simultaneously.
2. Dynamic shaking device according to claim 1 wherein the shaker element (5) (5a) is arranged in parallel to the rotary shaft (1).
3. Dynamic shaking device according to the any of the previous claims wherein the shaker element (5) (5a) has varying diameter in its serpentine-shape development.
4. Dynamic shaking device according to the any of the previous claims wherein two or more shakers presenting agitator elements (5) (5a) with different diameters between them.
5. Dynamic shaking device according to the any of the previous claims wherein two or more shakers presenting agitator elements (5) (5a) with different directions of development of their serpentine-shaped shakers (clockwise and counter-clockwise).
6. Dynamic shaking device according to the any of the previous claims wherein the shaker has a central shaft (4) inside the shaker element (5) (5a).
7. Dynamic shaking device according to the any of the previous claims wherein it presents rotation speed and intensity control system for shakers.

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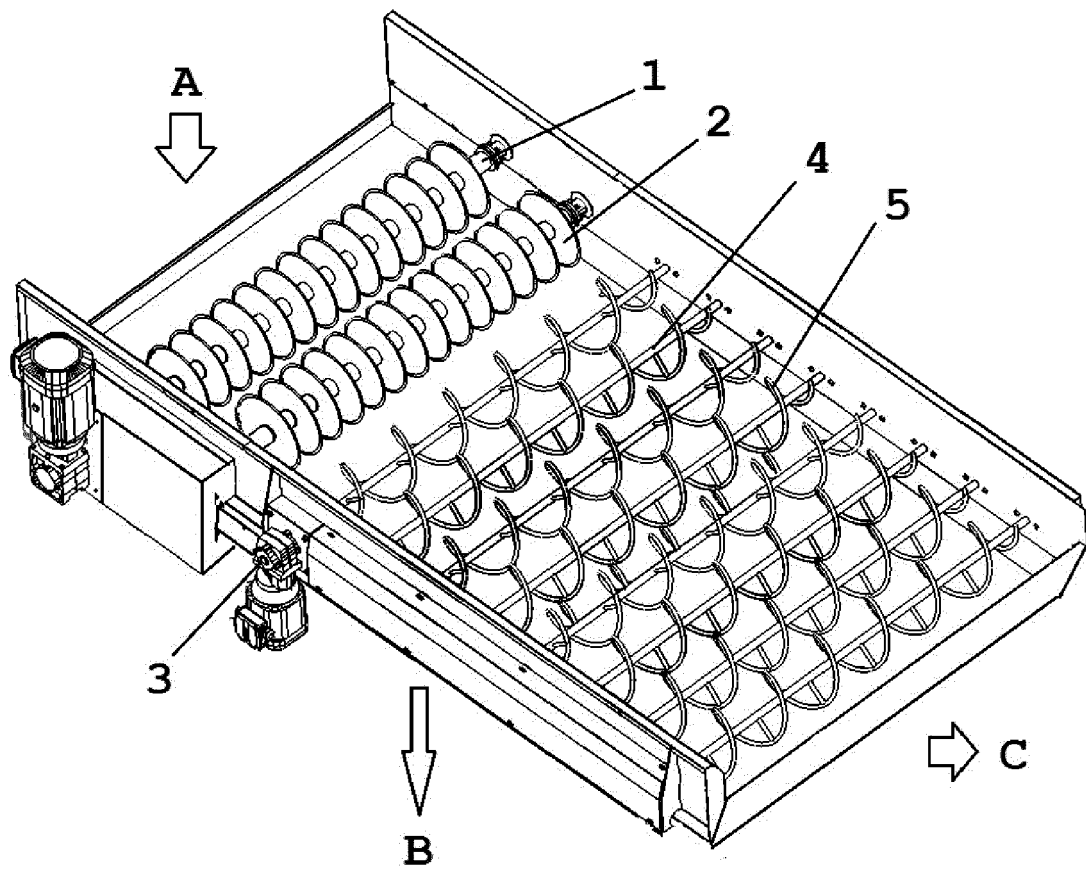


Figure 1

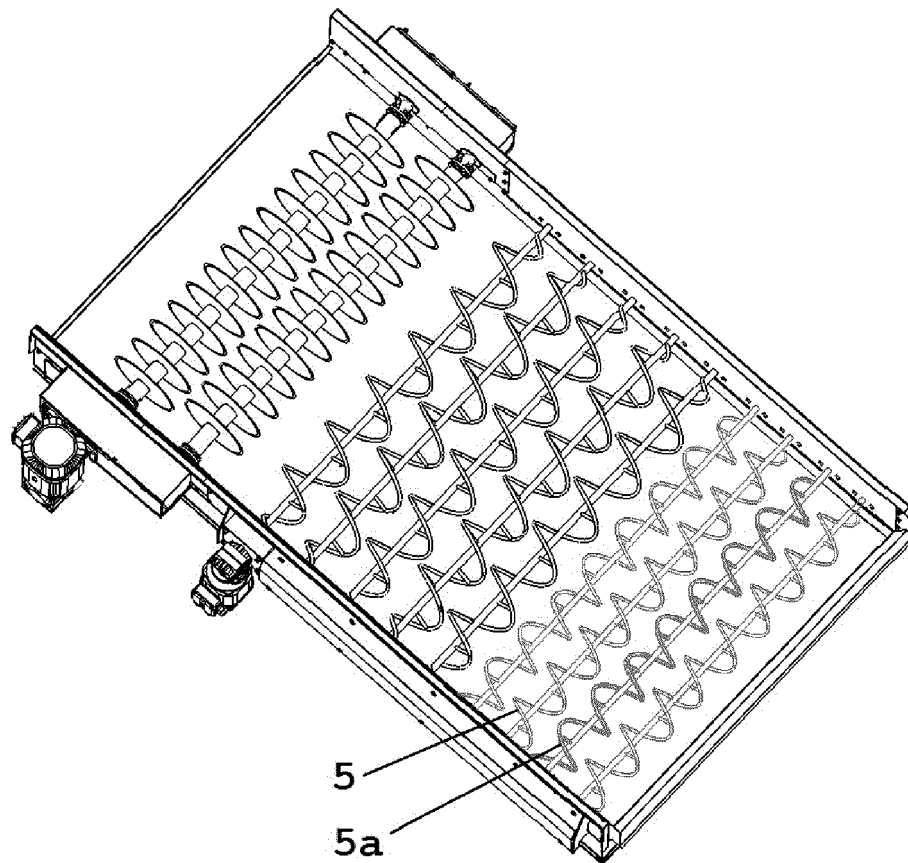


Figure 2



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 4360

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 1 838 582 B1 (AYAL ROBOTICS AND ENGINEERING LTD [IL]) 7 January 2015 (2015-01-07) * the whole document *	1-7	INV. B65B69/00
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A	FR 2 800 036 A1 (GUERIN SYSTEMS [FR]) 27 April 2001 (2001-04-27) * the whole document *	1-7	
A	GB 1 105 006 A (GRUN KG FA GEB) 6 March 1968 (1968-03-06) * the whole document *	1-7	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 November 2017	Examiner Ngo Si Xuyen, G
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	

EPO FORM 1503 03/82 (P04C01)

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

EP 17 17 4360

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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17-11-2017

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3070014 A1 [0003]
- EP 1838582 B1 [0003]