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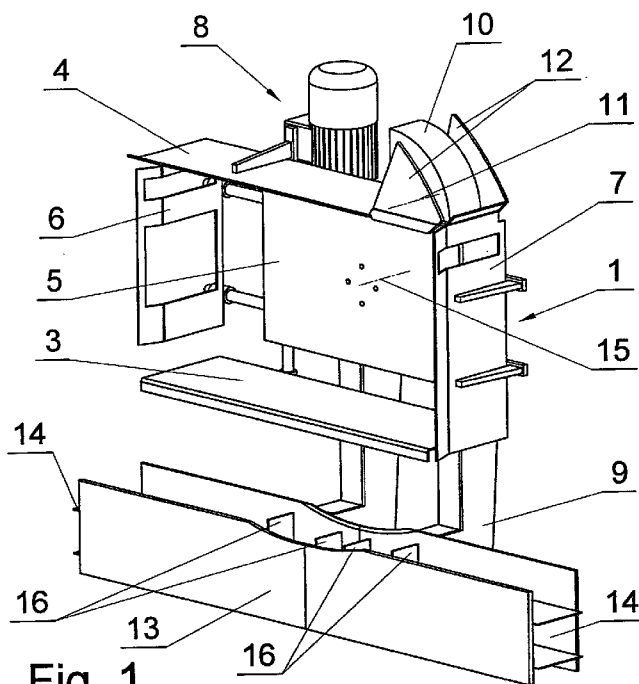
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5/108, PL-02-641 Warszawa (PL).(81) Designated States (unless otherwise indicated, for every
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ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
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[Continued on next page]

(54) Title: METHOD OF UNLOADING ROD-LIKE ELEMENTS COLLECTED IN A TRAY AND A DEVICE FOR UN-
LOADING TRAYS FILLED WITH ROD-LIKE ELEMENTS**Fig. 1**(57) Abstract: Unloading elements in the form of mass
outflow through a tilt valve (10) into a re- receiving chan-
nel (14) after the tray is rotated (2) around an axis (15) per-
pendicular to its back plate is carried out alternately to several
receiving channels (14), after placing the tilt valve (10)
above the entry to the respective channel (14), with the out-
flow of elements effected to channels (14) directed contrari-
wise to each other along one plane, or channels (14')
along different parallel planes. The device is equipped with
a tray-holding unit (1) connected to a rotating mechanism
(8) having a base (3), a top plate (4), a back plate (5) and
side jaws (6, 7). The end part of the top plate (4) securing
the elements in the tray (2) on the fixed side jaw (7) is a tilt
valve (10) with the rotation axis (11) perpendicular to the
back plate (5), opening to the outside of the top plate (4),
and the rotation axis (11) is at the distance from the plane of
the fixed side jaw (7) equal to the length of the valve (10).
The valve (10, 10') can be a section of a cylinder or a rect-
angular plate. To the lengthwise edge of the top plate (4),
between the rotation axis (H) and the plane of the jaw (7),
guides (12, 12') are fixed perpendicularly to the plate (4),
which may have the shape of a circular sector or a triangle
with an angle (α) $\leq 90^\circ$. The base (3) and one side (6) of
unit (1) are positioned adjustably. The receiving channels
(14, 14') in the entry area have guides (16) and are directed
contrariwise to each other in one plane parallel to the back
plate (5) or in different planes parallel to the back plate (5)
of unit (1).

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**METHOD OF UNLOADING ROD-LIKE ELEMENTS COLLECTED
IN A TRAY AND A DEVICE FOR UNLOADING TRAYS
FILLED WITH ROD-LIKE ELEMENTS**

The object of the invention is a method of unloading rod-like elements collected in a tray used in the tobacco industry and a device for semi-automatic unloading of trays with rod-like elements, the elements being transferred for further processing in the production line of the tobacco industry.

Trays are often used in production lines manufacturing tobacco products, such as cigarettes, filters, cigars or cigarillos, as intermediate magazines for temporary storage of rod-like elements. They are used particularly, when the machine manufacturing elements has different productivity than the receiving machine. Trays are also used where it is necessary to move finished products between different production lines. Delivery of rod-like elements to operational stations takes place after their unloading at the tray unloader, many kinds of which are used in the tobacco industry. The general rule of the unloader's operation is to rotate each incoming tray, so as to enable its gravitational or mechanical emptying, and rotary or rotary-linear motion may be applied, while full trays are fed from the bottom or in the direction of the rotation axis of the rotating mechanism. During rotation of the tray, the rod-like elements are restrained by means of a supporting plate pushed up to the open top side of the tray. After turning the tray and placing it in the unloading position, the supporting plate is withdrawn from the lower restraining position, and rod-like elements fall down from the tray onto the ones which are already

in the self-unloading hopper or can be mechanically removed, and the withdrawal of the plate is effected by means of linear motion, pendulous motion, or complex motion. In one embodiment of the trays unloading device, shown in Fig. 5 and Fig. 6 and in the description of USA Patent No. US 4.303.366, was presented a structure, wherein full trays are transferred by inclined conveyor toward the unloading position, from which the trays are received by a driver supporting the tray, mounted pivotally on a fixed axis. The driver includes an L-shaped support extending from the said axis and forming a support for the side and bottom of the tray, and a pair of parallel connectors are attached to the support near the axis, and extends in the direction parallel to the bottom of the support, the connectors being spaced at a distance slightly greater than the length of the rod-like elements located in the tray, so that between the connectors a slot is formed, through which the rod-like elements can come out of the tray. The said slot is covered by a tilting locking element, whose rotation axis is attached to the ends of the connectors, distant from the rotation axis of the support, while the locking element of the connector has, on the side of the connectors, a plate made of soft plastic with dimensions corresponding to the gap between the connectors. After the driver rotates with the tray by an angle greater than 90° , preferably up to 135° , the locking element is tilted owing to resting on the immobile bumper located near its rotation axis. In this position, the tray is unloaded by flowing out of the rod-like elements through the gap formed between the end of the locking element and the edge of the tray. The device can be operated both in the automatic or semiautomatic modes.

According to the invention, a significant feature of the method of unloading the rod-like elements located in the tray, where the mass flow of the elements to the receiving channel is effected due to tilting the valve after rotating the tray around the axis perpendicular to the back plate, is unloading the tray alternately to several receiving channels, after placing the tilting valve above the entry to the respective channel. The unloading is effected into the channels directed contrariwise to each other, in which the mass flow of the stack of elements is carried out along one plane, or in which the said movement is carried out along different parallel planes. Thus it is possible to unload trays, even if

the conveyors in the receiving channels are not situated opposite to each other, and the selection of the proper channel to which the elements are unloaded is controlled in accordance with current demand.

According to invention the essence of the device for unloading trays filled with rod-like elements, equipped with a tray-holding unit, which has a base, a top plate, a back plate and side jaws, the back plate being connected to a rotating mechanism, and below the holding unit there are receiving channels, is the structure, in which the final part of the top plate securing the elements in the tray, from the side of the fixed side jaw, is a tilt valve with the rotation axis perpendicular to the back plate, opening to the outside of the top plate, and the rotation axis of the valve is at the distance from the plane of the fixed side jaw equal to the length of the valve. The tilt valve may be a rectangular plate of the width corresponding to the width of the top plate, mounted rotationally on an axis situated in parallel to the plane of the top plate, at the distance from the plane of the fixed side jaw equal to the length of the plate. In another solution of the device according to the invention, the tilt valve may be a section of a cylinder of the height corresponding to the width of the top plate, with the valve's rotation axis being the axis of the cylinder, which is situated in parallel to the plane of the top plate at the distance from the plane of the fixed side jaw equal to the radius of the cylinder. To the lengthwise edge of the top plate, between the rotation axis of the valve and the plane of the fixed side jaw, guides are fixed perpendicularly to the plane of the top plate, directed in accordance with the opening movement of the valve, co-forming the chute for the rod-like elements. The guides may have the shape of a triangle with the angle at the base smaller than or equal to 90° or the shape of a circular sector of the radius corresponding to the radius of the walls in the area of entry to the receiving channels, with the beginning of the radius of each guide lying in the axis of the rotating mechanism. The rotating mechanism is connected with the unit holding the tray in the central area of the back plate. The unit holding the tray has an adjustable base and one adjustable side jaw, the base being positioned adjustably towards the longer side the tray, and the side jaw being positioned adjustably towards the shorter side the tray. The receiving channels in the entry area

have guides of the mass flow of the rod-like elements, and the said channels in the entry area may be directed contrariwise to each other in one plane, parallel to the back plate, or in different planes, parallel to the back plate. The advantage of the structure according to the invention is allowing semi-automatic or manual unloading of the trays without deformation of the rod-like elements, because the pressure on the out flowing elements is much smaller than with the typical methods of unloading, and also the operation of withdrawing the plate supporting the elements has been eliminated. After placing the tray in the unloading position, a closed channel is formed by the tilted valve and the guides, wherein the elements can move in an orderly mass flow stack to the receiving device, without disturbing the flow. Also the possibility of the elements from outside the tray entering the channel has been eliminated. Furthermore, one device can supply two or more receiving devices, even if their inlet channels are not positioned in front of each other.

For better understanding, the object of the invention is shown in example embodiments in the drawing, wherein Fig. 1 presents a perspective view of the device without a tray with the valve in the form of a section of a cylinder, and guides in the form of a circular sector, and the receiving channels situated in one plane, Fig. 2 - the device as in Fig. 1 with a tray, Fig. 3 - the device as in Fig. 2 after rotating the tray to the unloading position, Fig. 4 - the device as in Fig. 3 with open valve during unloading the elements to the left receiving channel, Fig. 5 - the device as in Fig. 4 during unloading to the right receiving channel, a Fig. 6 - a perspective view of the device with a valve in the form of a rectangular plate, the guides in the form of a triangle and the receiving channels situated in different parallel planes.

The device according to the invention has a holding unit 1, in which a tray 2 is placed, filled with rod-like elements. Unit 1 has an adjustable base 3, a top plate 4 and a back plate 5 and side jaws - adjustable 6 and fixed 7. The unit 1 is connected to a rotating mechanism 8 in the central part of the back plate 5, while the mechanism 8 is mounted on a frame 9. The base 3 is situated adjustably towards the longer side the tray 2, and the side jaw 6 is positioned adjustably towards the shorter side the tray 2. The end part

of top plate 4, which secures the rod-like elements in the tray 2, on the side of the fixed side jaw 7, is a tilt valve 10 opening to the outside of the top plate 4, and the rotation axis 11 of valve 10 is at the distance from the plane of the fixed side jaw 7 equal to the length of the valve 10, and is mounted perpendicularly to the back plate 5 of the unit 1. The tilt valve 10 is a section of a cylinder of the height corresponding to the width of top plate 4, with the rotation axis 11 of the valve 10 being the axis of the cylinder, and is situated in parallel to the plane of the top plate 4 at the distance from the plane of the fixed side jaw 7 equal to the radius of the cylinder. In another embodiment of the device (Fig. 6), a valve 10' is a rectangular plate of the width corresponding to the width of the top plate 4, mounted rotationally on an axis situated in parallel to the plane of the top plate 4, at the distance from the plane of the fixed side jaw 7 equal to the length of the plate. To the lengthwise edge of top plate 4, between the rotation axis 11 of the valve 10 and the plane of the fixed side jaw 7, guides 12 are fixed perpendicularly to the plane of the top plate 4, directed in accordance with the opening movement of the valve 10, co-forming the chute for the rod-like elements. The guides 12 have the shape of a circular sector of the radius corresponding to the radius of the walls 13 in the area of the inlet to receiving channels 14, with the beginning of the radius of each guide 12 lying in an axis 15 of the rotating mechanism 8. In another embodiment of the device (Fig. 6) guides 12' are of the shape of a triangle with the angle α preferably of 60° . The receiving channels 14 situated below the holding unit 1 have in the entry area guides 16 of the mass flow of the rod-like elements, and are directed contrariwise to each other in one plane, parallel to the back plate 5, of the unit 1. In another embodiment of the device (Fig. 6) the receiving channels 14' are situated in the inlet area contrariwise to each other in different planes, parallel to the back plate 5.

The operation of the device, according to the disclosed method is described hereunder. A tray 2 filled with rod-like elements is placed on a base 3 of a holding unit 1 open side up, then the base 3 and an adjustable jaw 6 are situated so that the open side of the tray 2 rests on a top plate 4, the end part of which on the side of a fixed side jaw 7 is a valve 10 or 10', closed at this moment. The adjustable base 3 and the adjustable

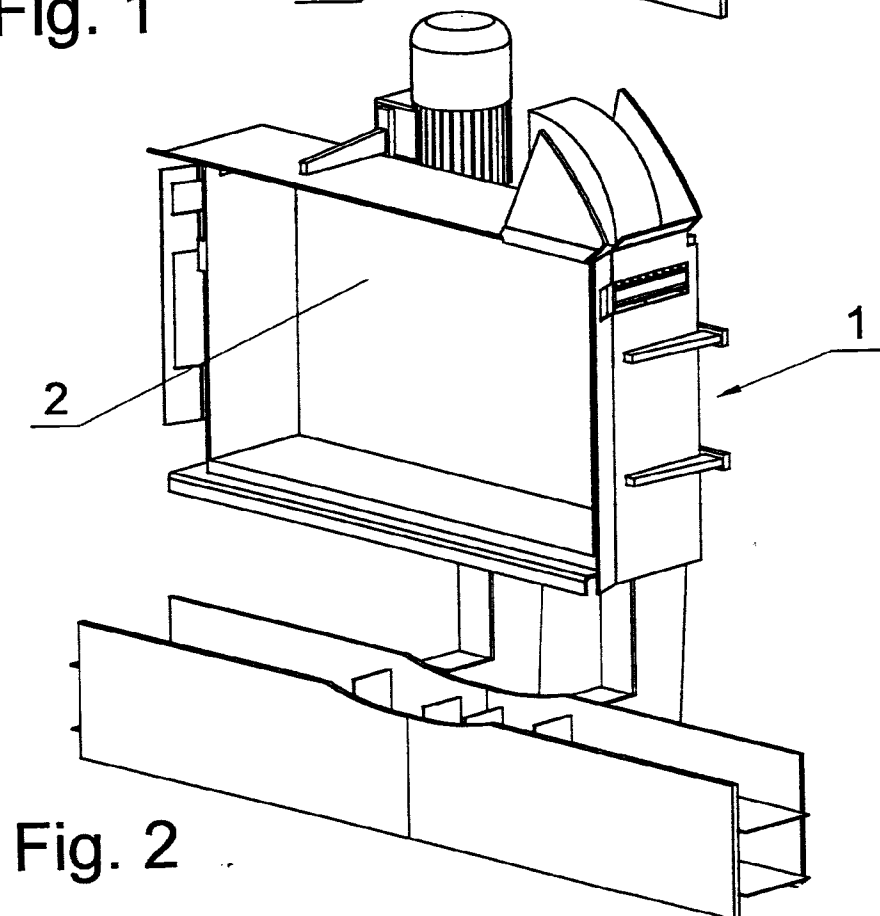
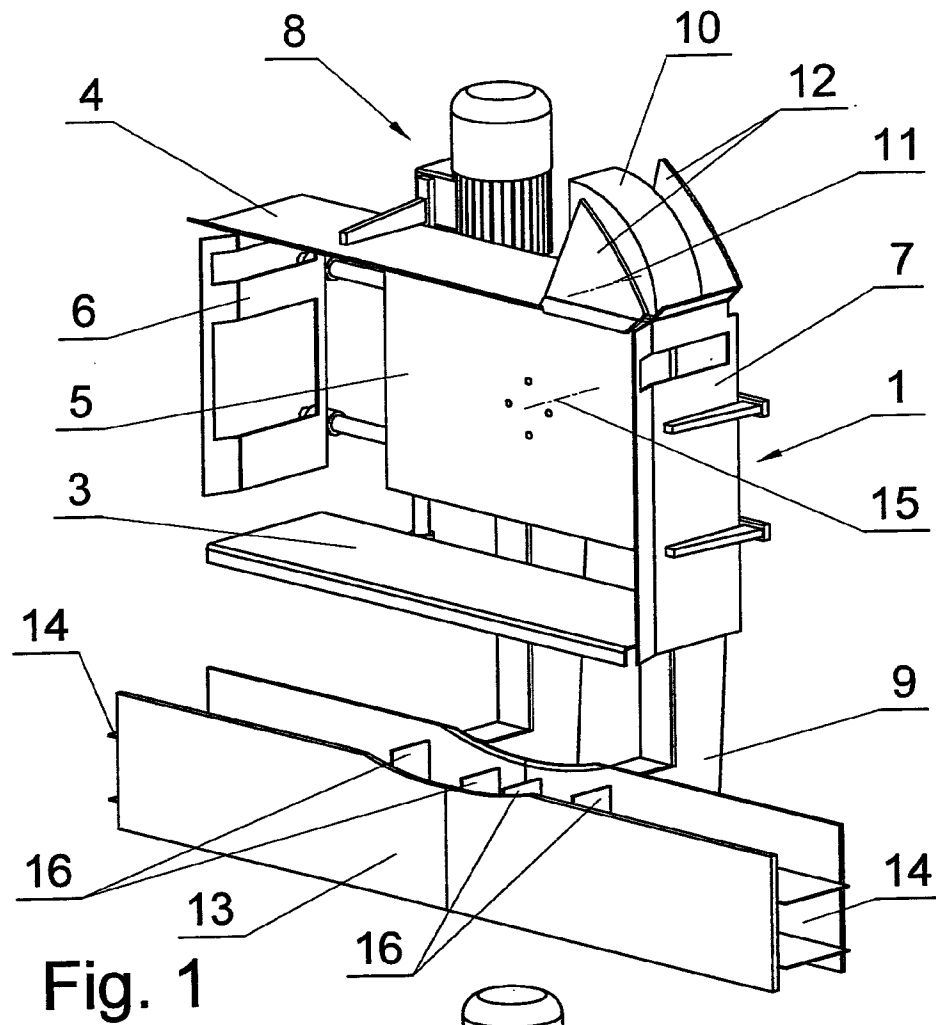
side jaw 6 permit adaptation of holding unit 1 to various tray dimensions 2, and also permit control of unit 1 for correct holding of tray 2. After rotation of unit 1 with tray 2 by means of the rotating mechanism 8 to the unloading position, so that the guides 12 or 12' are situated above the guides 16 in the entry area corresponding to the receiving channel 14 or 14', the valve 10 or 10' is opened by rotation around the axis 11 to the outside of the top plate 4, and rod-like elements in the form of stacked mass flow are transferred through a chute formed by the inner wall of valve 10 or 10', the inner walls of the guides 12 or 12' and the guide 16 to the respective receiving channel 14 or 14', wherein they are directed for further processing. The position of the valve 10 or 10' above the entry to the currently used receiving channel 14 or 14' is achieved through appropriate rotation and displacement of the rotating mechanism 8 on the frame 9 perpendicularly to the receiving channels 14 or 14'. The example embodiment of the device presented in Fig. 6 is not a limitation all structural options, since it is obvious that different forms of the valve 10 or 10', the guides 12 or 12' and the position of receiving the channels 14 or 14' may be applied alternatively, depending on need.

Claims

1. A method of unloading rod-like elements collected in a tray, wherein mass out-flow of rod-like elements into a receiving channel is effected through a tilt valve after the tray is rotated around an axis perpendicular to its back plate, characterized in that the unloading is carried out alternately to several receiving channels after placing the tilt valve above the entry to the respective channels.
2. A method as in claim 1, characterized in that the unloading is effected to the receiving channels directed contrariwise to each other, in which the mass flow of the stack of elements is carried out along one plane.
3. A method as in claim 1, characterized in that the unloading is effected to the receiving channels directed contrariwise to each other, in which the mass flow of the stack of elements is carried out along different parallel planes.
4. A device for unloading trays filled with rod-like elements, equipped with a tray-holding unit having a base, a top plate, a back plate, and side jaws, wherein the back plate is connected to the rotating mechanism, and below a gripping device there are receiving channels, characterized in that the end part of the top plate (4) securing the elements in the tray (2) from the side of the fixed side jaw (7) is a tilt valve (10) with the rotation axis (11) perpendicular to the back plate (5) of the unit (1) opening to the outside of the top plate (4), and the rotation axis (11) of the valve (10) is at the distance from the plane of the fixed side jaw (7) equal to the length of the valve (10).

5. A device as in claim 4, characterized in that the tilt valve (10) is a rectangular plate of the width corresponding to the width of the top plate (4), mounted rotationally on the axis (11), situated in parallel to the plane of the top plate (4), at the distance from the plane of the fixed side jaw (7) equal to the length of the valve (10).
6. A device as in claim 4, characterized in that the tilt valve (10) is a section of a cylinder of the height corresponding to the width of the top plate (4), and the rotation axis (11) of the valve (10) is the axis of the cylinder and is situated in parallel to the plane of the top plate (4), at the distance from the plane of the fixed side jaw (7) equal to the length of the valve (10).
7. A device as in claim 4, characterized in that to the lengthwise edge of the top plate (4), between the rotation axis (11) of the valve (10) and the plane of the fixed side jaw (7), guides (12) are fixed perpendicularly to the plane of the top plate (4), directed in accordance with the opening movement of the valve (10), co-forming the chute for the rod-like elements.
8. A device as in claim 7, characterized in that the guides (12') have the shape of a triangle of angle (α) meeting the condition $\alpha \leq 90^\circ$.
9. A device as in claim 7, characterized in that the guides (12) have the shape of a circular sector of the radius corresponding to the radius of the walls in the area of entry to the receiving channels (14).
10. A device as in claim 9, characterized in that the beginning of the radius of each guide (12) lies in the axis (15) of the rotating mechanism (8).
11. A device as in claim 4, characterized in that the rotating mechanism (8) is connected with the unit (1) holding the tray (2), in the central area of the back plate (5).
12. A device as in claim 4 or 11, characterized in that the unit (1) holding the tray (2) has an adjustable base (3) and one adjustable side jaw (6).

13. A device as in claim 12, characterized in that the base (3) is positioned adjustably towards the longer side the tray (2).
14. A device as in claim 12, characterized in that the side jaw (6) is positioned adjustably towards the shorter side the tray (2).
15. A device as in claim 4, characterized in that the receiving channels (14) in the entry area have guides (16) of the mass flow of the rod-like elements.
16. A device as in claim 4 or 15, characterized in that the receiving channels (14) in the entry area are directed contrariwise to each other in one plane, parallel to the back plate (5).
17. A device as in claim 4 or 15, characterized in that the receiving channels (14') in the input areas are directed contrariwise to each other in different planes, parallel to the back plate (5).



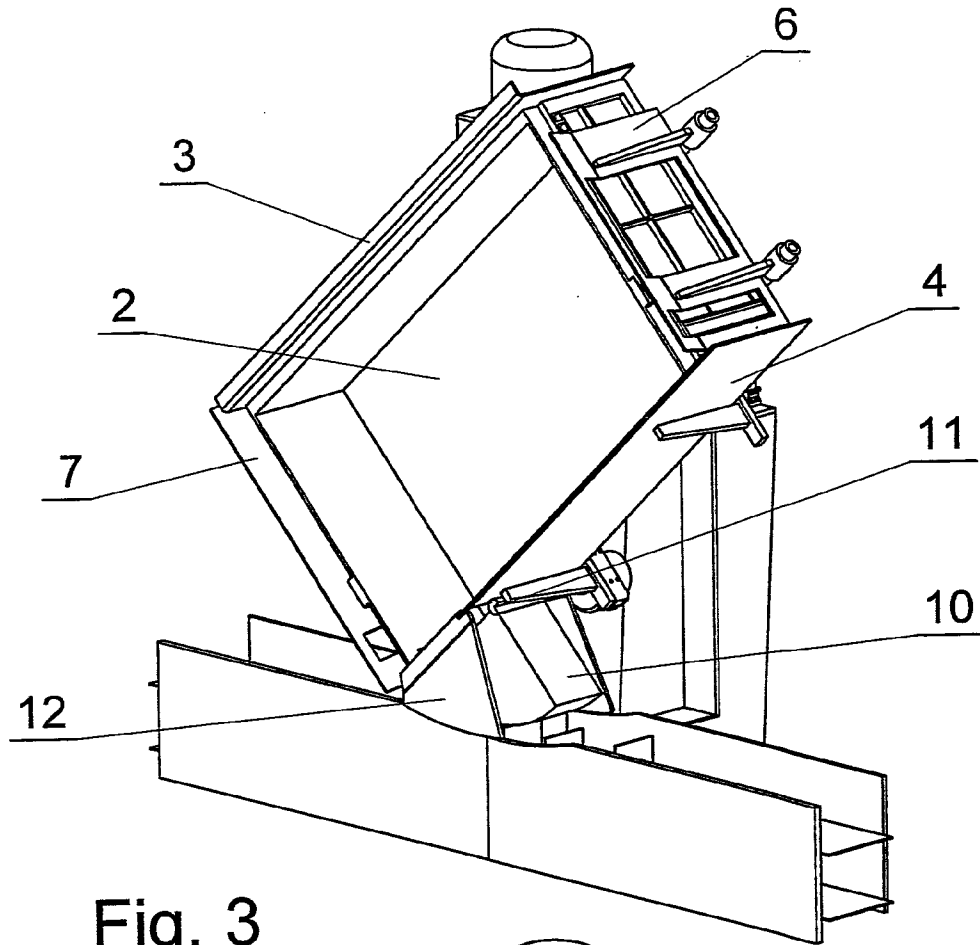
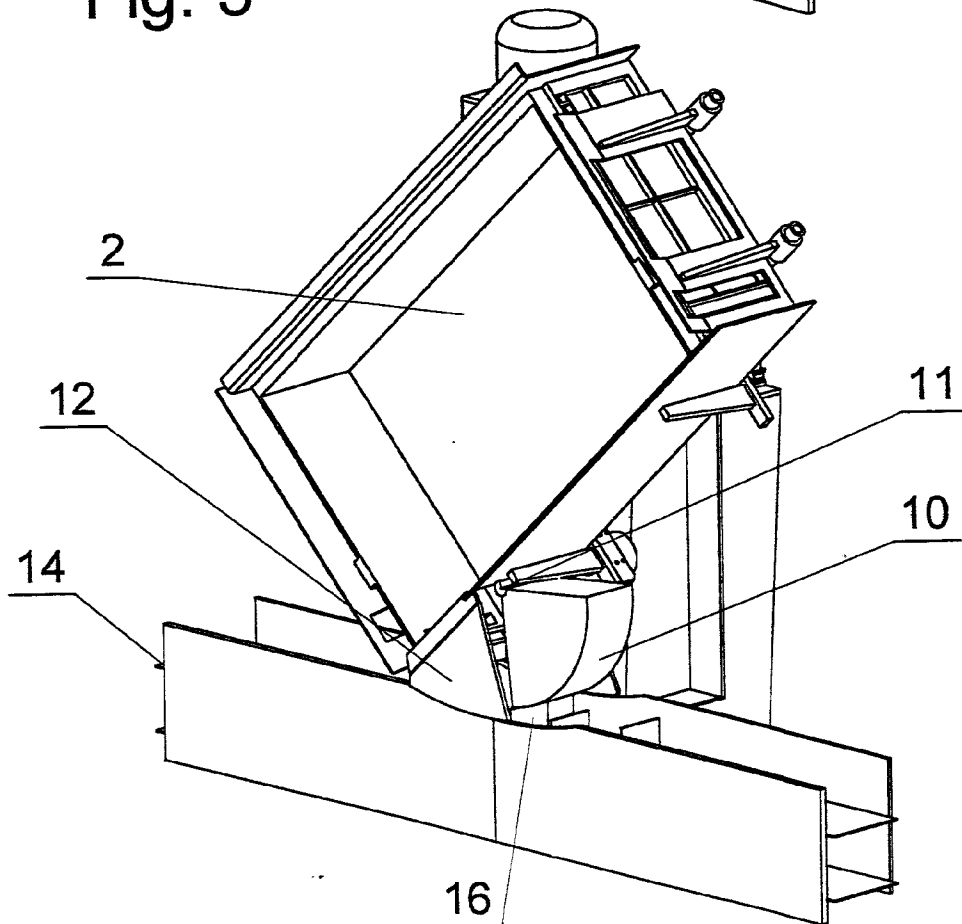
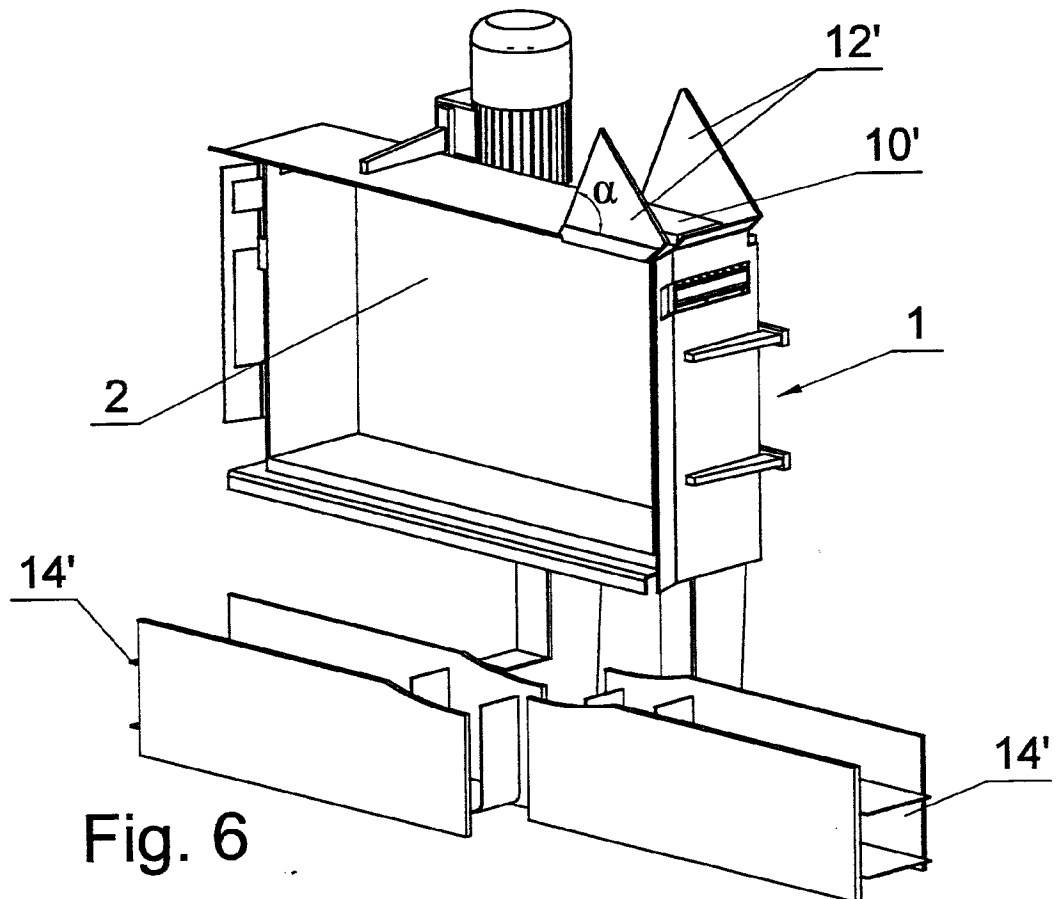
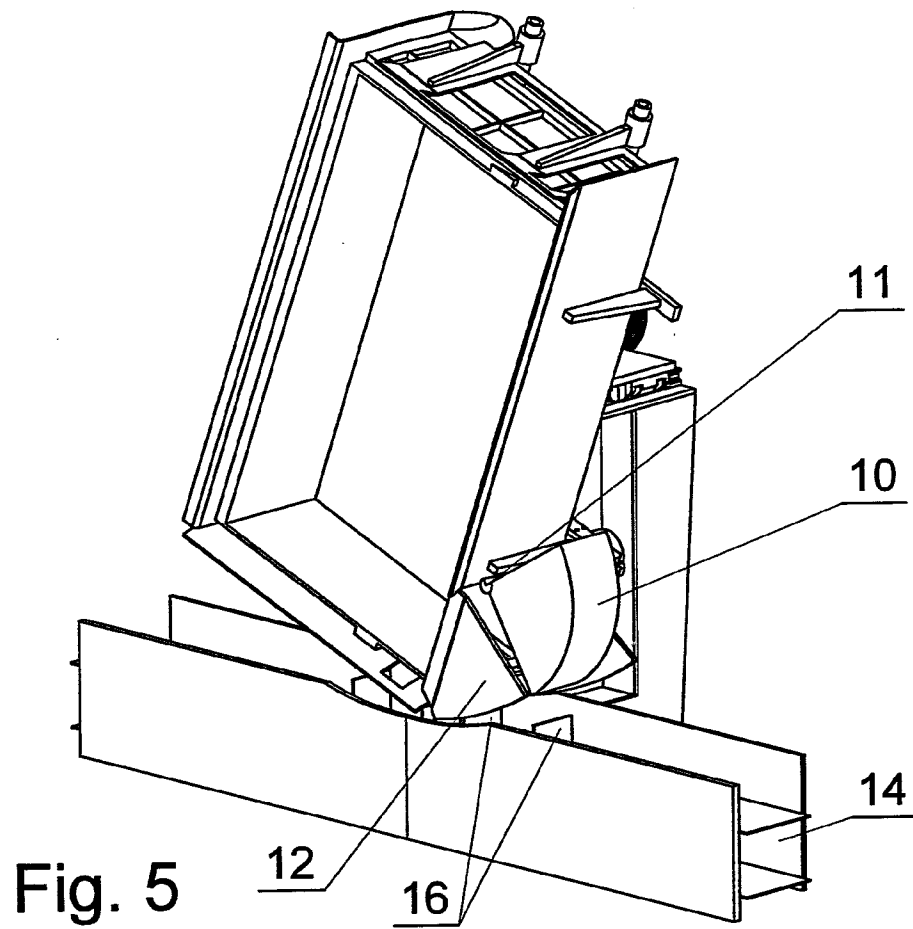


Fig. 3





INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2010/000042

A. CLASSIFICATION OF SUBJECT MATTER

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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)

A24C B65B

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 1 741 352 A1 (GD SPA [IT]) 10 January 2007 (2007-01-10) paragraph [0027] - paragraph [0047]; figures -----	1-17
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A	FR 1 497 997 A (NIEPMANN & CO MASCHF FR) 13 October 1967 (1967-10-13) the whole document -----	1-17
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

International application No

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