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### (54) Method and device for separating stacked containers

(57) It is disclosed a device for separating stacked containers (5) in which a retaining device (3) is active on at least one pile (4) of containers (5). A gripping and

separating means (6) is active at least on the last container of said pile (4) and removes the container itself utilising friction forces. The invention also relates to a method of separating stacked containers.

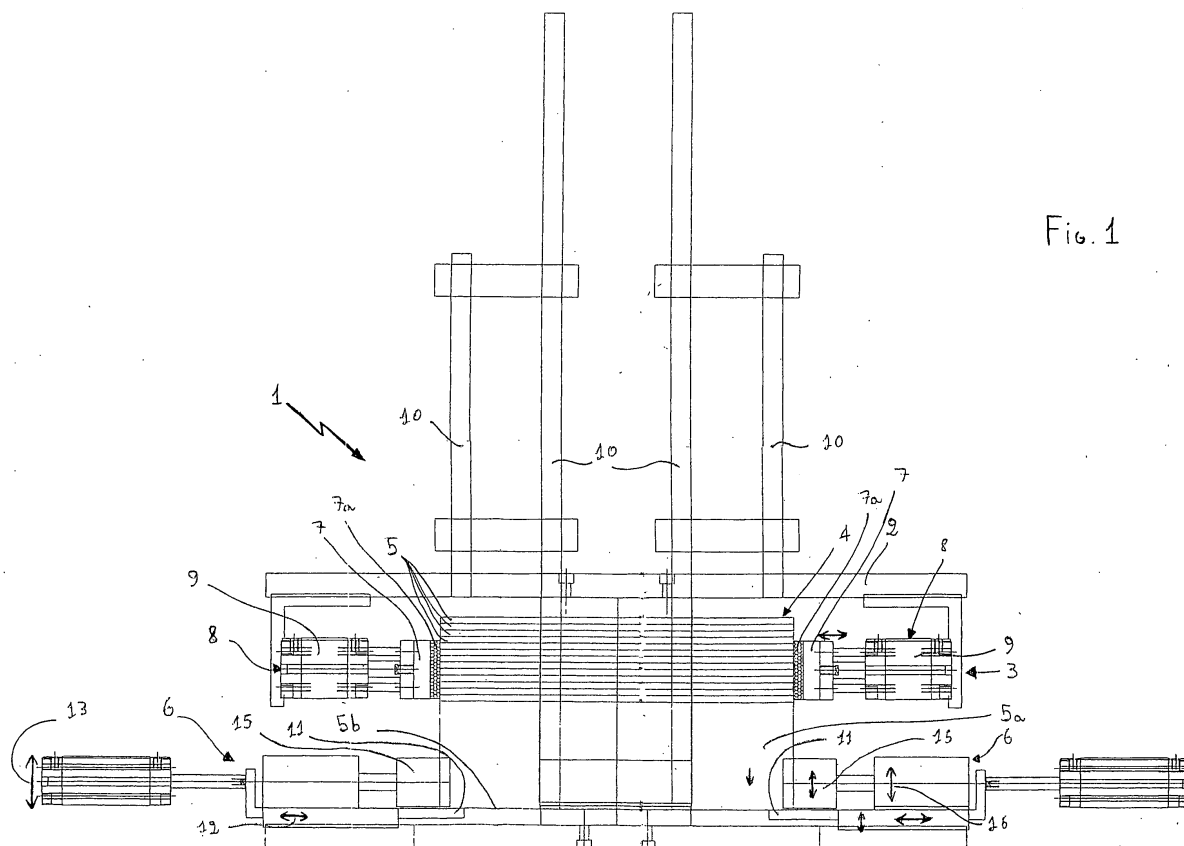


Fig. 1

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## Description

**[0001]** The present invention relates to a device for separating stacked containers and to the method of carrying out the separation.

**[0002]** It is known that there are presently on the market and are greatly widespread apparatus capable of separating stacked containers one by one.

**[0003]** In particular, for stocking reasons, the containers of paper material designed to enable baking of foodstuffs such as panettones, cakes and the like are supplied in the form of piles consisting of a predetermined number of said containers in engagement with each other.

**[0004]** The hitherto known apparatus are provided with suitable feeding guides designed to keep the stacked containers to the correct position and with suitable separation means active on the last container in the pile to separate it from said pile and dispose it on a conveyor belt for example, for subsequently forwarding it to the food packaging and/or baking lines.

**[0005]** A known type of the devices briefly described above involves insertion of the stacked containers with the cavity thereof facing the separation means, so that said means, provided with suction cups adapted to act through a vacuum engagement, is positioned at the container bottom and activates suction for grasping of the last container; by subsequent articulated movements the container is separated from the remaining ones and is laid on a conveyor belt by means of suitable rotation and translation movements carried out by mechanical arms on the ends of which said suction cups are located.

**[0006]** While the above devices are widely spread on the market, they however have drawbacks and operating limits.

**[0007]** It is to be pointed out first of all that in order to ensure a reliable operation, these machines require the presence of a container with a substantially flat and undeformed bottom, otherwise the suction cups do not succeed in exerting the necessary forces for carrying out separation.

**[0008]** It is however apparent that paper containers are very responsive to environmental conditions and sometimes can be easily deformed following the presence of humidity in the environment, so that an optimal operation of the above described machines is not possible.

**[0009]** It is further to be pointed out that the devices of the known art are not able to operate in a reliable manner on piles of containers having an undulated rim because in this case high friction forces are necessarily generated between the containers themselves and in particular high friction forces between the side surfaces of containers in succession that are often higher than the forces generated by the vacuum by means of the suction cups so that removal of the containers is not allowed.

**[0010]** Furthermore, it is not always possible to in-

crease the forces linked to the vacuum because these forces could involve undesirable deformations of the container bottoms or even breaking of same.

**[0011]** Finally the suction cups present in the machines of known type are subjected to wear problems and therefore frequent checks and replacements are required which will bring about times of inactivity of the machine.

**[0012]** Under this situation, the technical task of the present invention is substantially to solve the above mentioned drawbacks.

**[0013]** Accordingly, it is a main aim of the present invention to make available a device for separating stacked containers that is able to separate containers, preferably of paper material, of any nature in a very reliable and precise manner.

**[0014]** It is a further aim of the invention to enable the device to operate on containers for panettones, "pandori" and similar baked foodstuffs that generally have undulated side surfaces and therefore can generate strong frictions under a stacked condition.

**[0015]** Another aim of the invention is to provide a device and a process for separating containers that is able to ensure high separation rates in a reliable manner.

**[0016]** Finally, the invention aims at making available a device that can be easily adapted to different shapes of stacked containers to be separated.

**[0017]** The foregoing and further aims that will become more apparent in the course of the present description are substantially achieved by a device and a method of separating stacked containers in accordance with the features set out in the appended claims.

**[0018]** Further features and advantages will be best understood from the detailed description of a preferred but not exclusive embodiment of a device for separating containers in accordance with the present invention.

**[0019]** This description will be made hereinafter with reference to the accompanying drawings given by way of non-limiting example, in which:

- Fig. 1 is a diagrammatic side view of a device for separating containers in accordance with the present invention; and
- Fig. 2 is a top view of the device in Fig. 1 which is suitable for separating containers of non-circular shape.

**[0020]** With reference to the drawings, a device for separating stacked containers in accordance with the invention has been generally identified by reference numeral 1.

**[0021]** As viewed from Fig. 1, the device comprises a fixed supporting structure 2 with which a retaining device 3 is associated as well as gripping and separating means 6 active on a pile 4 of containers 5.

**[0022]** In particular, pile 4 comprises a predetermined number of containers at least partly inserted into each other in such a manner as to enable only a small portion

of a container to emerge from the subsequent container, as shown in Fig. 1.

**[0023]** Said pile 4 will be in particular inserted into the device for separating the containers from the top, being guided by suitable positioning means 10, so that the containers 5 are maintained substantially in engagement upon each other, in alignment and in place.

**[0024]** It is to be pointed out that the containers are fed in such a manner that the container bottom faces downwardly during the operating conditions of the device.

**[0025]** In particular, the device is adapted to separate containers of paper material consisting of a bottom and a side wall made separately and then connected to the bottom. The side wall also has undulations on an outer surface 5a thereof that are designed to improve the wall resistance to radial deformations during baking of the food.

**[0026]** In more detail as regards structure, the retaining device 3 is movable between at least one retaining condition at which it is active on a predetermined number of containers 5 (in particular it will engage at least the last but one container in the pile and all containers preceding it so as to keep them relatively tightened together) and at least one release condition at which it is moved apart from the pile 4 of containers 5.

**[0027]** As shown in Figs. 1 and 2, the retaining device 3 is made up of a predetermined number of actuators 8, preferably pneumatic actuators, provided with a fixed portion 9 and a movable element 7 selectively shiftable between the retaining and release positions. In particular the fixed portion 9 of actuators 8 is rigidly connected with the supporting structure 2.

**[0028]** The retaining device 3 is equipped with at least two movable elements 7 (i.e. with at least two actuators 8) shiftable between the retaining and release positions in such a manner as to be able to engage the containers 5. In particular, depending on the type of container, the presence of two or even three or more actuators 8 can be provided.

**[0029]** For example, if the device is wished to be used for removing containers of cylindrical shape, use of at least three movable elements 7 disposed radially around the container and offset by an angle of 120° with respect to each other appears to be optimal.

**[0030]** If, on the contrary, the container to be removed has a different shape (see Fig. 2, for example) only two movable elements 7, of different shape from each other for example, could be used, the shape of which elements will at least partly match that of the container to be retained; said movable elements 7 will be placed at opposite positions with respect to the container.

**[0031]** Obviously, even if not in a limiting sense, movement between the retaining position and the release position will be of the translational type as it can be obtained very easily.

**[0032]** Also provided is the presence of high-friction portions 7a designed to come into direct contact with the

pile 4 of containers 5.

**[0033]** In addition the retaining device 3 and in particular the movable element 7 and the high-friction portion 7a thereof will be active on an outer surface of pile 4.

**[0034]** Turning now to the gripping and separating means 6, the same comprises at least one rest body 11 (generally two or three of said rest bodies will be present depending on the type of container to be borne) which is designed to receive and keep in place the pile 4 of containers 5.

**[0035]** These rest bodies are designed and manufactured in such a manner as to keep a correct positioning of the whole pile of containers, as better specified in the following.

**[0036]** In particular, the rest bodies 11 receive the lower surface 5b of the last container 5 in the pile 4; however they can move away from/close to each other and the container 5 pile at least in a first radial direction 12 and also they can also move close thereto and away therefrom in a further direction 13 transverse to the first one (and preferably orthogonal thereto).

**[0037]** As still shown in Fig. 1, the gripping and separating means 6 has at least one actuator 14 which is preferably of the pneumatic type as well, provided with a movable head 15 shiftable between a position spaced apart from pile 4 and a position of engagement at least with the last container 5 of said pile.

**[0038]** The gripping and separating means 6 and in particular the movable head 15 is active on an outer surface 5a of the last container, like the retaining device 3.

**[0039]** In order to generate a suitable friction force with the outer surface of containers 5, the movable head 15 too has a portion 15a having a high friction degree and operating on the last container.

**[0040]** The whole actuator 14 is then movable away from/close to the supporting structure 2 or the retaining device 3 in an axial direction substantially coincident with the axial movement direction 13 of the rest bodies 11.

**[0041]** After the above description, operation of the machine is the following.

**[0042]** Starting from the configuration in Fig. 1 in which the containers are retained in position and the gripping and separating means 6 retains the last container by friction, the separation cycle first of all contemplates axial movement of the gripping and separating means 6 downwardly, away from the remaining containers.

**[0043]** In detail, the friction forces generated between the outer surface 5a and the movable head 15 are of such a nature that dragging along of the last container away from the remaining ones is enabled.

**[0044]** Once said last container has been completely separated, both the movable heads 15 and the rest bodies are radially moved away along the direction 12, so that the separated container is released and dropped by gravity onto a conveyor belt or the like.

**[0045]** At this point the gripping and separating means

6 is axially moved again close to the remaining containers (direction 16) and when it reaches again the starting position the rest bodies are radially approached (direction 12).

[0046] Now, the retaining device 3 reaches the spaced-apart release configuration letting the whole pile 4 fall by gravity until said pile rests on bodies 11.

[0047] The movable heads 15 engage the last container again and the retaining device 3 the last but one container and some of the preceding ones.

[0048] At this point the cycle can be repeated and the subsequent container can be removed still utilising the friction forces.

[0049] The invention achieves important advantages.

[0050] First of all the device in accordance with the invention allows stacked containers to be removed one by one in a very reliable and quick manner.

[0051] The same machinery can be adapted to different shapes of containers with few simple modifications of some elements thereof.

[0052] Therefore, the device allows removal of stacked containers generating high friction forces between each other, that are due to the particular paper materials and the geometrical shapes used.

[0053] It will be appreciated that the device of the invention has a very simple construction combined with a great mechanical strength, in turn combined with a great operating liability.

## Claims

1. A device for separating stacked containers, comprising:
  - a supporting structure (2);
  - a retaining device (3) associated with the supporting structure and active on at least one pile (4) of containers (5);
  - gripping and separating means (6) associated with the supporting structure and active at least on the last container of said pile (4), **characterised in that** the gripping and separating means (6) removes the last container (5) by utilising friction forces generated between the gripping and separating means itself (6) and at least the last container.
2. A device as claimed in claim 1, **characterised in that** the gripping and separating means (6) is active on an outer surface (5a) of the last container.
3. A device as claimed in anyone of the preceding claims, **characterised in that** the retaining device (3) is movable between at least one retaining condition at which it is active on a predetermined number of containers (5) to keep them relatively tightened with each other and at least one release condition at which said device (3) is moved away from the pile (4) of containers.
4. A device as claimed in the preceding claim, **characterised in that** the retaining device (3) comprises at least two movable elements (7) selectively shiftable between the retaining and release positions.
5. A device as claimed in claim 4, **characterised in that** each movable element (7) has a portion (7a) having a high friction degree that is designed to come into contact with the pile (4) of containers (5).
6. A device as claimed in claim 3, **characterised in that** the retaining device (3) consists of a predetermined number of actuators (8) preferably of the pneumatic type, provided with a fixed portion (9), rigidly connected with the supporting structure (2) for example, and with a movable element (7) selectively shiftable between the retaining and release positions.
7. A device as claimed in anyone of the preceding claims, **characterised in that** the retaining device (3) is active on an outer surface of said pile (4).
8. A device as claimed in anyone of the preceding claims, **characterised in that** it further comprises elements (10) for positioning the container pile (4) to maintain said containers substantially in alignment and in place.
9. A device as claimed in anyone of the preceding claims, **characterised in that** the gripping and separating means (6) comprises at least one rest body (11), and preferably two or three rest bodies, designed to receive and maintain in place the pile (4) of containers (5).
10. A device as claimed in the preceding claim, **characterised in that** the rest body (11) receives a lower surface (5b) of said last container (5) of the pile.
11. A device as claimed in claim 9, **characterised in that** the rest body (11) is movable relative to the supporting structure (2) in at least one first direction (12), a radial direction away from/close to the pile of containers (5) for example, and in a second direction (13), an axial direction away from/close to the retaining device (3) for example, which directions are transverse to each other.
12. A device as claimed in anyone of the preceding claims, **characterised in that** the gripping and separating means (6) comprises at least one actuator (14), preferably of the pneumatic type, having at least one movable head (15) shiftable between a

position spaced apart from the pile (4) and a position of engagement at least with the last container (5) of said pile.

13. A device as claimed in the preceding claim, **characterised in that** the movable head (15) has a high-friction portion (15a) that is designed to come into contact with the last container. 5
14. A device as claimed in claim 12, **characterised in that** said actuator (14) is movable along an axial direction (16) away from/close to the retaining device (3). 10
15. A device as claimed in anyone of the preceding claims, **characterised in that** said containers are made of a paper material and are preferably adapted for baking foods such as panettones, cakes and the like. 15
16. A method of separating stacked containers, comprising the following steps: 20
  - setting a predetermined number of stacked containers (5); 25
  - retaining a predetermined number of said stacked containers to a fixed position with respect to each other by means of a retaining device (3);
  - engaging at least the last one of said stacked containers by means of gripping and separating means (6); 30
  - by utilising the friction forces generated by the gripping and separating means (6), moving the last one of said containers away from the other stacked containers retained in place by the retaining device (3); 35
  - releasing the last one of said containers separated from the pile (4). 40
17. A method as claimed in the preceding claim, **characterised in that** the retaining device (3) retains the last but one container and the preceding containers in the pile (4) in place. 45
18. A method as claimed in claim 16, **characterised in that** the gripping and separating means (6) engages the last container (5) in the pile (4) and moves away along an axial direction (16) from the retaining device (3). 50
19. A method as claimed in the preceding claim, **characterised in that**, once the last container has been separated, a rest body (11) and a movable head (15) of the gripping and separating means (6) move away from the separated container along at least one radial direction (12) and drop it. 55

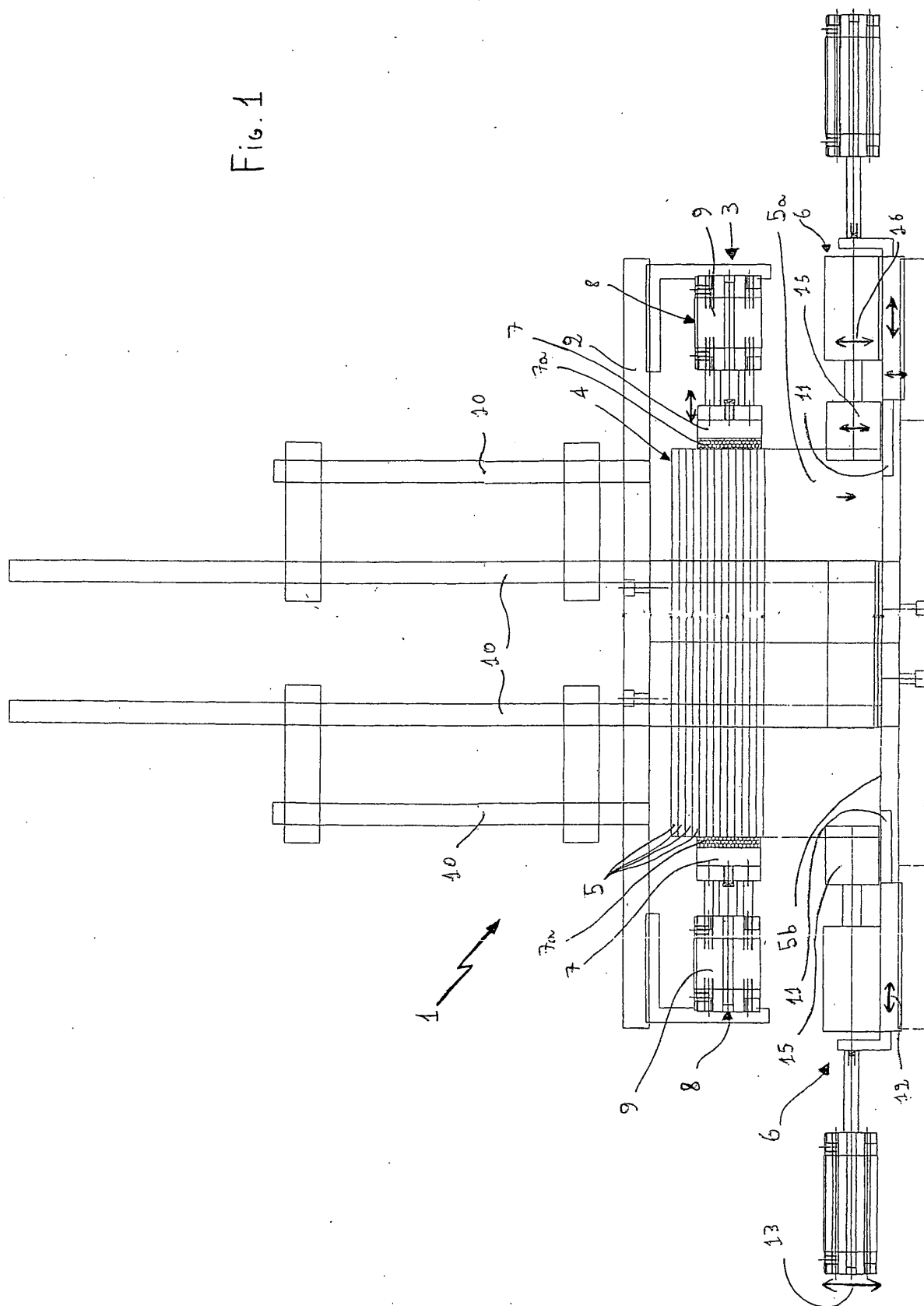
20. A method as claimed in the preceding claim, **characterised in that** after the step of moving away the gripping and separating means (6), the rest body (11) moves again near an axis (17) of the pile (4) along said radial direction (12).

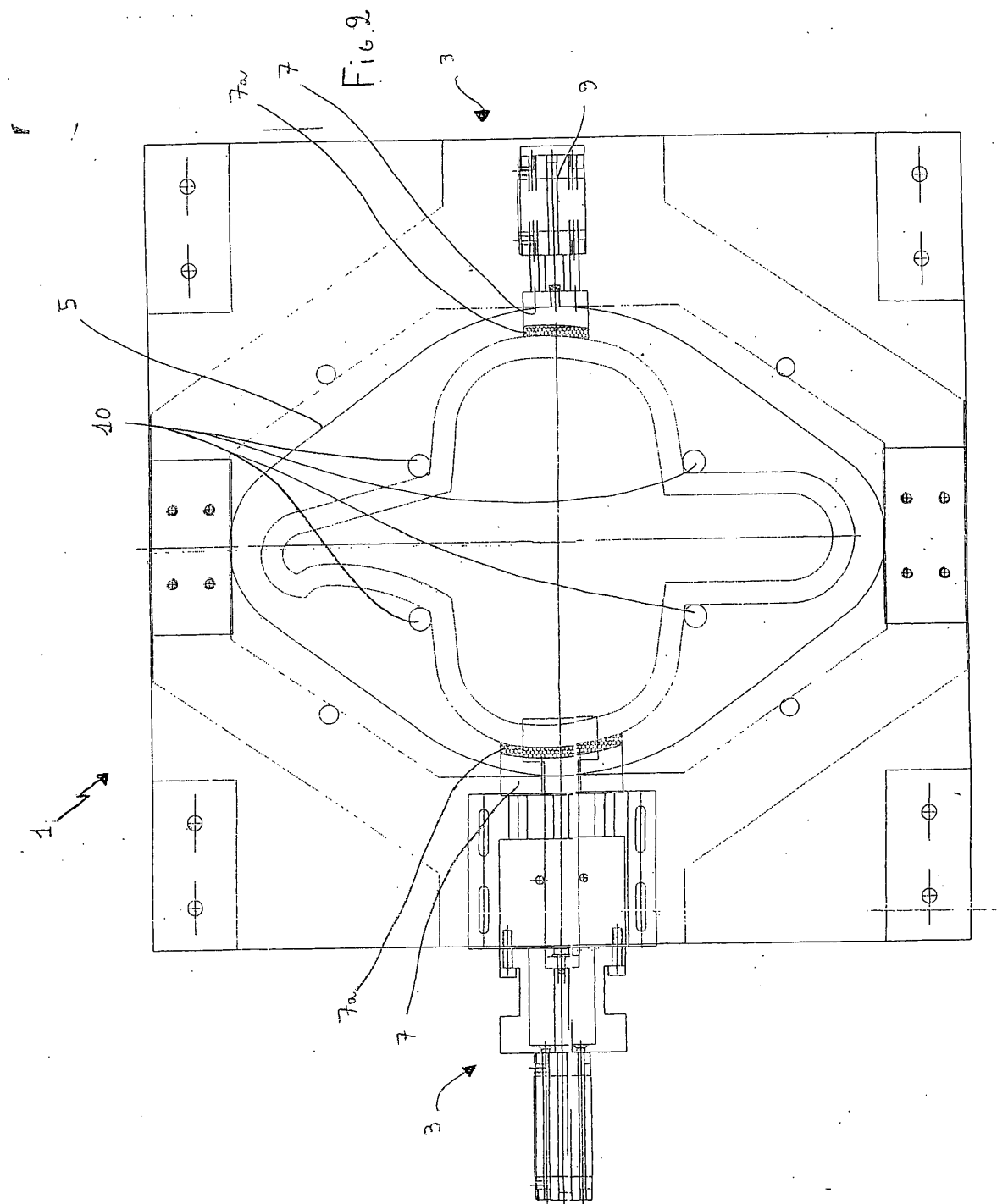
21. A method as claimed in the preceding claim, **characterised in that**, after the approaching step of the rest body (11), the retaining device (3) is moved away from the pile of containers (5) enabling falling of same onto the rest body.

22. A method as claimed in the preceding claim, **characterised in that**, after the falling step of the containers, the retaining device (3) is moved near the containers (5) again so that said containers are retained once more.

23. A method as claimed in claim 21, **characterised in that**, after the falling step of the containers, the movable head (15) of the gripping and separating means (6) is moved in engagement close to the last container of the pile.

Fig. 1







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Application Number  
EP 04 01 0430

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Y	column 1, lines 4-12; 39-47; column 2, line 36 - column 4, line 11; abstract; figures	4,5,15	
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A	column 1, lines 1-10; figures 2, 3	1-14,16-23	TECHNICAL FIELDS SEARCHED (Int.Cl.7)  B65G B65H B65B
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Place of search <b>Munich</b>		Date of completion of the search <b>10 March 2005</b>	Examiner <b>Clivio, E</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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