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Amended claims in accordance with Rule 137(2)
EPC.

(54) **VACUUM WASTE SORTING DEVICE WITH VACUUM GRIPPING COMPONENTS AND METHOD FOR CLEANING THE SAME**

(57) Vacuum waste sorting device comprising a vacuum segment conveyor (1) composed of a plurality of independent transverse segments (2) arranged side by side on a movable carrier (7). The transverse segments (2) comprise a matrix of vacuum gripping components (8) with independently remotely controlled valves. The transverse segments (2) are connected with telescopic hollow elements (4) to a central vacuum inlet (3) through a first valve (18). A cleaning liquid collecting container (12) is located below the vacuum segment conveyor (1), whereby the transverse segments (2) are connected with telescopic hollow elements (4) to a cleaning liquid inlet (13) from the cleaning liquid collecting container (12) through a second valve (14) and are also connected with a compressed air inlet (16) through a third valve (17)..

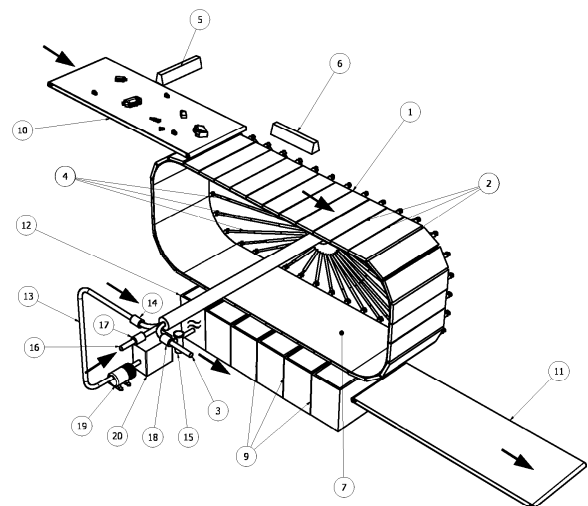


Fig. 3

Description

Technical field

[0001] The invention relates to device for vacuum sorting of waste by means of controlled vacuum gripping components, and to method for cleaning of the vacuum gripping components with valves in the transverse segments of the device. The invention falls within the field of waste management.

Background

[0002] Waste sorting systems are known already from the manual sorting of waste moving on the conveyor belt. More sophisticated sorting systems are also known, for example, the system described in document EP 0737112 B1 for colour-based sorting of scrap particles, which comprises the opaque conveyor belt for conveying randomly shaped and oriented scrap particles through the observation area in which a series of images are detected by an image detector. The separator control unit selectively activates the appropriate portion of the separator to separate desired particles from undesired particles.

[0003] Also known in the state of the art is the sorting device described in AU 2018271302 B2, which comprises the plurality of carriages, wherein each carriage comprises the loading-unloading device that can be selectively activated to load, unload an article from the carriage. It further comprises the electronic unit configured to receive and analyse the loading-unloading signal and actuate the loading-unloading device. Each carriage includes the permanent magnet that generates the stationary magnetic field, and each control unit includes the Hall effect transducer configured to detect the presence of the stationary magnetic field generated by the permanent magnet.

[0004] It is also known the magnetic induction field sorting device as described in US 6820561 B2. The sorting device comprises the carriages moving along the path between respective stations for loading and unloading objects in the direction transverse to direction of movement of the carriages. Each station includes the inductor for generating the variable magnetic induction field which is sensed by the detection mechanism, such as the antenna located on the carriage. In response to the detected magnetic induction field, the loading/unloading device on the carriage (e.g. the endless belt) is actuated to load or unload objects.

[0005] In conveying systems, the special overhead conveyor belts for plate bodies based on the vacuum suction principle with the suction cup gripping components are known.

[0006] The vacuum suction cup gripping components are also usable in waste sorting lines, as proven by the patent document US 5,628,409. Sensors are used to sense the thermal images of waste objects on the con-

veyor belt. Subsequently, the triggering commands derived from the particular thermal image and displaying the particular temperature range are transmitted to the sequentially arranged adjacent arrays of the vacuum grippers. Each vacuum gripper may be extended downward toward the conveyor belt to capture and grip, by means of the applied vacuum, a piece of waste moving on the conveyor.

[0007] The vacuum tentacles are moved downward by the solenoid that initiates the downward movement of the tentacle, which then connects the tentacle with the vacuum source. The grippers are mounted on the carriage that reversibly moves in three mutually perpendicular directions. The first reversible movement is in the vertical direction to remove the gripped portions of the municipal waste from the conveyor belt. The second direction is perpendicular to the conveyor belt to remove items of municipal waste across the conveyor belt, where they can be unloaded onto the separate conveyor belt or into the container. The third direction of reversible motion is parallel to the conveyor belt and moves the set of tentacles along with the conveyor belt. The disadvantage of this system is that it requires the belt conveyor to interact with the complex robotic system with carriages with the suction cup system to remove parts of the waste away from the belt conveyor. This results in higher return times for the carriages above the conveyor belt, which is matched by the lower speed of the conveyor belt. In the variant implementation, the suction cups are located on the overhead vacuum conveyor which follows with its entry the input belt conveyor carrying the waste parts. In this arrangement, there is only a very short section for the suction cups to grip the waste, which can cause the waste not to be gripped by the suction cups and negatively affect the quality of the sorting. Also, the different heights of the waste cause that the suction cups not to catch the low parts of the waste and these fall into the first selective collecting container, thus degrading the contents of the selective collecting container.

[0008] The above mentioned shortcomings motivated the experts to design a sorting system with more efficient way of sorting waste, where the criterion is the sorting time and the overall sorting performance, simplicity of design and cleanliness of the sorted waste. As a result of the design, the vacuum waste sorting device and the method for cleaning of the vacuum gripping components with valves in the transverse segments of the device according to the present invention.

Summary of the invention

[0009] In an effort to make the waste sorting method more efficient, the vacuum waste sorting device according to the first aspect of the present invention has been proposed, the vacuum waste sorting device essentially comprising the vacuum segment conveyor formed by the plurality of independent transverse seg-

ments arranged side-by-side on the closed trajectory of the movable transverse segment carrier. The transverse segments comprise the matrix of the vacuum gripping components - suction cups with independently remotely controlled valves. The transverse segments are connected by flexible hollow elements with the central vacuum inlet through the first valve. Thanks to this arrangement of the vacuum gripping components, each of which is individually remotely controlled, it is possible to achieve a precise selective gripping of the desired sorting objects at the segments, which ensures high accuracy in the sorting of the individual sorted commodities.

[0010] The arrangement of the vacuum gripping components in transverse segments provides the necessary scalability, as it is possible, depending on the required device parameters, to increase the width of the segments and thus increase the effective number of the vacuum gripping components as well as to increase the overall sorting performance.

[0011] The transverse segments of the vacuum segment conveyor according to the first aspect of the present invention are, in the input direction of their movement above their loading plane, partially overlapped by the input belt conveyor. For the purposes of the present invention, it is necessary to clarify that the term "loading plane" is to be understood as that part of the transverse segments of the vacuum segment conveyor on which the fragments of waste from the input belt conveyor fall. Thanks to the arrangement with partial overlapping of the transverse segments of the vacuum segment conveyor by the input belt conveyor, it is possible to take advantage of gravity.

[0012] Sorted waste collecting containers are placed under the unloading plane of the transverse segments of the vacuum segment conveyor. For the purposes of the present invention, it is necessary to clarify that the term "unloading plane" is to be understood as that part of the transverse segments of the vacuum segment conveyor from which waste fragments fall by gravity into the selective waste collecting containers. The optical detection and localization system is located above the input conveyor belt.

[0013] The optical monitoring (tracking) system is located above the vacuum segment conveyor. Preferably, the output conveyor belt is associated with the vacuum segment conveyor for conveying unsorted commodities which are then not mixed with sorted commodities. This ensures high sorting purity.

[0014] According to the first aspect of the present invention, there is provided the advantageous arrangement of the vacuum waste sorting device, wherein the vacuum segment conveyor has the closed trajectory of the movable carrier with at least two rectangular-shaped lines parallel to each other, wherein the transverse segments are connected with the central vacuum inlet by flexible telescopic hollow elements. In such arrangement, it is possible to extend the conveyor so as

to increase the number of sorting containers and thus increase the number of commodities to be sorted. It is the high number of sorted commodities, in addition to the high sorting speed and quality that is the key advantage of the present invention, since solutions in the state of the art at comparable sorting speeds to the sorting speed of the present invention offer only one-way or two-way sorting.

[0015] According to the first aspect of the present invention, there is also provided the advantageous arrangement of the vacuum waste sorting device wherein the vacuum segment conveyor has the closed circular trajectory of the moving carrier. However, this arrangement limits the number of collecting containers of already selected sorted waste but allows to increase the speed and thus the overall sorting performance.

[0016] In the vacuum gripping systems, it is important to keep these gripping components, especially the suction cups, clean to ensure a constant sorting quality and speed, as they become contaminated during sorting, which negatively affects their functionality. Therefore, according to the first aspect of the present invention, the advantageous arrangement of the vacuum waste sorting device is provided, wherein the transverse segments of the vacuum segment conveyor are connected by flexible hollow elements to the cleaning liquid inlet and are also connected to the inlet of compressed air. Such arrangement with the use of flexible hollow elements allows for the introduction and removal of multiple media (air, vacuum, liquid) and thus simplifies and makes its construction cheaper. The use of compressed air allows the suction cups to be dried after cleaning, which reduces the effective cleaning time as there is no need to wait for them to dry by natural process.

[0017] In such advantageous arrangement, the collecting container for the already used cleaning liquid is placed below the unloading plane of the transverse segments of the vacuum segment conveyor. The actual implementation of the cleaning arrangement is variable. In one case of an advantageous arrangement, the external cleaning fluid tank can be connected to the cleaning liquid inlet through the pump or it can be the pressurized cleaning fluid tank. Then, also to the compressed air inlet the external pressurized air container is connected, or the compressed air inlet is connected with the pressurized air manifold, or the compressor is connected with the compressed air inlet. In the second case of the advantageous arrangement, the components of the cleaning device can be arranged in such way that the collecting container for the used cleaning liquid, the cleaning liquid tank, the filter, the pump are implemented in the vacuum waste sorting device itself.

[0018] In the third case of the advantageous arrangement it is possible that at least some of the components, which are the collecting container for the used cleaning liquid, the cleaning liquid tank, the filter, the pump, are arranged in the attachable external cleaning

module. For all three possible advantageous arrangements, the second valve is included in the cleaning liquid inlet and the third valve is included in the compressed air inlet. In the second and third cases, the filter used ensures a higher cleaning efficiency by keeping the liquid free of contamination and it is therefore possible to reduce its consumption during cleaning. According to the second aspect of the present invention, the method of sorting waste is provided using the vacuum waste sorting device described above. A waste objects advancing on an input conveyor towards the vacuum segment conveyor are sensed by the detection and localization optical system, where their presence is detected, they are carried by the input conveyor belt and their material or individual sorted commodities are recognized. Subsequently, the waste items fall from the input conveyor to the down positioned upper part of the vacuum segment conveyor and are sensed by the camera monitoring (tracking) optical system with machine vision.

[0019] The sensed data from the detection and localization optical system and from the camera monitoring (tracking) optical system with machine vision are processed by the control unit (herein also referred to as the control system) into instructions for opening the respective vacuum gripping components - suction cups on the respective transverse segment on which the pieces of waste have fallen, whereby the open suction cups are sucked to the piece of waste. The transverse segments are continuously moved in one direction until the respective transverse segments with the gripped waste parts are moved to the bottom side of the vacuum segment conveyor. When the transverse segments with the gripped specified waste components are moved above the respective sorted waste collecting container, the control unit issues the command for closing of the respective vacuum gripping components - suction cups on the respective transverse segment on which the waste parts are located, and the waste parts fall into the respective collecting container.

[0020] According to the third aspect of the present invention, there is provided the method for cleaning of the vacuum waste sorting device described above, the essence of which is that in the first step, the transverse segment of the vacuum segment conveyor is set above the collecting container with the used cleaning liquid. In the second step, all the valves of the vacuum gripping elements of the adjusted transverse segment of the vacuum segment conveyor are opened. In the third step, the first central vacuum supply valve is closed and the second cleaning liquid inlet valve is opened. In the fourth step, the pumping and circulation of the cleaning liquid from the cleaning liquid tank, through the cleaning liquid inlet and through the open valve in the set transverse segment of the vacuum segment conveyor 1 to the collecting container of the used cleaning liquid is initiated. In the fifth step, all the valves of the vacuum gripping components of the set trans-

verse segment of the vacuum segment conveyor are closed and another transverse segment of the vacuum segment conveyor is set above the collecting container of the used cleaning liquid. In the sixth step, after all the transverse segments have been cleaned, the third compressed air inlet valve is opened and compressed air is blown through all the transverse segments to remove the liquid from the transverse segments of the vacuum segment conveyor. In the last seventh step, the third compressed air inlet valve is closed.

[0021] The cleaning method according to the third aspect of the present invention provides the advantage of simplifying and making cheaper the maintenance of the device, eliminating the need for human intervention in cleaning, eliminating errors in the manual cleaning process, speeding up the actual cleaning as compared to manual cleaning, and reducing the shutdown time of the device due to its cleaning.

Overview of the figures on the drawings

[0022] The vacuum waste sorting device and the method of cleaning of the vacuum gripping elements with valves in the transverse segments of the device according to the invention will be further explained in the drawings, in which:

Fig. 1 shows the vacuum waste sorting device from one side of the vacuum segment conveyor with the visible flexible hollow telescopic elements.

Fig. 2 shows the vacuum waste sorting device from the other side of the vacuum segment conveyor with the visible central vacuum inlet.

Fig. 3 shows the improved vacuum waste sorting device from the other side of the vacuum segment conveyor with the visible central vacuum inlet, compressed air inlet and cleaning liquid inlet.

Fig. 4 shows the transverse segment with the matrix of 240 suction cups and with the planar filling among the suction cups.

Fig. 5 shows the transverse segment with the matrix of 138 suction cups and the free space among the suction cups.

Examples of the embodiments

[0023] It is understood that the various embodiments of the invention are presented by way of illustration and not as limitations of the solutions.

Example 1

[0024] In this example of the specific embodiment, the basic vacuum waste sorting device according to

the invention is described as illustrated in Figs. 1 and 2. The device comprises the vacuum segment conveyor 1 formed by 38 independent rectangular transverse segments 2 arranged side by side on the closed rectangular trajectory of the movable carrier 7 of the transverse segments 2. The transverse segments 2 comprise the matrix of 240 vacuum gripping components 8 - suction cups with individually remotely controlled valves with the planar filling between the suction cups as illustrated in Fig. 4. The transverse segments 2 are connected with flexible hollow telescopic elements 4 to the central vacuum inlet 3 through the first valve 18. The transverse segments 2 of the vacuum segment conveyor 1 are, towards the inlet of their movement above their loading plane, partially covered by the input conveyor belt 10 conveying the waste parts to the upper side of the vacuum segment conveyor 1. Six collection containers 9 of already separated sorted waste are placed below the unloading plane of the transverse segments 2 of the vacuum segment conveyor 1. The optical detection and localization system 5 comprising 3D scanner, hyperspectral camera, RGB camera is placed above the input conveyor belt 10. The monitoring (tracking) optical system 6 is placed above the vacuum segment conveyor 1.

[0025] In the alternative preferred embodiment, the output belt conveyor 11 for removing a non-sortable waste is associated with the vacuum segment conveyor 1.

[0026] In the further alternative embodiment, the vacuum waste sorting device has the vacuum segment conveyor 1 having the closed circular trajectory of the movable carrier 7, wherein the transverse segments 2 are connected with the central vacuum inlet 3 by flexible hollow components 4. Then, below the vacuum segment conveyor 1, two collecting containers 9 of already separated sorted waste are placed, but this is not shown in any of the figures.

[0027] In another alternative embodiment, the vacuum waste sorting device has transverse segments 2 of the matrix of 138 vacuum gripping components 8 - suction cups with individually remotely controlled valves and with the free space among the suction cups as shown in fig. 5.

Example 2

[0028] In this example of the specific embodiment, the improved vacuum waste sorting device according to the preceding example, as illustrated in fig. 3, with the cleaning arrangement for cleaning the vacuum gripping components 8 - suction cups, is described. The device is essentially as described in Example 1, and is supplemented by design features and arrangements such that, below the vacuum segment conveyor 1, the collecting container 12 for the used cleaning liquid is placed with five collecting containers 9 of the already separated sorted waste. In doing so, the transverse

segments 2 are connected with flexible hollow telescopic elements 4 to the cleaning liquid inlet 13 of the cleaning liquid collecting container 12 through the second valve 14, the pump 19 and the filter 15, and are also connected with the compressed air inlet 16 through the third valve 17. In this case, components of the cleaning device such as the collecting container 12 for the used cleaning liquid, the cleaning liquid tank 20, the filter 15, the pump 19, the second valve 14 and the third valve 17 are implemented in the vacuum waste sorting device itself.

[0029] The alternative implementation is that at least some of the components, which are the collecting container 12 for the used cleaning liquid, the cleaning liquid tank 20, the filter 15, the pump 19, have been implemented in the attachable external cleaning module. In doing so, the second valve 14 and the third valve 17 are either included in the attachable external cleaning module or are included directly in the vacuum waste sorting device. In this case, the compressed air inlet 16 through the third valve 17 is connected with the industrial pressurized air distribution system or with the compressor, which is not shown in any of the figures.

[0030] In the further alternative embodiment, only the external collecting container 12 for the used cleaning liquid is connected with the vacuum waste sorting device, furthermore the external pressurized air container with pressurized air is connected with the compressed air inlet 16, or the pressurized air inlet 16 is connected with the industrial pressurized air distribution line, or the compressor is connected with the compressed air inlet 16. Also the cleaning liquid inlet 13 is connected with the external cleaning liquid tank 20 through the pump 19, or it may be the pressurized cleaning liquid tank 20, which is also not shown in any of the figures.

Example 3

[0031] In this example of the specific embodiment, the method for cleaning vacuum gripping components with valves in the transverse segments of the vacuum segment conveyor in the vacuum waste sorting device according to the invention is described, characterized by the sequence of steps. In the first step, the respective transverse segment 2 of the vacuum segment conveyor 1 is set above the collecting container 12 with the cleaning liquid. In the second step, all valves of the vacuum gripping components 8 of the set transverse segment 2 of the vacuum segment conveyor 1 are opened. In the third step, the first valve 18 of the central vacuum inlet 3 is closed and the second valve 14 of the cleaning liquid inlet 13 of the cleaning liquid from the cleaning liquid collecting container 12 is opened. In the fourth step, the pumping and circulation of the cleaning liquid from the cleaning liquid collecting container 12, through the cleaning liquid inlet 13 and through the open valve in the set transverse segment 2 of the vacuum segment conveyor 1, back to the cleaning liquid

collecting container 12 is started. In the fifth step, all valves of the vacuum gripping components 8 of the set transverse segment 2 of the vacuum segment conveyor 1 are closed and another transverse segment 2 of the vacuum segment conveyor 1 is set above the cleaning fluid collecting container 12. In the sixth step, after all the transverse segments 2 have been cleaned, the third valve 17 of the compressed air inlet 16 is opened, and compressed air is blown through all the transverse segments 2 to remove the cleaning liquid from the transverse segments 2 of the vacuum segment conveyor 1. In the seventh step, the third valve 17 of the compressed air inlet 16 is closed, and the cleaning process is completed.

Industrial applicability

[0032] The vacuum waste sorting device and the method for cleaning the vacuum gripping components with valves in the transverse segments of the device according to the invention are useful in waste management.

List of reference numbers

[0033]

- 1 Vacuum segment conveyor
- 2 Transverse segments
- 3 Central vacuum inlet
- 4 Flexible hollow telescopic elements
- 5 Detection and localization optical system
- 6 Monitoring (tracking) optical system
- 7 Transverse segment carrier
- 8 Vacuum gripping components
- 9 Collecting containers for sorted waste
- 10 Input belt conveyor
- 11 Output belt conveyor
- 12 Cleaning liquid collecting container
- 13 Cleaning liquid inlet
- 14 Second valve
- 15 Filter
- 16 Compressed air inlet
- 17 Third valve
- 18 First valve
- 19 Pump
- 20 Cleaning liquid tank

Claims

1. A vacuum waste sorting device with vacuum gripping components, **characterized in that** it comprises:
 - a vacuum segment conveyor (1) composed of the plurality of independent transverse segments (2) arranged side by side on the closed trajectory of the movable carrier (7) of the

transverse segments (2), wherein the transverse segments (2) comprise a matrix of vacuum gripping components (8) with independently remotely controlled valves;

- the transverse segments (2) are connected with a flexible hollow elements (4) to a central vacuum inlet (3) through a first valve (18);
- the transverse segments (2) of the vacuum segment conveyor (1) are partially covered above their loading plane by a input belt conveyor (10);
- a collecting containers (9) for sorted waste placed under the unloading plane of the transverse segments (2) of the vacuum segment conveyor (1);
- a detection and localization optical system (5) located above the input conveyor belt (10);
- a monitoring (tracking) optical system (6) located above the vacuum segment conveyor (1);
- a control system for opening/closing of valves of the vacuum gripping components (8) in the transverse segments (2).

2. The vacuum waste sorting device according to claim 1, **characterized in that** an output belt conveyor (11) is associated with the vacuum segment conveyor (1).
3. The vacuum waste sorting device according to any one of claims 1 or 2, **characterized in that** the vacuum segment conveyor (1) has the closed trajectory of the movable carrier (7) with at least two lines parallel to each other, wherein the transverse segments (2) are connected with the central vacuum inlet (3) by flexible telescopic hollow elements (4).
4. The vacuum waste sorting device according to any one of claims 1 or 2, **characterized in that** the vacuum segment conveyor (1) has the closed circular trajectory of the movable carrier (7).
5. The vacuum waste sorting device according to any one of claims 1 to 4, **characterized in that** the transverse segments (2) are connected with the flexible hollow elements (4) to the cleaning liquid inlet (13), wherein a collecting container (12) for the cleaning liquid is placed below the unloading plane of the transverse segments (2) of the vacuum segment conveyor (1).
6. The vacuum waste sorting device according to claim 5, **characterized in that** the cleaning liquid collecting container (12) is connected through a cleaning liquid tank (20) and a pump (19) with a cleaning liquid inlet (13).

7. The vacuum waste sorting device according to any one of claims 5 or 6, **characterized in that** a filter (15) is connected between the collecting container (12) for the cleaning liquid and the tank (20) for the cleaning liquid. 5
8. The vacuum waste sorting device according to claim 5, **characterized in that** the transverse segments (2) are connected with the flexible hollow elements (4) to a compressed air inlet (16). 10
9. The vacuum waste sorting device according to any one of claims 5 to 8, **characterized in that** a second valve (14) is included in the cleaning liquid inlet (13) and a third valve (17) is included in a compressed air inlet (16). 15
10. The vacuum waste sorting device according to any one of claims 5 to 9, **characterized in that** at least two of the components: the collecting container (12) for the cleaning liquid, the tank (20) for the cleaning liquid, the filter (15), the pump (19), the second valve (14) and the third valve (17) are arranged in the attachable external cleaning module. 20 25
11. A method for cleaning of the vacuum gripping components with valves in the transverse segments of the vacuum segment conveyor in the vacuum waste sorting device according to any one of claims 5 to 10, **characterized in that:** 30
- in the first step, the transverse segment (2) of the vacuum segment conveyor (1) is positioned above the cleaning liquid collecting container (12); 35
 - in the second step, all valves of the vacuum gripping components (8) of the set transverse segment (2) of the vacuum segment conveyor (1) are opened;
 - in the third step, the first valve (18) of the central vacuum inlet (3) is closed and the second valve (14) of the cleaning liquid inlet (13) is opened; 40
 - in the fourth step, the pumping and circulation of the cleaning liquid from the cleaning liquid inlet (13) and through the open valve in the set transverse segment (2) of the vacuum segment conveyor (1) back to the cleaning liquid collection container (12) is initiated; 45
 - in the fifth step, all valves of the vacuum gripping components (8) of the set transverse segment (2) of the vacuum segment conveyor (1) are closed and another transverse segment (2) of the vacuum segment conveyor (1) is set above the cleaning liquid collecting container (12). 50 55

12. The Method for cleaning vacuum gripping compo-

nents with valves in transverse segments of the vacuum segment conveyor in the vacuum waste sorting device according to claim 11, **characterized in that:**

- in the sixth step, after cleaning all the transverse segments (2), the third valve (17) of the compressed air inlet (16) is opened, whereby the compressed air blows through all the transverse segments (2) to remove the liquid from the transverse segments (2) of the vacuum segment conveyor (1);
- in the seventh step, the third valve (17) of the compressed air inlet (16) is closed.

Amended claims in accordance with Rule 137(2) EPC.

1. A vacuum waste sorting device with vacuum gripping components comprising:
- a vacuum segment conveyor (1) composed of the plurality of independent transverse segments (2) arranged side by side on the closed trajectory of the movable carrier (7) of the transverse segments (2), wherein the transverse segments (2) comprise a matrix of vacuum gripping components (8) with independently remotely controlled valves;
 - the transverse segments (2) are connected with a flexible hollow elements (4) to a central vacuum inlet (3) through a first valve (18);
 - a detection and localization optical system (5) located above the input belt conveyor (10);
 - a control system for opening/closing of said independently remotely controlled valves of the vacuum gripping components (8) in the transverse segments (2);
- characterized in that:**
- the hollow elements (4) are flexible hollow elements (4);
 - the transverse segments (2) of the vacuum segment conveyor (1) are arranged beneath the input belt conveyor (10) and are partially covered above their loading plane by the input belt conveyor (10);
 - collecting containers (9) for sorted waste are placed under the unloading plane of the transverse segments (2) of the vacuum segment conveyor (1); and
 - a monitoring and tracking optical system (6) is located above the vacuum segment conveyor (1).
2. The vacuum waste sorting device according to claim 1, wherein an output belt conveyor (11) is

associated with the vacuum segment conveyor (1).

3. The vacuum waste sorting device according to any one of claims 1 or 2, wherein the closed trajectory of the movable carrier (7) comprises at least two rectangular-shaped lines parallel to each other, wherein the flexible hollow elements (4) connecting the transverse segments (2) with the central vacuum inlet (3) are telescopic. 5
4. The vacuum waste sorting device according to any one of claims 1 or 2, wherein the vacuum segment conveyor (1) has the closed circular trajectory of the movable carrier (7). 10
5. The vacuum waste sorting device according to any one of claims 1 to 4, wherein the transverse segments (2) are connected with the flexible hollow elements (4) to the cleaning liquid inlet (13), wherein a collecting container (12) for the cleaning liquid is placed below the unloading plane of the transverse segments (2) of the vacuum segment conveyor (1). 15 20
6. The vacuum waste sorting device according to claim 5, wherein the cleaning liquid collecting container (12) is connected through a cleaning liquid tank (20) and a pump (19) with a cleaning liquid inlet (13). 25
7. The vacuum waste sorting device according to any one of claims 5 or 6, wherein a filter (15) is connected between the collecting container (12) for the cleaning liquid and the tank (20) for the cleaning liquid. 30 35
8. The vacuum waste sorting device according to claim 5, wherein the transverse segments (2) are connected with the flexible hollow elements (4) to a compressed air inlet (16). 40
9. The vacuum waste sorting device according to any one of claims 5 to 8, wherein a second valve (14) is included in the cleaning liquid inlet (13) and a third valve (17) is included in a compressed air inlet (16). 45
10. The vacuum waste sorting device according to any one of claims 5 to 9, wherein at least two of the components: the collecting container (12) for the cleaning liquid, the tank (20) for the cleaning liquid, the filter (15), the pump (19), the second valve (14) and the third valve (17) are arranged in the attachable external cleaning module. 50 55
11. A method for cleaning of the vacuum gripping components with valves in the transverse segments of the vacuum segment conveyor in the vacuum

waste sorting device according to any one of claims 5 to 10, **characterized in that:**

- in the first step, the transverse segment (2) of the vacuum segment conveyor (1) is positioned above the cleaning liquid collecting container (12);
 - in the second step, all valves of the vacuum gripping components (8) of the set transverse segment (2) of the vacuum segment conveyor (1) are opened;
 - in the third step, the first valve (18) of the central vacuum inlet (3) is closed and the second valve (14) of the cleaning liquid inlet (13) is opened;
 - in the fourth step, the pumping and circulation of the cleaning liquid from the cleaning liquid inlet (13) and through the open valve in the set transverse segment (2) of the vacuum segment conveyor (1) back to the cleaning liquid collection container (12) is initiated;
 - in the fifth step, all valves of the vacuum gripping components (8) of the set transverse segment (2) of the vacuum segment conveyor (1) are closed and another transverse segment (2) of the vacuum segment conveyor (1) is set above the cleaning liquid collecting container (12).
12. The method for cleaning vacuum gripping components with valves in transverse segments of the vacuum segment conveyor in the vacuum waste sorting device according to claim 11, wherein:
- in the sixth step, after cleaning all the transverse segments (2), the third valve (17) of the compressed air inlet (16) is opened, whereby the compressed air blows through all the transverse segments (2) to remove the liquid from the transverse segments (2) of the vacuum segment conveyor (1);
 - in the seventh step, the third valve (17) of the compressed air inlet (16) is closed.

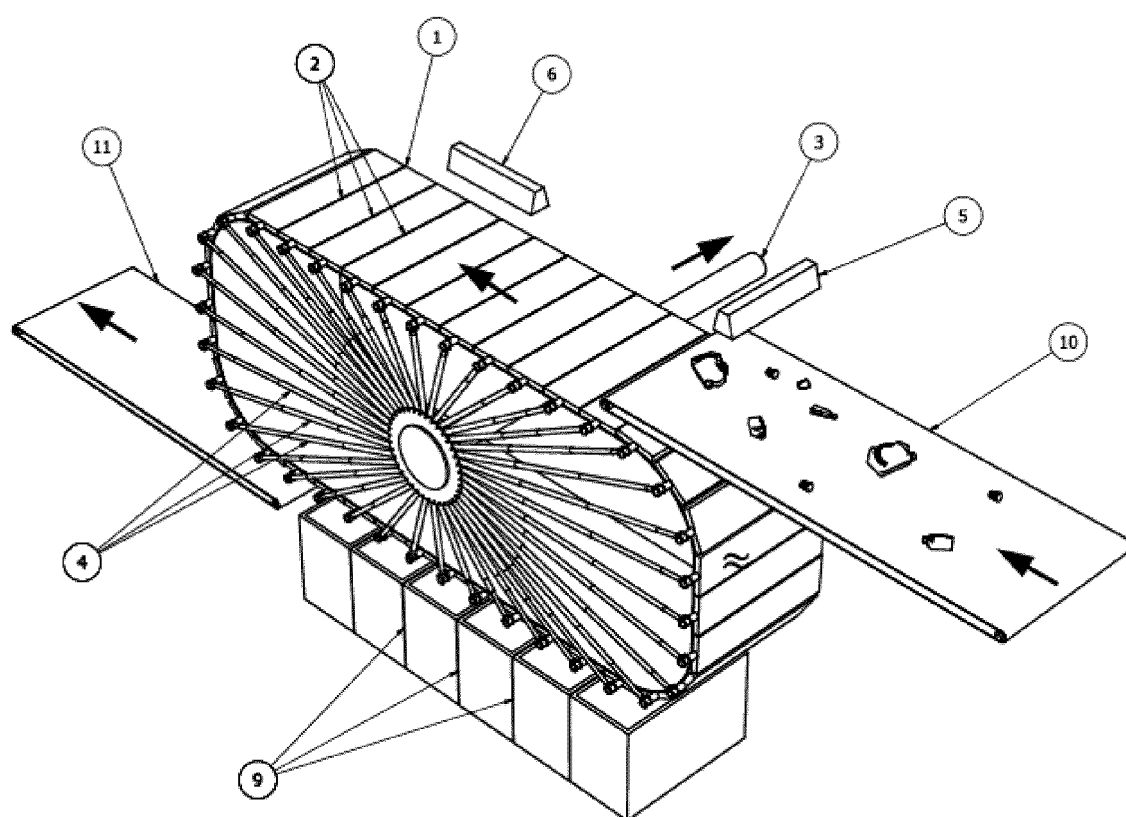


Fig. 1

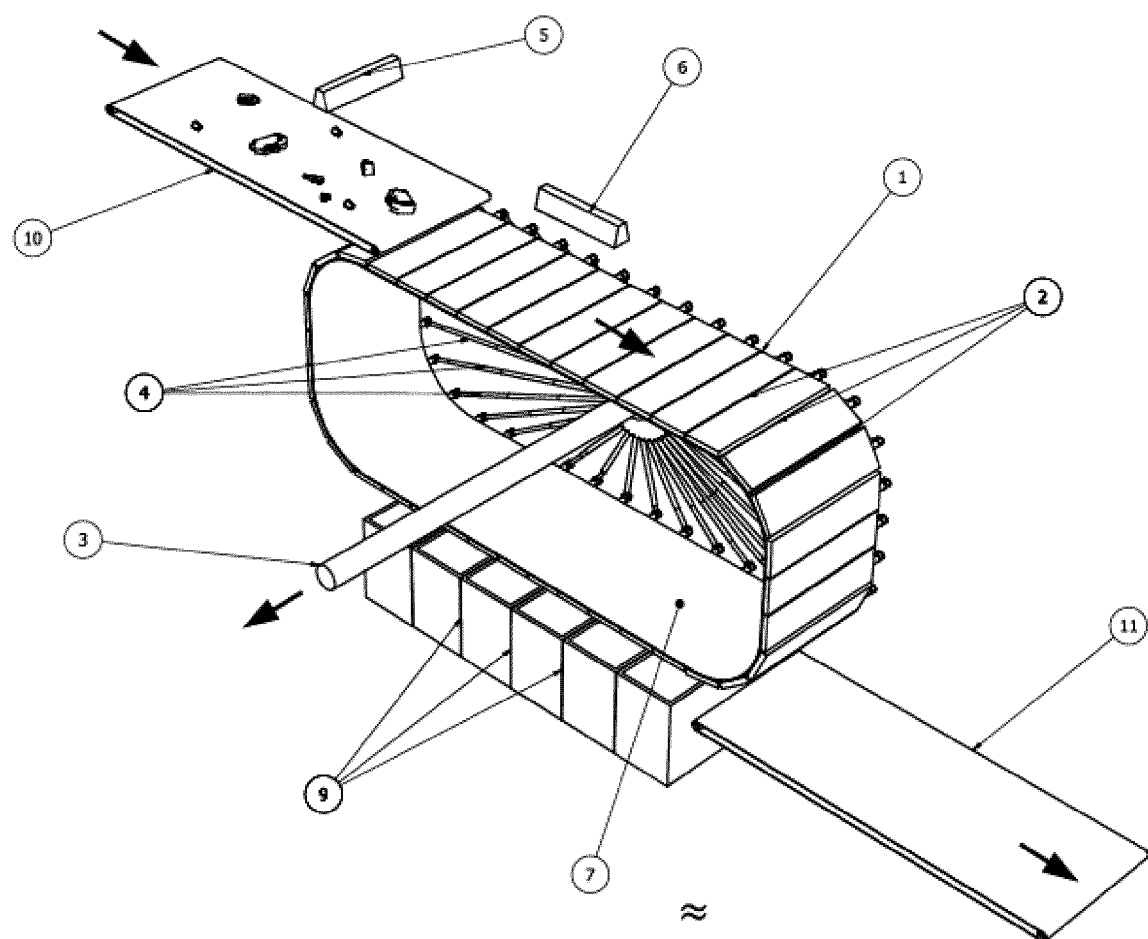


Fig. 2

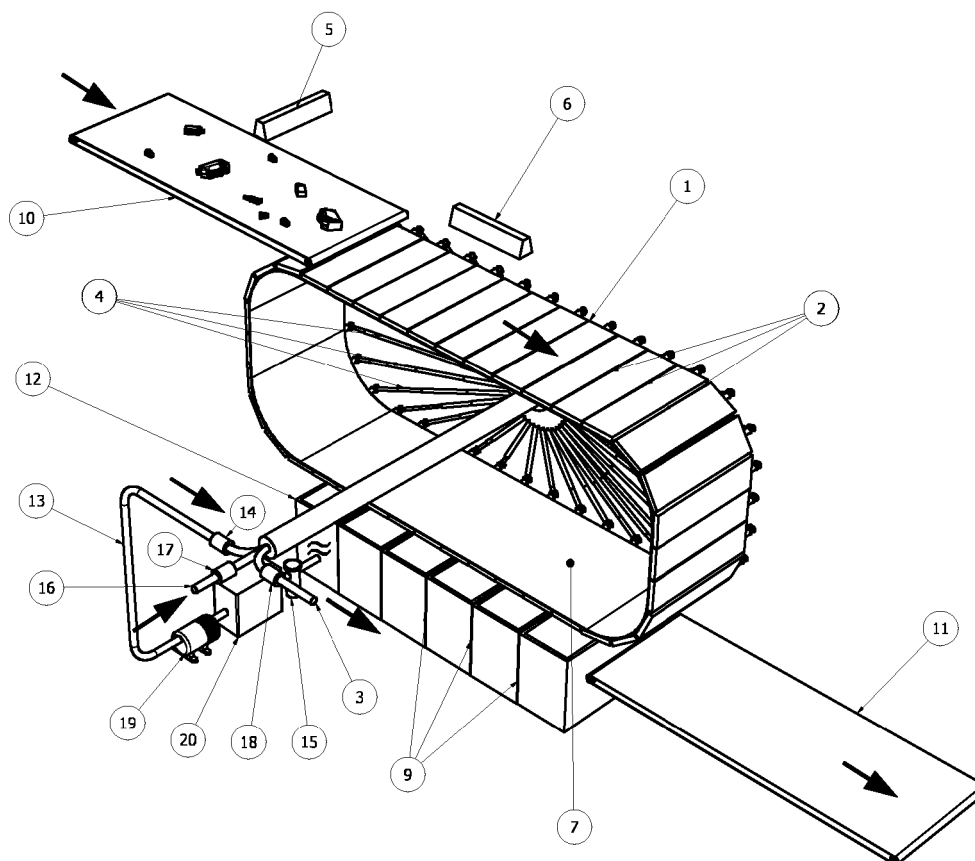


Fig. 3

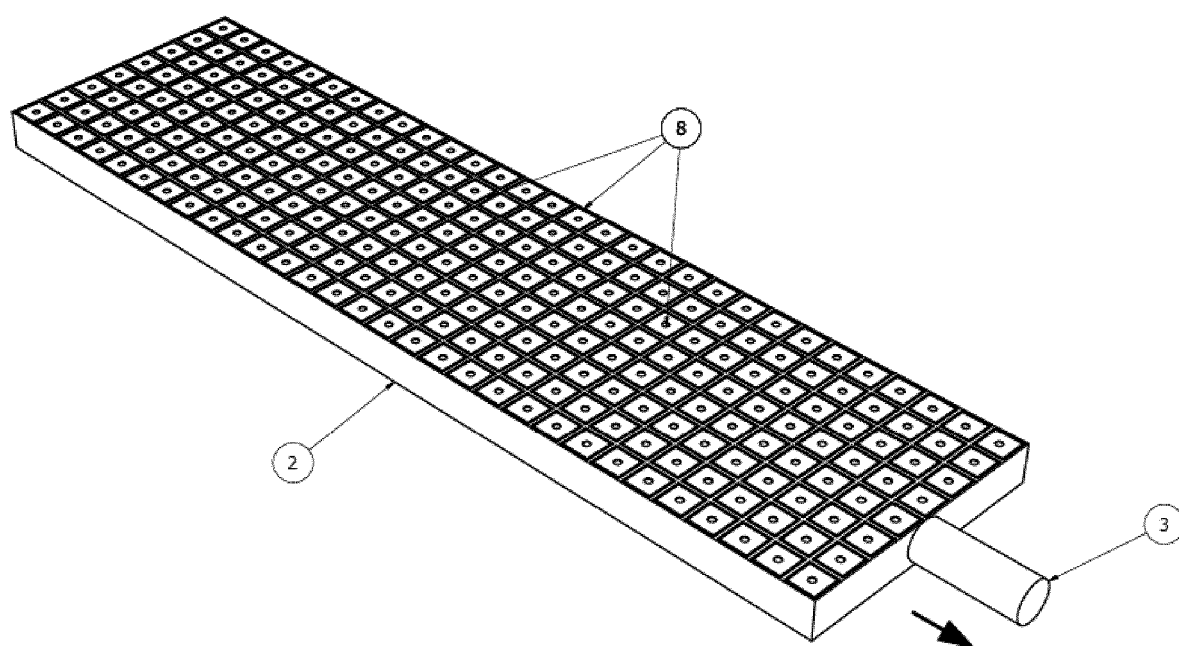


Fig. 4

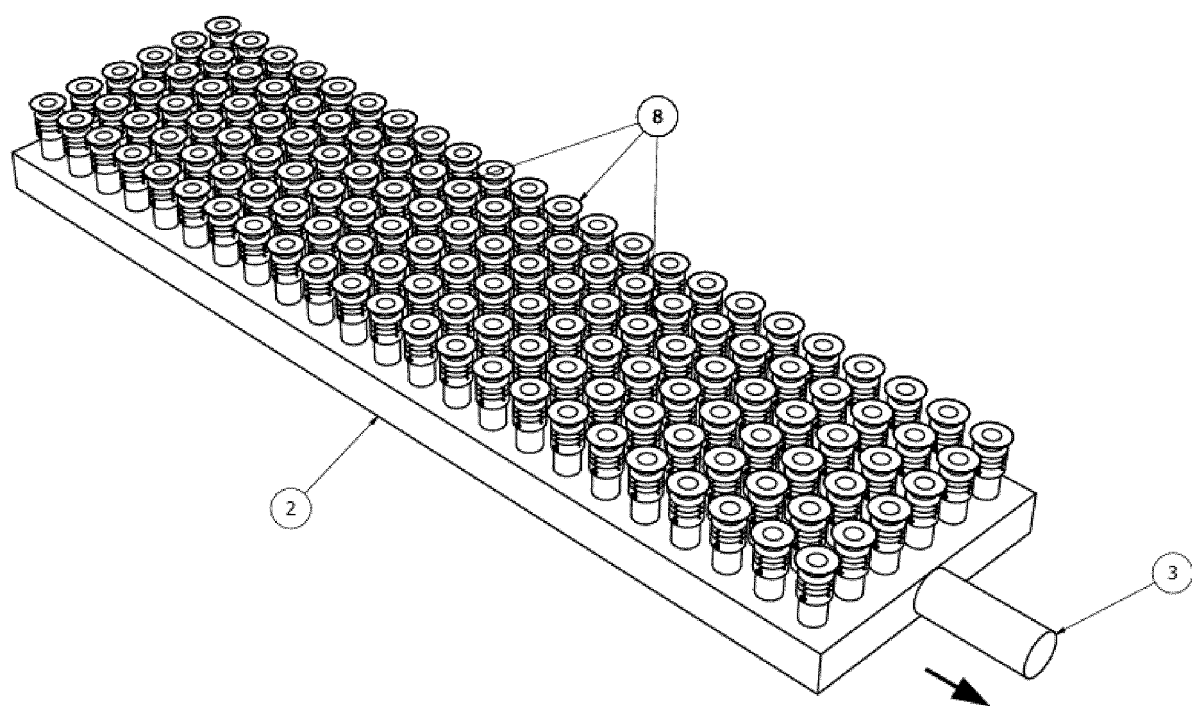


Fig. 5



EUROPEAN SEARCH REPORT

Application Number

EP 25 17 0548

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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