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(54) **A device for compaction and selective disposal of liquid containers, and small-sized plastic, cardboard or metal packaging**

(57) The present invention relates to a device for compacting bottles and packaging, substantially consisting in a stack of drawers (1) provided with a top horizontal plate (14) adapted to slide downwards in order to crush articles positioned on a lower surface (4), it being provid-

ed that said surface is provided with means (8) to convey crushed articles towards a through opening (5) from which said articles selectively fall into one of the drawers (3) provided in said stack of drawers (1).

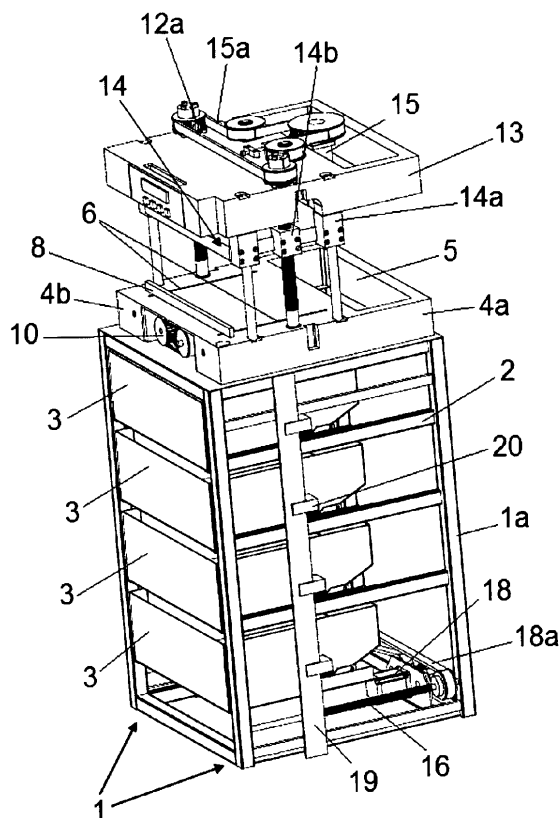


Fig. 1

Description

[0001] The present patent application for industrial invention relates to a device for compaction and selective disposal of liquid containers and small-sized plastic, cardboard or metal packaging.

[0002] The peculiarities and advantages of the device of the invention will become evident after a short description of the prior art.

[0003] Devices used to compact plastic bottles, metal cans, and cardboard packaging before disposal are known.

[0004] Such compaction of recyclable waste intends to considerably reduce volume of waste, thus saving space in containers or bags used for final disposal.

[0005] According to a preferred embodiment, traditional devices are provided with a sort of hammer, normally consisting in a heavy horizontal metal plate adapted to crush, during its descending travel, the article to be compacted positioned on a support surface under said hammer.

[0006] After completing the crushing operation of the recyclable article, the hammer makes an ascending travel to return to the upper end-of-travel position, distant from said support surface where crushing was carried out.

[0007] Then the user of such a device takes the crushed article and places it inside a container or bag expressly used for such sort of recyclable waste.

[0008] It appears evident that the procedure that is currently carried out with similar devices is a semi-automatic procedure because automation only affects the crushing of recyclable articles, which is actuated by a traditional geared motor responsible for alternate travels of said hammer.

[0009] The successive operations in the management of said devices are completely manual, i.e. picking of articles crushed by said hammer and selective disposal inside said dedicated containers.

[0010] Therefore, the specific purpose of the present invention is to provide a device for compaction of said recyclable waste, which is able to automatically manage picking of crushed articles and disposal inside a dedicated container.

[0011] To that end, the device of the invention is provided with a traditional hammer mounted on top of a metal stack of drawers, which is closed by a top horizontal wall adapted to act as support surface.

[0012] The first peculiarity of the device of the invention relates to the fact that the back wall on top of said stack of drawers is provided with a through opening, practically a door, in off-centered position with respect to the impact area of the hammer.

[0013] According to the operational cycle of said device, the hammer traditionally makes its descending travel in order to compact the article positioned on the impact area. Likewise, said hammer is adapted to recover its upper end-of-travel position immediately afterwards,

leaving the perfectly crushed article on said support surface.

[0014] Then, a rod adapted to slide in parallel direction above said support surface is actuated to push the crushed article towards the door provided on the support surface.

[0015] So, the compacted article falls by simple gravity inside the stack of drawers, ending its travel into the drawer dedicated to the specific type of waste, which was previously positioned under said opening.

[0016] The device of the invention uses automation also to make sure that the drawer disposed under the door is exactly the one dedicated to the type of waste that has been crushed.

[0017] Practically speaking, before enabling the descending travel of the hammer, the user must select the type of specific article to be crushed on the control push-button panel of the device of the invention.

[0018] Further to such a selection, the actuators of said sliding drawers guarantee that only the drawer dedicated to the specific article to be compacted will slide towards the stand-by position under said opening.

[0019] When the drawer has received the crushed article, said actuators will bring the drawer back to non-operational position, with inverse sliding travel, until it is selected again by the user in order to crush and dispose of a new article of the specific type of waste.

[0020] For explanatory reasons the description of the invention continues with reference to the attached drawings, which only have an illustrative, not limiting value, wherein:

- Fig. 1 is an axonometric view of the device of the invention, with all drawers in idle position;
- Fig. 2 is a side view of Fig. 1;
- Figure 3 is an axonometric rear view of the device of the invention, with one of its drawers in operational position;
- Fig. 4 is a side view of Fig. 3;
- Figs. 5A and 5B are two axonometric views of one of the drawers provided in the device of the invention, in idle position and operational position, respectively;
- Fig. 6 is an axonometric view of the device of the invention, after removing the fixed top platform, in order to show the exact position and configuration of the crushing plate.

[0021] Referring to the aforementioned figures, the device of the invention (D) is provided with a stack of drawers (1) consisting in a parallelepiped cage-shaped supporting frame (1 a) provided on two sides with opposite pairs of crosspieces (2) whereon telescopic guides (G1) with traditional structure are mounted to guarantee support and sliding of drawers (3) towards the outside of the stack of drawers (1).

[0022] Each of said drawers (3) is adapted to selectively receive, amongst the waste to be compacted with the device of the invention, only one specific type of said

waste, meaning that one of said drawers is used for plastics, one for cardboard, one for aluminum, etc.

[0023] On top of said parallelepiped frame (1 a) a metal base (4) is fixed, having a substantially rectangular shape, and being internally empty, which is provided with an open door (5) towards the back end.

[0024] The surface of said base (4) is provided for its entire thickness with two longitudinal rectilinear notches (6) in immediately more internal position with respect to the lateral edges (4a) of the base (4).

[0025] Two vertical rods (7) slide inside said rectilinear notches (6) and, being controlled by suitable actuators, slide alternatively and jointly from one end to the other end of said notches (6).

[0026] Moreover, the upper ends of said rods (7) shortly protrude with respect to the surface of the base (4), in such way to be coupled with a small transversal bar (8) in intermediate position.

[0027] In view of the above, the alternate travels of the two rods (7) impose corresponding travels to the bar (8) on the surface of base (4), from the front end-of-travel position shown in Fig. 1 to the back end-of-travel position shown in Fig. 3.

[0028] More precisely, in said front end-of-travel position (which also coincides with idle position), bar (8) is in proximity of the front transversal edge (4b) of the base.

[0029] Instead, in said back end-of-travel position (which also coincides with operational position), bar (8) is substantially at the height of the front longitudinal edge (5a) of said door (5) of the base (4).

[0030] Referring to said actuators of said two sliding rods (7), it must be noted that according to the preferred embodiment of the invention, each rod (7) is driven into alternate travels by a female screw (9a) alternatively sliding along a worm screw (9b) housed inside the base (4) under the corresponding rectilinear notch (6).

[0031] A first geared motor (10) housed inside the base (4) enables the inverse rotations of said two screws (9b).

[0032] Two opposite pairs of columns (11) protrude upwards from the two sides of said surface of the base (4), in more external position with respect to said rectilinear notches (6); it being provided that a threaded bar (12), which substantially consists in an additional worm screw with vertical direction, is disposed in intermediate position between said two columns (11) of each pair.

[0033] The four columns (11) support a top fixed platform (13), whereas said two worm screws (12) enable the alternate vertical travels of a horizontal plate (14), with substantially rectangular shape, adapted to slide in parallel direction from upper end-of-travel position (shown in the attached figures) to lower end-of-travel position.

[0034] In said upper end-of-travel position, said plate (14) is disposed immediately under said platform (13), whereas, in said lower end-of-travel position, said plate (14) is substantially disposed against the area of said base (4) not affected by said through opening (5), acting as a crushing hammer for the articles to be compacted

that are positioned on said base (4).

[0035] In the center of each transversal edge (14c) of said plate (14) a female screw with vertical axis (14b) is fixed and disposed between two bushes (14a) with vertical direction.

[0036] The four bushes (14a) associated with said plate (14) slide on the outside of said columns (11) during the inverse travels of said plate (14). In view of the above, the function of said bushes (14a) is evidently to guide and balance the alternate travels of the plate (14) on the fourth corners of said plate (14).

[0037] Instead, said two female screws (14b) mounted on the two transversal edges of the plate (14) are helically coupled with said worm screws with vertical axis (12) and adapted, during inverse rotations of said screws (12), to slide vertically with respect to the latter, in order to generate alternate travels of said plate (14) to which they are joined.

[0038] Referring to the attached figures, the upper ends of said two worm screws (12) protrude above said platform (13) after crossing the entire thickness in correspondence of suitable holes with vertical axis.

[0039] Pulleys with vertical axis (12a) are keyed in correspondence of said upper ends of the two worm screws (12), and adapted to be driven into inverse rotations by a toothed drive belt (15a) receiving motion, with interposition of two splined connection and return wheels (15b), from a second geared motor (15) mounted in vertical position on said fixed platform (13).

[0040] The alternate rotation imposed by said second geared motor (15) to said "screw (12)-female screw (14b)" pairs alternatively favors the descending travel of the plate (14) until it is substantially situated against said base (4) and the ascending travel of the plate (14) towards the upper end-of-travel position, as shown in the attached figures.

[0041] The drawers (3) of said stack of drawers (1) have a particular structure, being formed of a bearing front section (3a) and a back section (3b) axially sliding with respect to the front section (3a).

[0042] In particular, said back section (3b) of each drawer (3) is slightly narrower than the front section (3a) in such manner that its lateral edges are disposed in slightly more internal position with respect to the corresponding lateral edges of the front section (3a).

[0043] Figs. 5A and 5B show the two positions that are alternately occupied by the back section (3b) of each drawer (3) with respect to the corresponding front section (3a).

[0044] As shown in Fig. 5A, the back section (3b) is mainly inserted into the front section (3a) in maximum forward position, whereas as shown in Fig. 5b, the back section (3b) is almost completely pulled out of said front section (3a), in maximum backward position.

[0045] Moreover, as shown in Fig. 4, until they are maintained in the compact position of Fig. 5A, the longitudinal dimension of said drawers (3) is considerably lower than the depth of the stack of drawers (1).

[0046] Only when they are in the "extended" position of Fig. 5B, said drawers (3) reach a longitudinal dimension that is substantially equal to the depth of the stack of drawers (1), so that the back sliding sections (3b) are exactly disposed under said door (5) of the base (4) mounted on top of said stack of drawers (1).

[0047] In order to provide alternate sliding of the back section (3b) of each drawer with respect to the front bearing section (3a), said front bearing section (3a) is provided on the bottom, in close position to its lateral edges, with two telescopic guides (G2) connected to the lateral edges of the back sliding section (3b).

[0048] Coupling between the front section (3a) of each drawer (3) and said telescopic guides (G1) fixed to said crosspieces (2) of the stack of drawers (1) allows the drawer (3) to make traditional travels from closing position - wherein it is contained inside the stack of drawers (1), as shown in Fig. 4 - to partially pull-out position - wherein it is disposed in projecting position on the back of the stack of drawers (1).

[0049] Again, coupling between said telescopic guides (G2) contained inside the front bearing section (3a) of each drawer (3) and the lateral edges of the back section (3b) of the drawer (3) guarantees that said sliding section (3b) makes said alternate inverse travels with respect to said front bearing section (3a).

[0050] As shown in the enclosed figures, said lateral edges of the back sliding section (3b) of each drawer (3) are provided with circular holes (30) in specular position.

[0051] Moreover, with reference to Figs. 5A and 5B, said two opposite holes (30) provided on the lateral edges of the back section (3b) of each drawer (3) are adapted to remain always outside the lateral edges of the front bearing section (3a), also when the entire drawer (3) is maintained in the compact position of Fig. 5A.

[0052] Now the present description illustrates the way in which, according to a preferred embodiment of the invention, alternate selective sliding of the back section (3b) of one of said drawers (3) is provided with respect to said front supporting section (3a).

[0053] To that end, a parallel pair of threaded bars, configurable as worm screws (16), is mounted on the bottom of the stack of drawers (1).

[0054] Said worm screws (16) are disposed in horizontal position, each of them being substantially positioned on one of the sides of said parallelepiped supporting frame (1 a) of the stack of drawers (1).

[0055] Each worm screw (16) is helically coupled with a female screw (17); it being also provided that said two worm screws (16) are driven into inverse rotations by a third geared motor (18) mounted in horizontal position on the bottom of the stack of drawers (1).

[0056] Also in this case, motion is transmitted from said third geared motor (18) to said two worm screws (16) by means of a toothed drive belt (18a) with interposition of two splined connection and return wheels (18b).

[0057] The actuation of said "screw (16)-female screw (17)" pairs generates the alternate sliding of female screw

(17) with respect to screw (16) according to the direction of rotation imposed by said third geared motor (18).

[0058] It is important to note that said two female screws (17) are fixed at the base of corresponding uprights (19) situated on the sides of said supporting frame (1 a) of the stack of drawers (1) and provided with suitable height in order to be externally interfaced with the lateral edges of all drawers (3).

[0059] Because of said cooperation between said two female screws (17) and uprights (19), said uprights (19) follow the alternate sliding of female screws (17) along said worm screws (16), and therefore along the depth of the stack of drawers (1), in particular, from front end-of-travel position (shown in Fig. 2) to back end-of-travel position (shown in Fig. 4).

[0060] On the side of the stack of drawers (1), during its alternate travels, each of said uprights (19) uses the guide and stop action of a first crosspiece (19a) mounted towards the top of the stack of drawers (1) and of a second crosspiece (19b) mounted towards the bottom of the latter.

[0061] Moreover, each upright (19) is laterally provided with substantially horizontal ears (20) in number equal to the number of said drawers (3) and situated at different heights, in such manner that each ear (20) is substantially disposed at the height of the lateral edges of the back sections (3b) of said drawers (3).

[0062] It must be also considered that each of said ears (20) orthogonally supports an electromagnet (21) facing towards the center of the stack of drawers (1) and housing an axial plug (22) with basically cylindrical shape; it being provided that each of said electromagnets (21) is adapted to alternately eject said plug (22) towards the center of the stack of drawers (1) and bring it back inside.

[0063] In particular, ejection of said plugs (22) occurs selectively, meaning that it is only provided for ejection of one of said plugs (22) lying on one side of the stack of drawers (1) and of the corresponding plug (22) lying on the opposite side of the stack of drawers (1).

[0064] A comparative analysis of Figs. 2 and 4 shows that the alternate travels of each rod (19) only cover a central short section of the depth of the stack of drawers (1).

[0065] Referring to Fig. 2, in non-operational position, the two opposite rods (19) are disposed in such way to provide perfect alignment between said pull-out plugs with horizontal axis (22) and the opposite pairs of holes (30) provided in drawers (3) still in the compact position of Fig. 5A.

[0066] After completing the description of the structure and components of the device of the invention, this document continues with a description of its peculiar operating modes.

[0067] In order to crush the article that must be disposed of, the user places said article onto the base (4).

[0068] By using the control push-button panel provided in the device of the invention, the user simultaneously enables the descending travel of the plate (14) in order

to crush the article to be compacted, and the actuation of the drawer (3) expressly adapted to receive the type of waste of the product that is to be crushed.

[0069] Such a control results in the operation of said second geared motor (15) responsible for the descending travel of the plate (14) until the plate (14) energetically interferes with said article in such way to obtain perfect crushing, using the advantageous support action provided by said base (4).

[0070] An additional consequence of said actuation of the device of the invention is the actuation of one of said drawers (3), meaning that the back sliding section (3b) of the drawer (3) is brought to maximum backward position, in such way to be disposed under said door (5) of the base (4).

[0071] In particular, as shown in Fig. 3, the drawer to be actuated is the drawer in second position in the stack of drawers (1), starting from above.

[0072] Such a selective actuation of one of the drawers (3) is provided by said pair of opposite vertical rods (19).

[0073] When the user selects the specific drawer (3) to be actuated, the two cylindrical plugs (22) positioned at the same height as drawer (3) in said opposite rods (19) are simultaneously ejected.

[0074] In view of the above, said plugs (22) can be inserted from opposite sides into said holes (30) provided on the lateral edges of the back section (3b) of the selected drawer (3).

[0075] Immediately afterwards, said third geared motor (18) enables the actuation of said "screws (16) and female screws (17)" pairs, meaning that it imposes the rods (19) a travel towards the back of the stack of drawers (1) to bring the back section (3b) of the drawer (3) to maximum backward position, namely under the door (5) of the base (4), as expressly shown in Fig. 4.

[0076] Now, plate (14) is lifted again because of inverse rotation of said second geared motor (15), said first geared motor (10) is activated, enabling the actuation of said two "screws (9b) - female screws (9a)" pairs housed in the base (4), and said transversal bar (8) slides towards door (5).

[0077] During such sliding the bar (8) intercepts the article that was previously crushed by the plate (14) and pushes it towards the door (5), favoring its fall by gravity towards the bottom of the stack of drawers (1) and, more precisely, inside the drawer (3) that was previously brought to operational extended position by said two opposite sliding rods (19).

[0078] Before starting a new operation cycle, the initial position of the device of the invention is automatically restored.

[0079] To that end, the first geared motor (10) is actuated again with inverse rotation, in order to bring said bar (8) back to its idle position, in proximity of the front transversal edge (4b) of the base (4).

[0080] Additionally, the third geared motor (18), which is responsible for bringing said two opposite rods (19) back to initial position, is actuated in such manner that

also the drawer that was previously brought to operational extended position resumes its compact position similarly to the other drawers.

[0081] Finally, the two opposite plugs (22), which previously provided coupling between said two rods (19) and the back section (3b) of one of the drawers (3) in order for said drawer (3) to assume the extended position, are moved backwards.

Claims

1. A device for compaction and selective disposal of liquid containers and small-sized packaging, **characterized in that** it comprises:

- a stack of drawers (1) formed of a parallelepiped frame (1 a) housing a plurality of drawers (3), each of them adapted to alternately slide on a pair of telescopic guides (G1) mounted above crosspieces (2) provided on two sides of said frame (1a); it being provided that each of said drawers (3) comprises a front section (3a) and a back section (3b) associated with sliding means (G2) to slide axially with respect to said front section (3a) from maximum forward position, wherein the longitudinal dimension of said drawer (3) is considerably lower than depth of said stack of drawers (1), to maximum backward position, wherein the longitudinal dimension of said drawer is substantially equal to the depth of the stack of drawers (1)

- means (19, 22) adapted to selectively generate said alternate travels of the back section (3b) of each of said drawers (3) with respect to front section (3a); it being provided that said means (19, 22) are adapted to cooperate with fixing means (30) provided in said front section (3b) of each of said drawers (3)

- a base (4) situated on top of said stack of drawers (1) and also provided, towards the back of said stack of drawers (1), with open door (5) situated in the position that is selectively occupied, in said stack of drawers (1), by said back portion (3b) of each of said drawers (3) in said maximum backward position

- a horizontal plate (14) situated above said base (4) and controlled by means (11, 12, 14a, 14b, 15) adapted to impose alternate vertical travels, from upper end-of-travel position, wherein said plate (14) is at considerably higher height than base (4), to lower end-of-travel position, wherein it is substantially disposed against said base (4) in order to crush a compactable article that was previously disposed on said base (4)

- means (8) adapted to intercept, on the surface of base (4), the article that was crushed by said descending travel of the plate (14) and convey

it towards said door (5) provided on base (4).

2. The device of claim 1, wherein said back section (3b) of each of said drawers (3) is coupled with front section (3a) in such manner that lateral edges of said back section (3b) are in more internal position with respect to the lateral edges of front section (3a); it being also provided that said means for alternate sliding of back section (3b) of each drawer (3) with respect to front section (3a) consist in one pair of telescopic guides (G2) mounted on the bottom of said front section (3a) and in proximity of lateral edges. 5

3. The device of the first or both preceding claims, wherein said means adapted to selectively generate alternate travels of back section (3b) of each of said drawers (3) with respect to front section (3a) consist in one opposite pair of vertical rods (19) situated on the two sides of said stack of drawers (1) and controlled by means (16,17,18) to simultaneously make alternate travels along the depth of the stack of drawers (1) from front end-of-travel position to back end-of-travel position; it being provided that said rods (19) are laterally provided, in specular position, with substantially horizontal ears (20) in number equal to the number of said drawers (3), which are positioned at different heights, in such manner that each opposite pair of said ears (20) is disposed at the height of the lateral edges of the back section (3b) of one of said drawers (3); it being additionally provided that each of said ears (20) supports, towards the inside of the stack of drawers (1), an electromagnet (21) housing an axial plug (22) adapted to be alternately ejected out of said electromagnet (21) and brought back inside it; it being provided that each opposite pair of said plugs (22) is disposed, when said rods (19) are in front end-of-travel position, in perfect alignment with holes (30) obtained on the lateral edges of the back section (3b) of the specific drawer (3) occupying the same height as said pair of plugs (22) in the stack of drawers (1), in such manner that, when they are ejected by said electromagnets (21), the plugs (22) are exactly inserted into said holes (30) of the lateral edges of the back section (3b) of the drawer (3) and bring said back section (3b) to maximum backward position, when said rods (19) reach the back end-of-travel position. 10 15 20 25 30 35 40 45

4. The device of claim 3, wherein said means adapted to generate alternate travels of said opposite rods (19) consist in a third geared motor (18) housed on the bottom of said stack of drawers (1), adapted to drive into inverse rotations, with interposition of a toothed drive belt (18a), two worm screws (16) with horizontal axis coupled with female screws (17), each of them being joined with the lower end of one of said rods (19); it being provided that said worm 50

screws (16) are also mounted on the bottom of the stack of drawers (1), each of them on one of its sides.

5. The device of one or more of the preceding claims, wherein said means adapted to generate said alternate vertical travels of the plate (14) consist in a second geared motor (15) mounted vertically on a platform (13) fixed to the top of two opposite pairs of columns (11) protruding upwards on the transversal edges (4a) of said base (4); it being provided that said second geared motor (15) is adapted to drive into simultaneous inverse rotations two worm screws (12), which protrude vertically from said base (4), each of them being mounted in intermediate position between two columns (11) of each of said opposite pairs; it being additionally provided that each worm screw (12) is coupled with a corresponding female screw (14b) fixed in the center of one of the transversal edges (14c) of the plate (14) in intermediate position between two bushes with vertical axis (14a), likewise joined with the same transversal edge (14c) of the plate (4), each of them being adapted to alternately slide on the outside of one of said columns (11). 5 10 15 20 25 30 35 40 45

6. The device of claim 5, wherein said two worm screws (12) are provided with upper ends protruding above said platform (13) and coupled with corresponding pulleys with vertical axis (12a) adapted to be driven into inverse rotations by a toothed drive belt (15a) receiving motion from said second geared motor (15), with interposition of two splined connection and return wheels (15b). 50

7. The device of one or more of the preceding claims, wherein said means adapted to intercept and drive the crushed article on the surface of said base (4) consist in a bar (8) in transversal position with respect to the base (4) and also subject to the action of means (7, 9a, 9b) adapted to impose alternate travels from front end-of-travel position, in proximity of the front transversal edge (4b) of the base (4), to back end-of-travel position, in proximity of the front longitudinal edge (5a) of said door (5). 55

8. The device of claim 7, wherein said means adapted to impose alternate travels to said bar (8) consist in a pair of vertical rods (7) protruding from the surface of said base (4) in correspondence of longitudinal notches (6) obtained in close position to the lateral edges (4a) of the base (4); it being provided that said rods (7) are adapted to alternately slide from one end to the other end of said notches, being coupled with female screws (9a) that are coupled, inside the base (4), with corresponding worm screws with horizontal axis (9b) driven into inverse rotations by a first geared motor (10) housed inside the base (4).

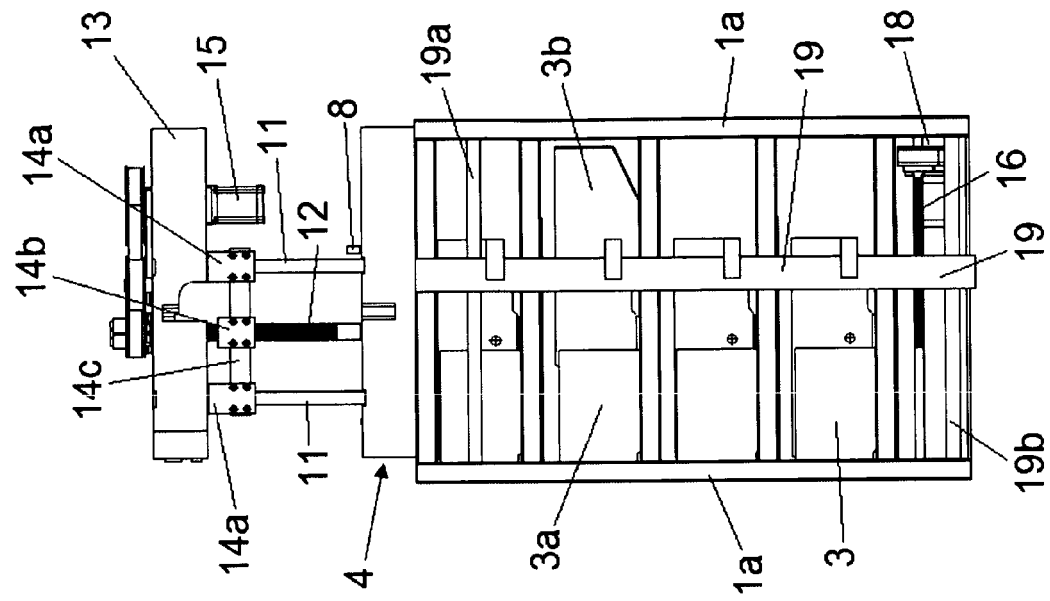


Fig. 4

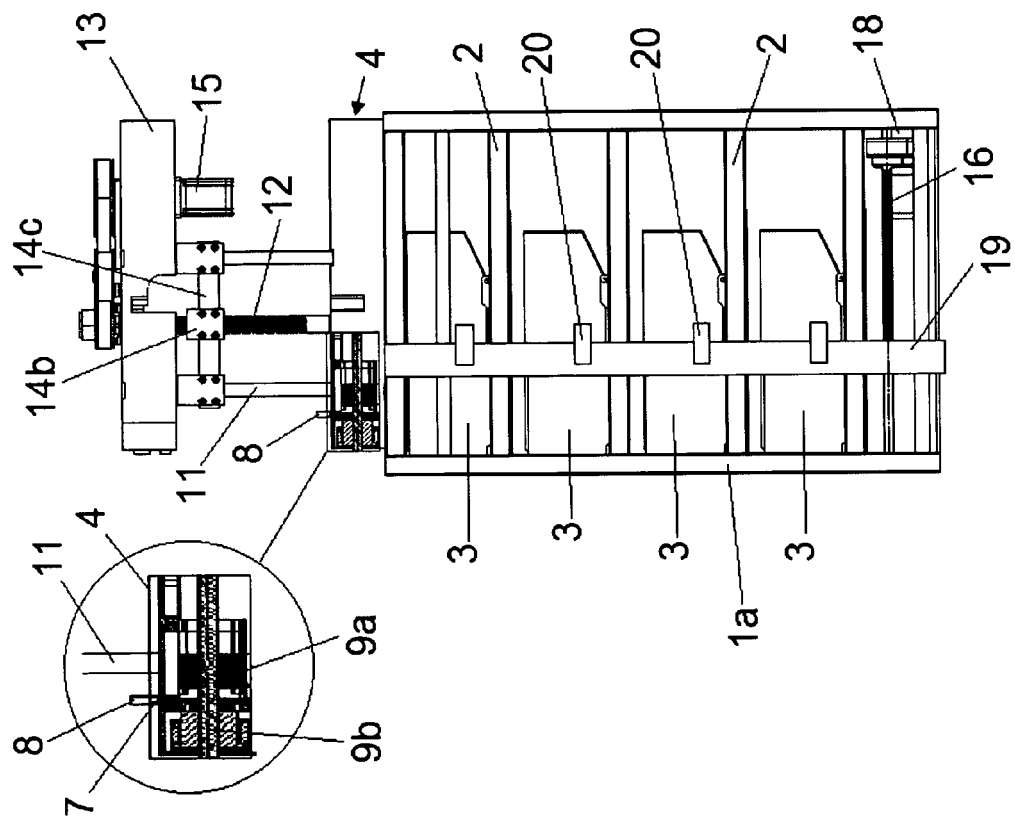


Fig. 2

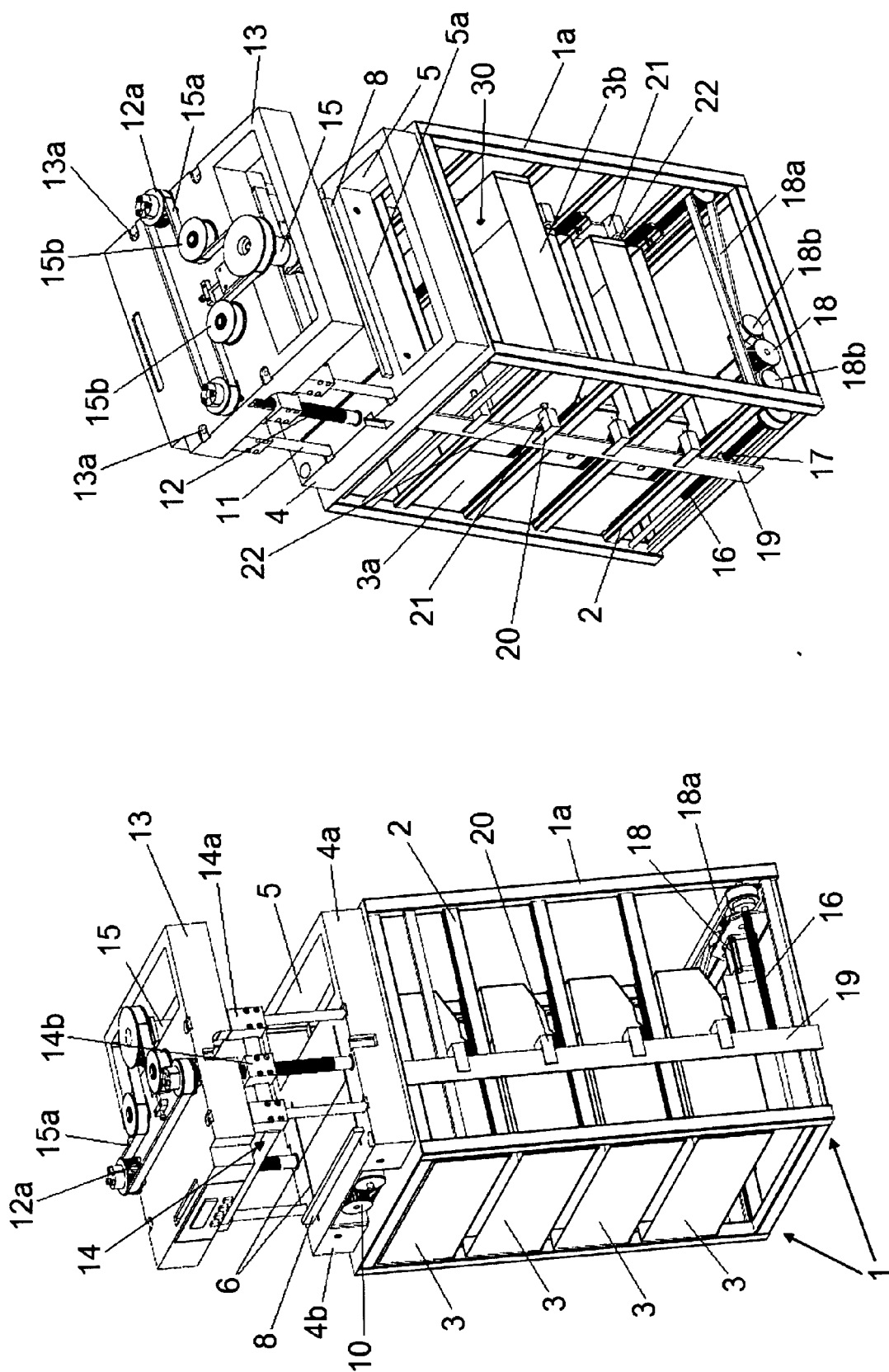
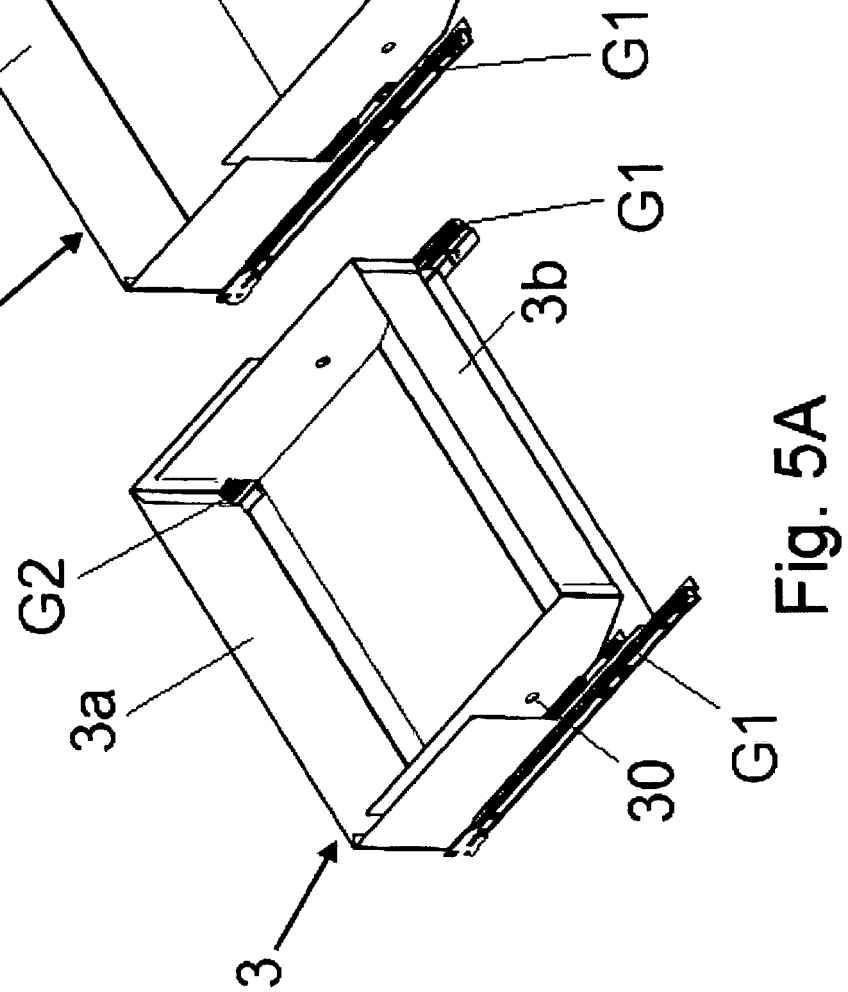
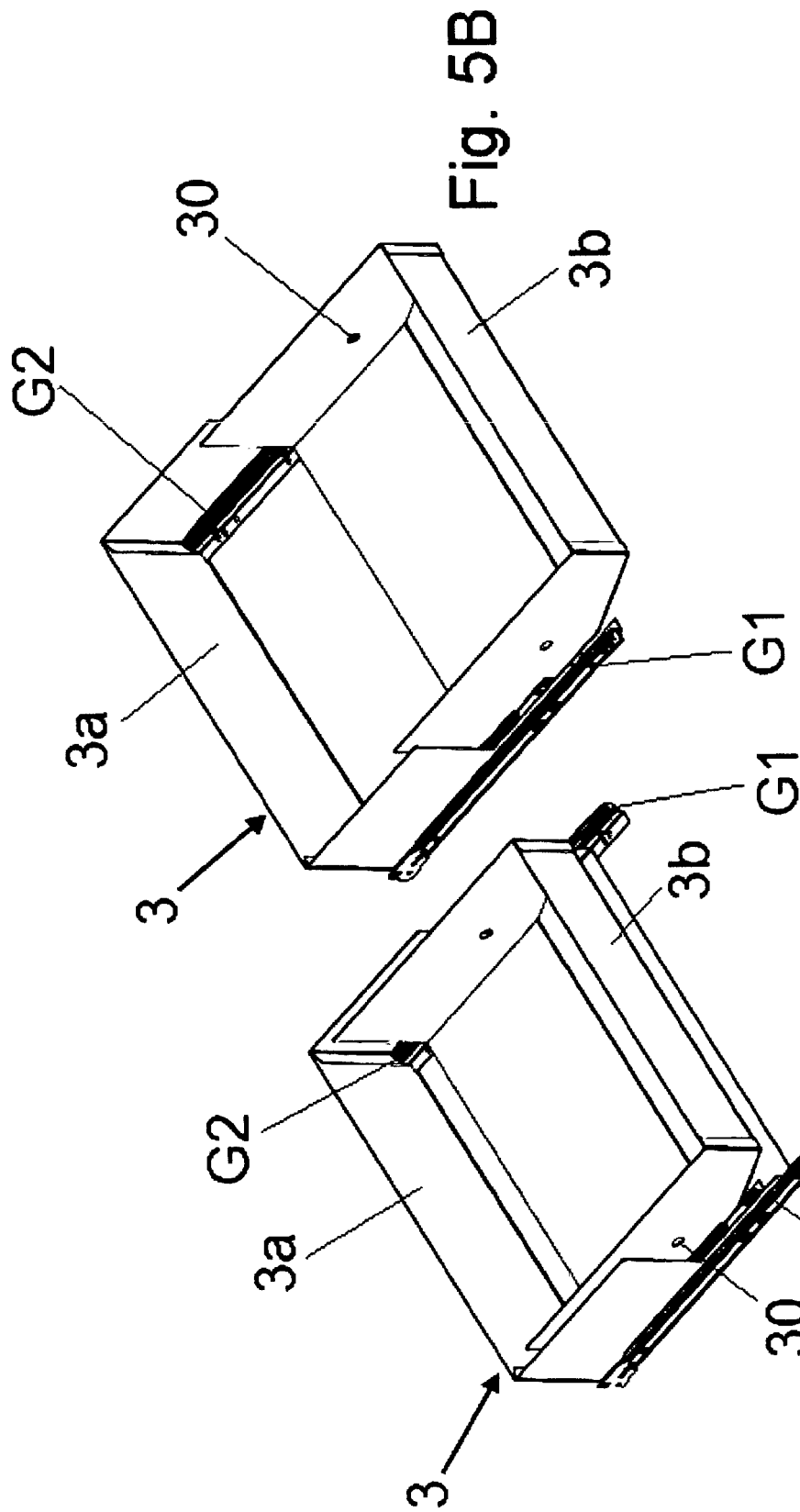


Fig. 3

Fig. 1



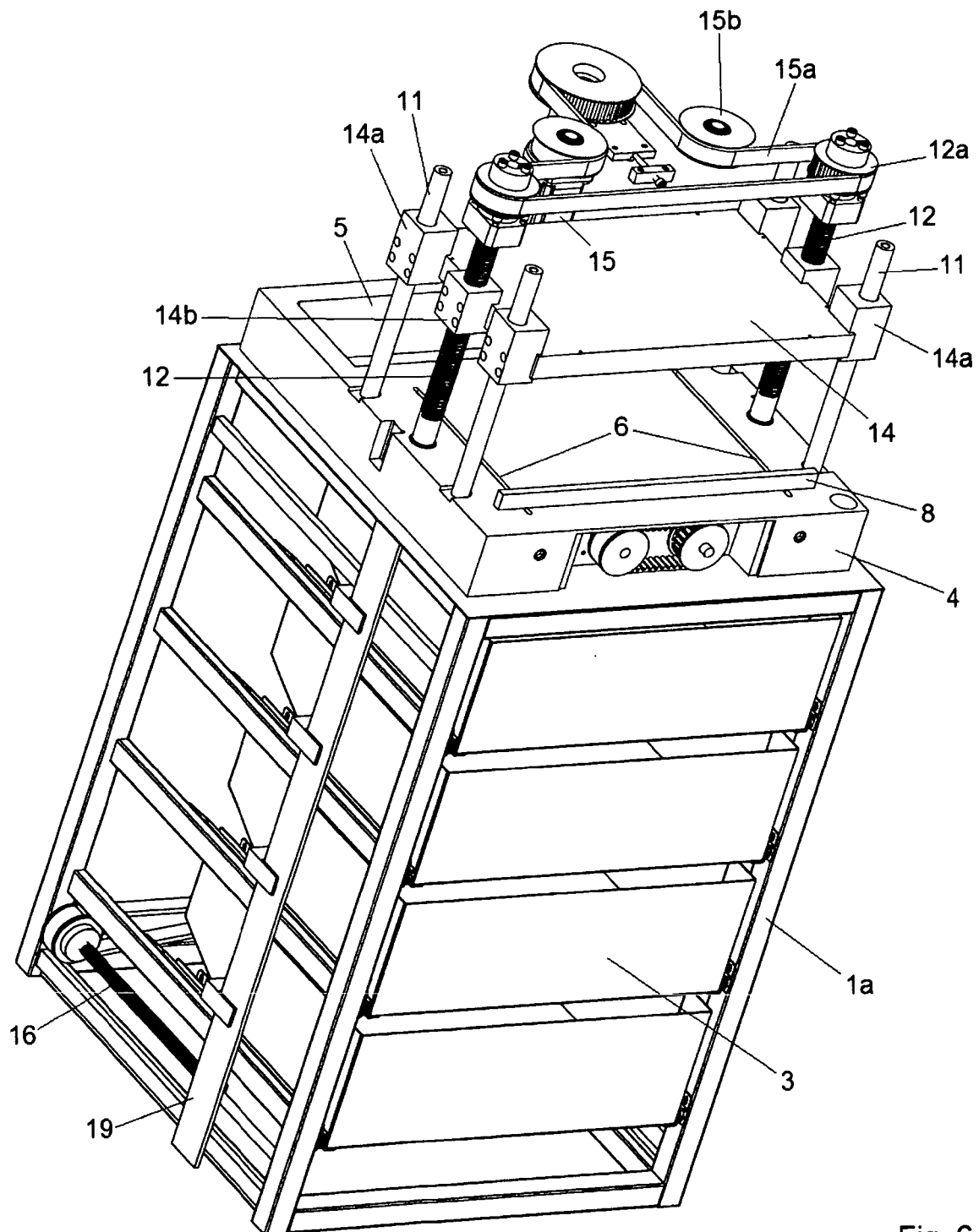


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 13 42 5025

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	EP 2 253 461 A1 (CIMAROSSA BRUNA [IT]) 24 November 2010 (2010-11-24) * claims * * figures *	1-8	INV. B30B9/32
A	US 2011/253818 A1 (JEON KI JEONG [KR]) 20 October 2011 (2011-10-20) * abstract * * claims 1-5 * * figures 1,14-16 *	1-8	
A	EP 0 686 579 A2 (CALDERINI NAZZARENO [IT]; PONTI ENG SRL [IT]) 13 December 1995 (1995-12-13) * claims 1,2,7; figures 1,2,4 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			B30B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 July 2013	Examiner Jensen, Kjeld
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