



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.07.2008 Bulletin 2008/30

(51) Int Cl.:
B07C 1/02 (2006.01)

(21) Application number: **08150331.0**

(22) Date of filing: **16.01.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
 Designated Extension States:
AL BA MK RS

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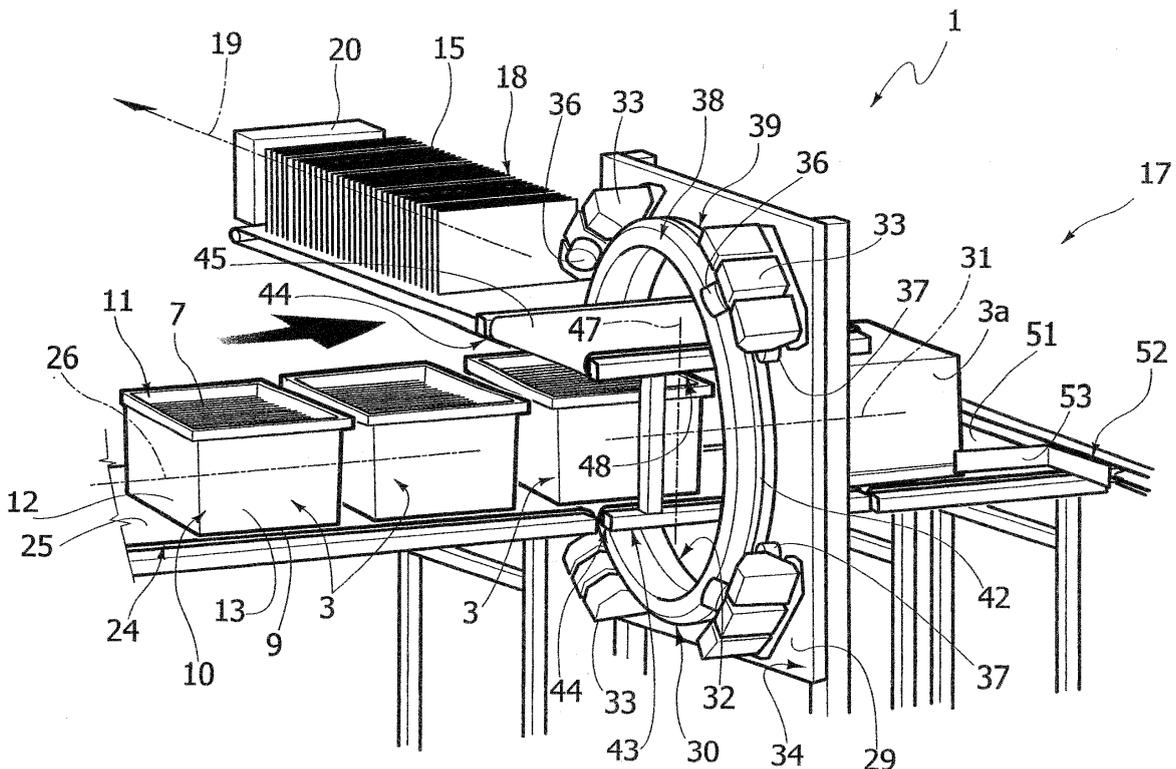
(30) Priority: **17.01.2007 IT TO20070024**

(54) **Device and method for tipping top-open boxes containing mail**

(57) A device (1) for tipping top-open boxes (3) containing mail (7) is provided with a frame (43), which is rotationally coupled to a fixed supporting structure (29) about an essentially horizontal axis (31) and carries two conveyors (44); the conveyors (44) face each other and are reciprocally spaced so as to define a seat (48) for at

least one box (3), rotate along with the frame (43) about the essentially horizontal axis (31), and are motorized so as to horizontally move the box (3) out; the frame (43) is rotated by an angle essentially equal to 180° about the essentially horizontal axis (31) when, in use, a box (3) engages the seat (48).

FIG. 1



Description

[0001] The present invention relates to a device for tipping top-open boxes containing mail.

[0002] As known, in mail sorting systems, the envelopes and/or postcards are arranged in boxes and placed with an edge thereof on the bottom of the boxes themselves, so as to remain upright and facing each other. The boxes are emptied by arranging the envelopes in a row on a horizontal conveyor, which automatically conveys such a row towards a so-called "singulator" device, i.e. a device which singularly, that is one by one, extracts the envelopes and moves them in an orthogonal direction for handling and sorting.

[0003] According to a known solution, the boxes are emptied manually by an operator, who tips one box at a time, so that the envelopes are placed with an edge thereof on the conveyor, removes the box itself, and then compacts the envelopes underneath towards the row of envelopes which is advancing towards the "singulator" device.

[0004] It is felt the need to at least partially automate the emptying operations of the boxes, so as to relieve the operator's workload, speed up the operations and avoid the risk of strewing mail, with the risk of jamming or stopping the sorting process.

[0005] It is the object of the present invention to make a device for tipping top-open boxes containing mail, which allows to simply and cost-effectively respond to the foregoing needs.

[0006] According to the present invention a device for tipping top-open boxes containing mail is provided, the device comprising:

- a supporting structure;
- a frame rotationally coupled to said supporting structure about an essentially horizontal axis and carrying two conveyors, which face each other and are reciprocally spaced so as to define a seat for at least one said box, rotate along with said frame about said essentially horizontal axis, and are motorized so as to horizontally move said box out;
- driving means for rotating said frame by an angle essentially equal to 180° about said essentially horizontal axis when, in use, a box engages said seat.

[0007] The invention will now be described with reference to the accompanying drawings which illustrate a non-limitative embodiment thereof, in which:

- figure 1 shows a perspective view with diagrammatic parts of a preferred embodiment of the device for tipping top-open boxes containing mail, according to the present invention;
- figure 2 is similar to figure 1 and shows the device in figure 1 during the tipping of a box.

[0008] In figure 1, numeral 1 indicates a device for tip-

ping boxes 3, each of which contains a pack of mail, e.g. a set of envelopes 7.

[0009] Each box 3 comprises a corresponding horizontal rectangular-bottom wall 9 (the edge of which is only visible) and a corresponding essentially vertical peripheral wall 10, which defines an upper opening 11 opposite to the wall 9 and consists of two reciprocally opposite portions 12 and of two portions 13, also reciprocally opposite.

[0010] In each box 3, the envelopes 7 have a corner or edge 15 thereof placed against the wall 9; when the box 3 is almost full, the envelopes 7 are essentially upright, facing each other and reciprocally aligned in a row along an axis orthogonal to the edges 15 and to the walls 13.

[0011] Specifically, the height of wall 10 is greater than the height of envelopes 7, but could possibly be less.

[0012] The device 1 is accommodated in a station 17 wherein the envelopes 7 are extracted from the boxes 3. The entrance of the station 17 is defined by a motorized conveyor 24 of the type featuring a horizontal belt 25, on which the boxes 3 are placed, either manually or by means of an automated device (not shown), with the portions 12 aligned and facing each other along a horizontal direction 26.

[0013] The conveyor 24 moves the boxes 3 along the direction 26, making them enter into the device 1, and is synchronically controlled with the device 1 by a control unit 28 (diagrammatically shown in figure 2).

[0014] The device 1 comprises a fixed structure 29, specifically a vertical plate, which supports a crown 30 having an essentially horizontal axis 31, parallel to the direction 26. Specifically, the plate 29 defines an opening 32 coaxial to the crown 30 and carries a plurality of supporting bodies 33, arranged in fixed positions about the opening 32 and reciprocally angularly spaced. The bodies 33 protrude towards the conveyor 24 from a vertical face 34 of the plate 29 and carry two sets of rollers 36, 37 (partially shown), which are arranged on axially opposite sides of the crown 30. The rollers 36, 37 are running coupled on corresponding truncated-cone-shaped tracks 38, 39 external to the crown 30, so as to make the crown 30 rotatable about the axis 31 with respect to the plate 29. Preferably, the rollers 36, 37 are rotationally idle with respect to the bodies 33, while the crown 30 is rotationally driven about the axis 31 by a motor 41 (diagrammatically shown in figure 2) by means of a transmission, which comprises an external toothing 42 axially arranged between the tracks 38, 39 and a pinion (not shown) actuated by the motor 41 and meshing with the toothing 42. Alternatively, the crown 30 is rotationally driven by one or more rollers 36, 37.

[0015] The motor 41 is fixed with respect to the plate 29, and preferably of the two-way type and controlled by the unit 28 so as to make the crown 30 rotate by 180°.

[0016] The crown 30 surrounds a frame 43, which is fixed with respect to the crown 30 and carries two motorized conveyors 44 of the type featuring corresponding

belts 45. The conveyors 44 face each other and are spaced along a direction 47 so as to define a seat 48, on the upper and lower sides when the frame 43 is stopped about the axis 31. The conveyors 44 rotate along with the frame 43 about the axis 31 and horizontally move a box 3 exiting from and/or entering the seat 48.

[0017] According to the illustrated embodiment, the conveyors 44 move the boxes 3 parallelly to the axis 31 of the conveyor 24 onto a surface 51 arranged at a height so as to facilitate the placement and the advancement of the edge of the envelopes 7 arranged under the tipped box, indicated by reference numeral 3a. For example, the surface 51 is coplanar with the upper surface of the belt 25.

[0018] In other words, the entrance and the exit of the seat 48 are preferably reciprocally opposite along the axis 31. Alternatively, the moving direction supplied by the conveyors 44 is orthogonal to the axis 31, and/or the entrance and the exit of the seat 48 reciprocally coincide. Alternatively, the entrance and the exit of the seat 48 could be arranged at 90° (in this case, the conveyors 44 could feature corresponding reciprocally orthogonal belts, or could be of the type generally called "cross point conveyor", i.e. conveyors capable of moving objects in reciprocally orthogonal directions). Furthermore, according to a variant (not shown), the conveyors 44 could rotate with respect to the crown 33 about the vertical direction 47.

[0019] The actuation (not shown) of the conveyors 44 is preferably carried by the frame 43 and defined either by two separate motor reducers or by a motor reducer and a motion transmission between the two conveyors 44. Preferably, the axis 31 is at exactly half way between the belts 45 along the direction 47.

[0020] According to variants (not shown), the position of the conveyors 44 along the direction 47 is adjustable; and/or the position of the conveyors 44 along the direction 47 is damped or spring-mounted with respect to the frame 43. In case of damping or spring-mounting, there may be included a system for locking the position of the conveyor 44 which defines the seat 48 at its lower part, so as to have a higher fixed resting surface (e.g. by 1 cm) with respect to that of the conveyor 24 and to the surface 51 during the loading/unloading of the boxes 3 from the device 1.

[0021] Preferably, the seat 48 is laterally defined by two guide walls (not shown), which form part of the frame 43, face each other, are arranged in positions so as to avoid empty space on the sides of the belts 45, to avoid the loss of mail, could possibly be damped or spring-mounted, and comprise corresponding terminal lead-in portions converging towards the seat 48 for facilitating the entrance of boxes 3 from the conveyor 24.

[0022] In use, when the frame 43 is stopped about the axis 31 (figure 1), the conveyors 24 and 44 are actuated together to make the tipped box 3a exit from the seat 48 along the axis 31 through the opening 32 and, at the same time, to introduce a next box 3 in the seat 48. The

box 3a is taken onto the surface 51, which is associated to a conveyor device 52, e.g. of the conveyor belt type which specifically features a thrust finger 53. The device 52 is synchronically controlled by the unit 28 with the device 1 for moving the box 3a along a horizontal direction 54 orthogonal to the axis 31 (figure 2).

[0023] In this area of the station 17, an operator (not shown), manually lifts and removes the box 3a, and then compacts the envelopes 7 underneath, which were contained in the box 3a, at the bottom of a row 18 which extends along a horizontal direction 19 parallel to the direction 54.

[0024] The row 18 is automatically transported, in a known and not detailed manner, towards a so-called "singulator" device (diagrammatically shown), i.e. a device which sequentially extracts the envelopes 7 from the row 18 and moves them in a horizontal direction orthogonal to the direction 19.

[0025] Alternatively, the removal of the upturned box 3a could be automatically performed by means of a robotized device (not shown) either synchronically automatically with the device 52 or in response to a manual control.

[0026] During the advancement of the box 3a performed by the device 52, the device 1 is actuated by the unit 28 so as to make the seat 48 rotate by 180° (figure 2). Preferably, the rotation speed is such as the centrifugal force contributes to maintain the edge 15 of the envelopes 7 as long as possible in contact with the wall 9 during the rotation.

[0027] The rotation could possibly be initially either lower or higher than 180°, and then perform one or more subsequent movements towards the final angular position of 180°. A settling oscillation about the final angular position is performed to move the envelopes 7 away from the wall 9 and/or to settle the envelopes 7 downwards at the end of the tipping, and is useful when the boxes 3 are very full and the envelopes 7 tend to stick to the wall 10.

[0028] Disregarding the possible settling of the box 3 in the neighbourhood of the final angular position, preferably the tipping of the box 3 is performed by rotating the crown 30 about the axis 31 in an opposite direction with respect to the tipping direction of the previous box 3a, i.e. preferably the directions of rotation are reciprocally alternating between one tipping and the next: in this manner, the control signals may be simply transferred to the conveyors 44 only by means of wires, i.e. without rotating joints for the electric connection.

[0029] Furthermore, it is apparent from the above that the device 1 allows to automatically tip each box 3, without requiring the intervention of the operator and maintaining the mail contained in the space defined by the walls 9, 10 and the belt 45 facing the opening 11. Therefore, the risks of losing mail are eliminated, and the disarrangement of the envelopes 7, which would slow down the process in the station 17 during the compacting operations at the bottom of the row 18, is limited.

[0030] The device 1 is extremely simple to be coupled to the other components of the station 17, is not very cumbersome and requires a little number of components.

[0031] Other advantages are thus apparent from the above-described features.

[0032] Finally, it is apparent from the above that changes and variations may be applied to the described device 1 without departing from the scope of protection of the present invention.

[0033] Specifically, the axis 31 could be arranged in a different vertical position from what described with respect to the conveyors 44; and/or only the conveyor 44 could be actuated for advancing the boxes 4 through the seat 48; and/or the rotation of the crown 30 could be again performed in the same direction; and/or the device 52 could be different from that described (e.g. the finger 53 could be absent or replaced by another similar thrust mechanism).

[0034] Furthermore, the entrance of the station 17 could be defined by a descent which, in a few meters of length, takes the box 3 to be tipped from a relatively high position, e.g. of approximately 3 meters, to the height of the device 1. The gradient of this descent will be limited by the need to prevent the box 3 from running and avoiding the strewing of mail. In this case the rotation of the seat 48 of the device 1 will not be exactly by 180° but will be by an angle of (180° - a) where:

a = degrees of descent gradient;

while the initial position of the seat 48 before the tipping will not be horizontal, but aligned to the aforesaid descent.

[0035] Furthermore, sensors or other monitoring device, e.g. of the photocell type, may be included for controlling the correct operation of the devices 1 and 52 and/or the correct positioning of the box 3 in the seat 48 before and after tipping.

Claims

1. A device (1) for tipping top-open boxes (3) containing mail (7); the device comprising:

- a supporting structure (29);
- a frame (43) rotationally coupled to said supporting structure (29) about an essentially horizontal axis (31) and carrying two conveyors (44), which face each other and are reciprocally spaced so as to define a seat (48) for at least one said box (3), rotate along with said frame (43) about said essentially horizontal axis (31), and are motorized so as to horizontally move said box (3) out;
- driving means (41,42) for rotating said frame (43) by an angle essentially equal to 180° about

said essentially horizontal axis (31) when, in use, a box (3) engages said seat (48).

2. A device according to claim 1, **characterized in that** said conveyors (44) define said seat (43) at its lower and upper parts when said frame (43) is stopped about said essentially horizontal axis (31).
3. A device according to claim 2, **characterized in that** said frame (43) comprises two guides defining the opposite sides of said seat (48) and provided with corresponding lead-in ends defining an entrance for said seat (43).
4. A device according to claim 2 or 3, **characterized in that** the position of said conveyors (44) which respect to said frame (43) is variable.
5. A device according to claim 4, **characterized by** comprising damping means arranged between said frame (43) and said conveyors (44).
6. A device according to any one of the preceding claims, **characterized in that** said moving direction imparted to the boxes (3) by said conveyors (44) is parallel to said essentially horizontal axis (31).
7. A device according to any one of the preceding claims, **characterized in that** said seat (48) has a reciprocally different entrance and exit.
8. A device according to any one of the preceding claims, **characterized in that** said essentially horizontal axis (31) is arranged half way between said two conveyors (44).
9. A device according to any one of the preceding claims, **characterized in that** said supporting structure (29) defines a through opening (32) crossed in use by said boxes (3) and carries a plurality of supporting bodies (33) arranged about said opening (32) and provided with rollers (36, 37) running coupled on a crown (30) which carries said frame (43).
10. A method for tipping top-open boxes (3) containing mail (7) by means of a device (1) made according to any one of the preceding claims, **characterized by** comprising the following steps:
 - introducing a first box (3a) in said seat (48);
 - tipping said first box (3a) by rotating said frame by an angle essentially equal to 180° about said essentially horizontal axis (31);
 - actuating at least one of said conveyors (44) to make the first tipped box (3a) exit horizontally from said seat (48).
11. A method according to claim 10, **characterized by**

comprising the steps of:

- introducing a second box (3) in said seat (48) subsequently to said first box (3a);
- tipping said second box (3) by rotating said frame by an angle essentially equal to 180° about said essentially horizontal axis (31) in a direction opposite to the tipping direction of said first box (3a).

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12. A method according to claim 10 or 11, **characterized by** comprising the step of horizontally introducing a second box (3) in said seat (48) subsequently to said first box (3a); the exiting of the first tipped box (3a) from said seat (48) and the entrance of said second box (3) in said seat (48) being performed at the same time.

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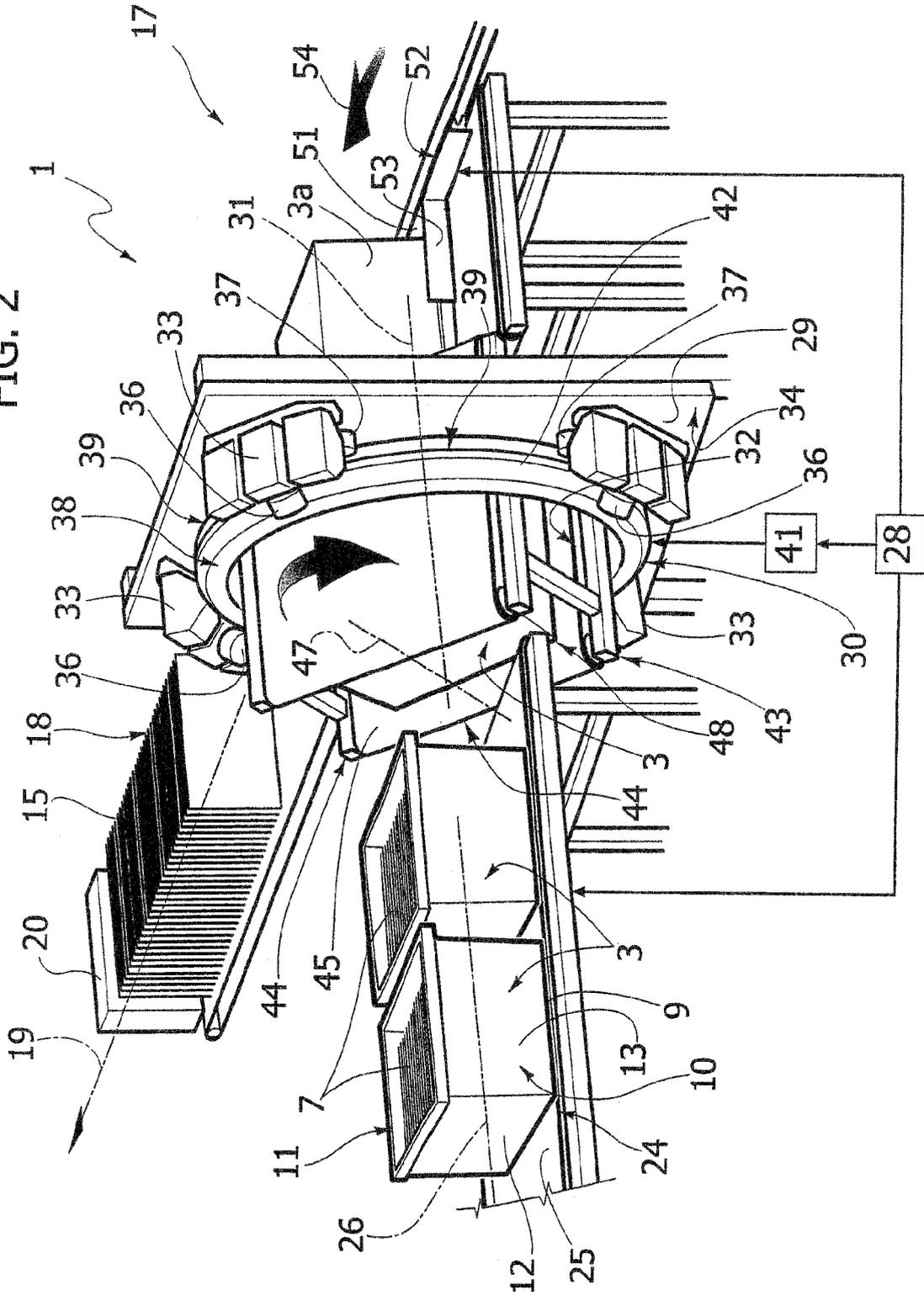
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FIG. 2



**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 15 0331

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-04-2008

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