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(71) Applicant: **Ronchi, Mario**
Cologno Monzese (Milano) (IT)

(72) Inventor: **Ronchi, Mario**
Cologno, Monzese (Milano) (IT)

(74) Representative:
Raimondi, Alfredo, Dott. Ing. Prof.
Dott. Ing. Prof. RAIMONDI ALFREDO S.r.l.
Piazzale Cadorna 15
20123 Milano (IT)

(54) Machine for filling boxes with arrays of containers, provided with rotating upright having two arms for transportation of the containers

(57) Machine for filling boxes (3) with arrays of containers (1), which comprises a part (100) for supplying the containers (1), a part (200) for supplying the boxes (3) and devices (300) for gripping and transferring the containers (1) into the boxes (3), in which said devices (300) for transferring the containers comprise at least two arms (303a,303b) carrying the means (400) for gripping the containers and integral with an upright (301) which can be rotationally operated.

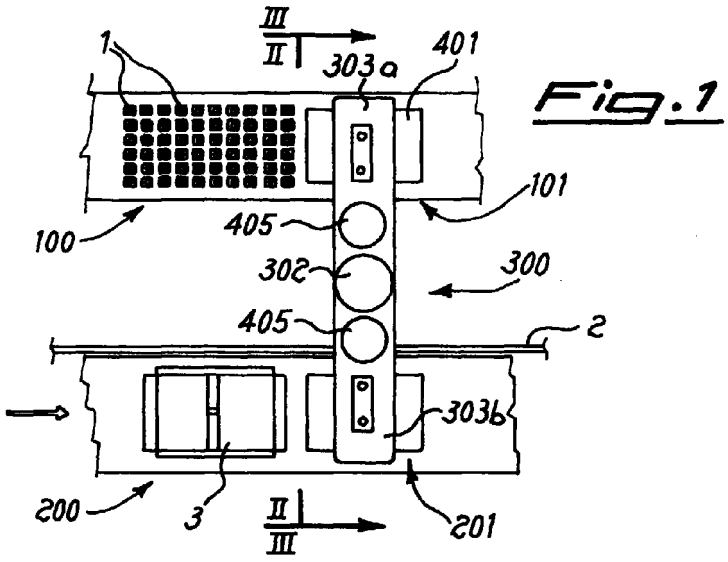

Fig.1

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Description

[0001] The present invention relates to a machine for filling boxes with arrays of containers, which is provided with an upright which can be rotationally operated and which has, integral with it, at least two arms carrying the means for gripping the containers so as to transport them from a zone for formation of the arrays, into the boxes.

[0002] It is known that, in the art of packaging containers having varying shapes, such as bottles, phials and the like, there exists the need to arrange said containers aligned in arrays formed by a predefined number of rows and columns depending on the dimensions of the packaging box into which they are to be inserted by means of a handling head which removes the array of containers and places it inside the box.

[0003] It is also known that automatic machines designed for this purpose exist, said machines being substantially divided into two parts which are arranged alongside each other and synchronised: in the first of said parts the arrays of containers are formed, while in the second part the box to be filled is formed; the connection between the two parts of the machine being performed by means of the said head for gripping and inserting the array, already formed, inside the box.

[0004] These machines, although performing their intended function, nevertheless have problems of limited productivity owing to cycle idle time due to the movement of the devices for gripping and transferring the arrays of containers into the box.

[0005] These devices, in fact, basically consist of a rotating shaft having, extending from it, an arm at the free end of which the means for gripping the containers are arranged; the container transportation cycle involves rotation of the shaft through an acute angle so as to bring the gripping means above the containers, lowering of the gripping means towards the containers, raising of the gripping means after engagement with the containers, a further rotation of the shaft in the opposite direction so as to bring the containers above the box, lowering of the gripping means so as to deposit the containers inside the box, raising of the gripping means and return of the shaft into the initial position.

[0006] It is obvious how at least the time required for raising of the gripping means after deposition of the containers, return of the arm into the initial position and renewed lowering of the gripping means also constitutes cycle idle time in that said operations are performed passively.

[0007] The technical problem which is posed, therefore, is that of providing a packaging machine for introducing arrays of containers into pre-formed boxes, which is provided with devices for gripping and transporting the containers which are designed to achieve a high hourly production output and a reduction in the cycle idle time.

[0008] Within the context of this problem a further requirement is that the machine should be compact and easy to assemble and access for the normal maintenance operations.

[0009] These technical problems are solved according to the present invention by a machine for filling boxes with arrays of containers, which comprises a part for supplying the containers, a part for supplying the boxes and devices for gripping and transferring the containers into the boxes, in which said devices for transferring the containers comprise at least two arms carrying the means for gripping the containers and integral with an upright which can be rotationally operated.

[0010] Further details may be obtained from the following description of a non-limiting example of embodiment of the invention provided with reference to the accompanying drawings, in which:

- Figure 1 shows a top plan view of the machine according to the invention;
- Figure 2 shows a cross-section along the plane indicated by II-II in Fig. 1;
- Figure 3 shows a cross-section along the plane indicated by III-III in Fig. 1;
- Figure 4 shows a top plan view of a variation of an example of embodiment of the machine according to the invention;
- Figure 5 shows a cross-section along the plane indicated by V-V in Fig. 4.

[0011] As shown in Fig. 1, the machine according to the invention comprises a first part 100 for supplying the containers 1 to a zone 101 for picking up the arrays of containers which may be pre-formed or formed in the same pick-up zone.

[0012] Parallel to the part for supplying the containers and on the opposite side to a vertical partition 2 there extends the part 200 of the machine which forms the boxes 3 to be filled and supplies them to the zone 201 for introducing arrays of containers inside them.

[0013] The devices 300 for transporting the arrays of containers from the pick-up zone into the box are located in a suitable zone, i.e. in the example between the two machine parts.

[0014] Said container transportation devices 300 consist of an upright 301 which is supported by a base 301a and guided by fixed flanges 301b (Fig. 2).

[0015] The upright 301 is able to rotate about its longitudinal axis with respect to the base 301a upon operation of actuation means which, in the figures, consist by way of example of a controlled electric motor 302.

[0016] In an approximately upper end position the upright 301 supports a cross-piece 303, the two sections 303a, 303b of which, extending on opposite sides of the upright 301, form the arms at the ends of which the devices 400 for gripping the containers are arranged.

[0017] Each gripping device, which is conventional

per se and therefore only schematically shown at 401, is mounted on a plate 401a which is integral with an endless screw 402 engaged inside a nut-screw 402a fixed to the associated transverse arm 303a, 303b.

[0018] In order to ensure the stability of each screw 402, the latter are constrained to a small column 403 parallel to the screw and longitudinally guided by a bush 403a which is fixed to the associated arm 302a, 302b.

[0019] Each screw 402 is rotationally actuated by a respective motor 405 which is connected to the nut-screw 402a which, being axially fixed, causes with its rotation the downward/upward movement of the screw 402 and therefore the gripping means 401.

[0020] The mechanisms for opening/closing the gripping means 400, the rotational movements of the upright 301 and the endless screws 402 are controlled by means of suitable sensors and actuators which are within the competence of a person skilled in the art and therefore are not illustrated nor described in detail.

[0021] The operating principle of the machine is as follows:

- the containers 1 are supplied to the pick-up zone where the gripping means which are located in the raised position are ready (Fig. 2);
- the cycle control devices start the motor 405 which, operating the nut-screw 402a, causes lowering of the screw 402 and therefore the gripping means 401 which open and close onto the containers 1;
- once the containers 1 have been gripped, the cycle control devices reverse rotation of the motor 405, causing raising of the screw 402 and hence the containers 1;
- at the same time the cycle control devices actuate the motor 405 of the screw carrying the gripping means 401 arranged above the zone for filling the cardboard box 3 so as to bring them into the raised position;
- the upright 301 rotates about its longitudinal axis, causing rotation of the arms 303a,303b and bringing the arm 303a with the containers 1 above the box 3 and the empty arm 303b above the pick-up zone 101;
- the control devices cause lowering of the screws 402 so that the gripping means deposit the array of containers, previously picked up, into the box and at the same time the gripping means above the pick-up zone grip a new array of containers, thereby recommencing the cycle.

[0022] It can therefore be understood how, after a first half cycle, each rotation of the upright causes the deposition of an array of containers inside the box and elimination of the idle time for return of the arm, raising and lowering of the empty gripping means, since, at the same time, the other arm is already picking up a new array of containers.

[0023] Figs. 4 and 5 shows a further embodiment of the machine according to the invention in which the gripping devices are multiples of the basic device.

[0024] More particularly, in the example shown, two cross-pieces 303 arranged at 90° with respect to each other are envisaged, and consequently the arms with operational gripping means become four, allowing the hourly production output of the machine to be doubled.

[0025] Similarly it is possible to envisage a further increase in the number of pick-up arms in accordance with the speed of supplying of the containers and/or the boxes to be filled, as well as different constructional forms of the individual parts such as the electric motors and the screws which could be replaced by hydraulic, pneumatic and similar devices.

Claims

1. Machine for filling boxes (3) with arrays of containers (1), which comprises a part (100) for supplying the containers (1), a part (200) for supplying the boxes (3) and devices (300) for gripping and transferring the containers (1) into the boxes (3), characterized in that said devices (300) for transferring the containers comprise at least two arms (303a,303b) carrying the means (400) for gripping the containers and integral with an upright (301) which can be rotationally operated.

2. Machine according to Claim 1, characterized in that said arms (303a,303b) carrying the gripping means extend on opposite sides of the upright (301).

3. Machine according to Claim 1, characterized in that said means (400) for gripping the containers are integral with means (402) for actuating them translationwise in a direction perpendicular to said arms.

4. Machine according to Claim 3, characterized in that said translation means consist of endless screws (402) engaged with corresponding nut-screws (402a) axially fixed to the associated arm.

5. Machine according to Claim 4, characterized in that said nut-screw is made to rotate by associated actuating means (405) mounted on the respective arm.

6. Machine according to Claim 5, characterized in that said means for actuating the screws are controlled electric motors.

7. Machine according to Claim 5, characterized in that said means for actuating the screws are of the hydraulic/pneumatic type.

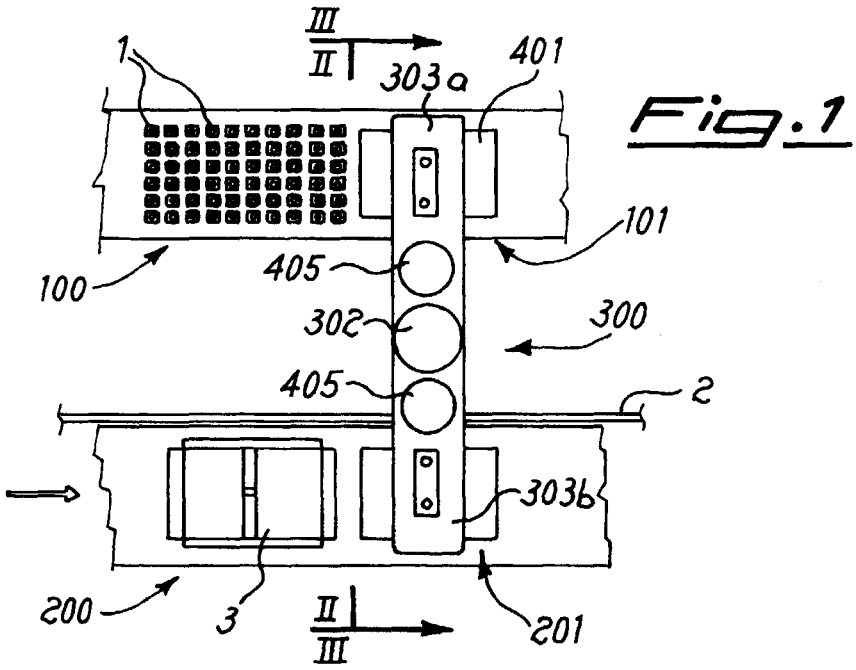


Fig.1

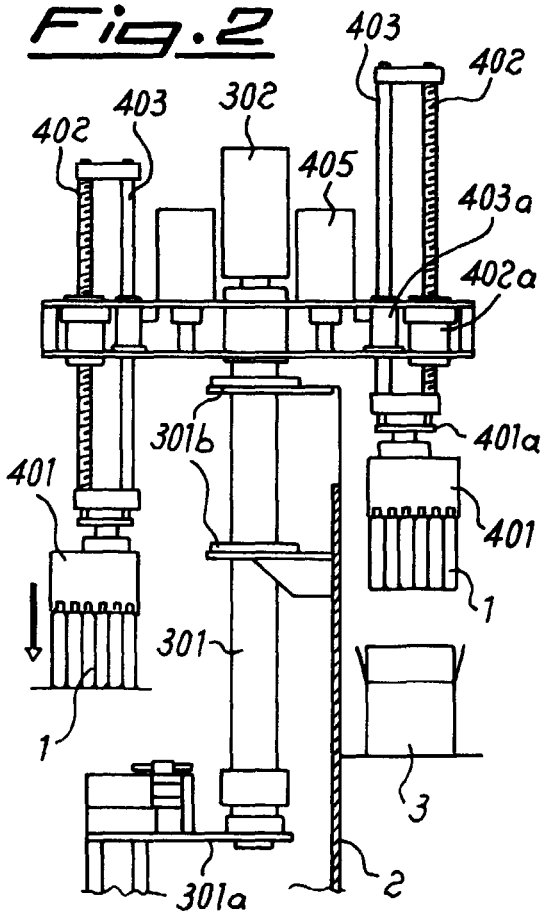


Fig.2

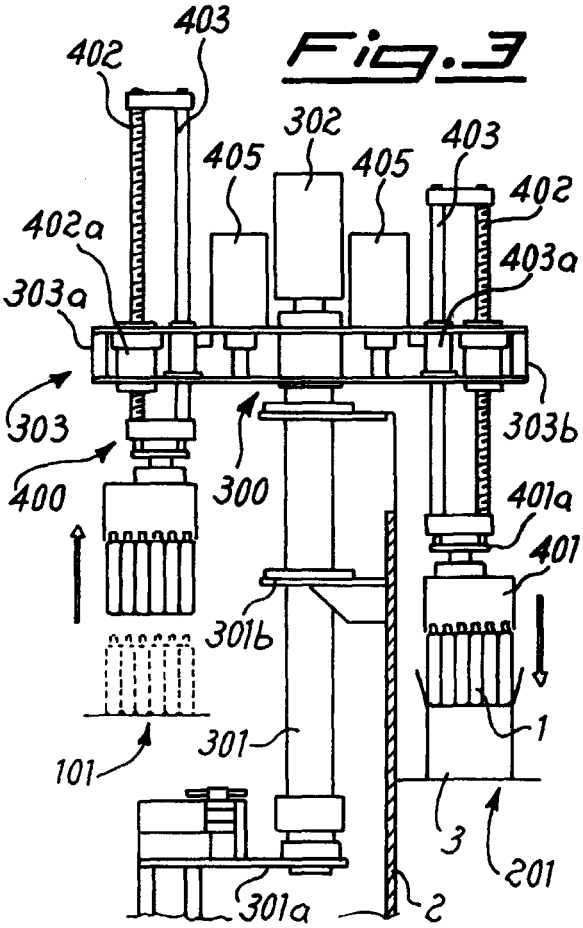
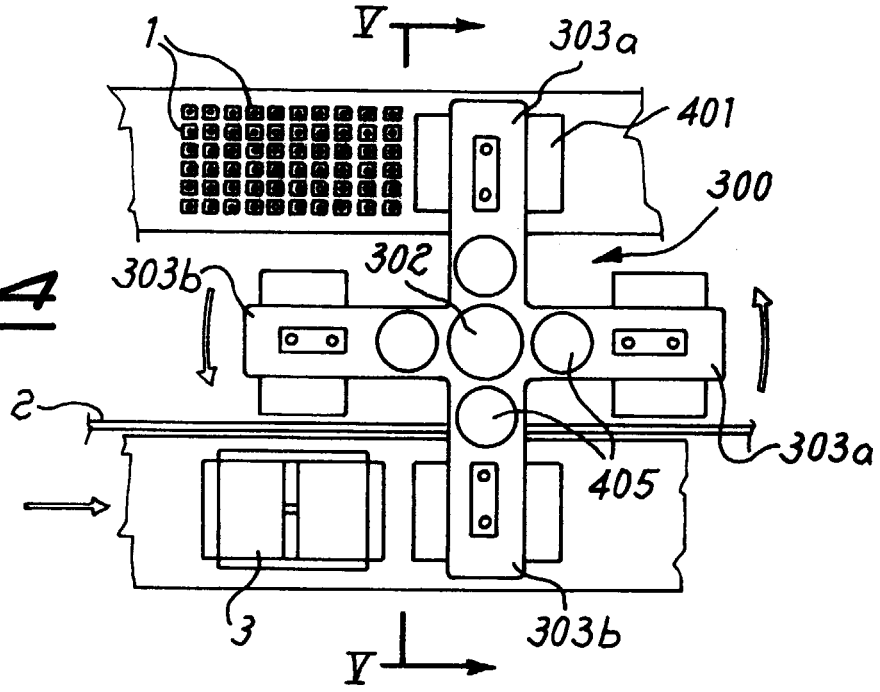
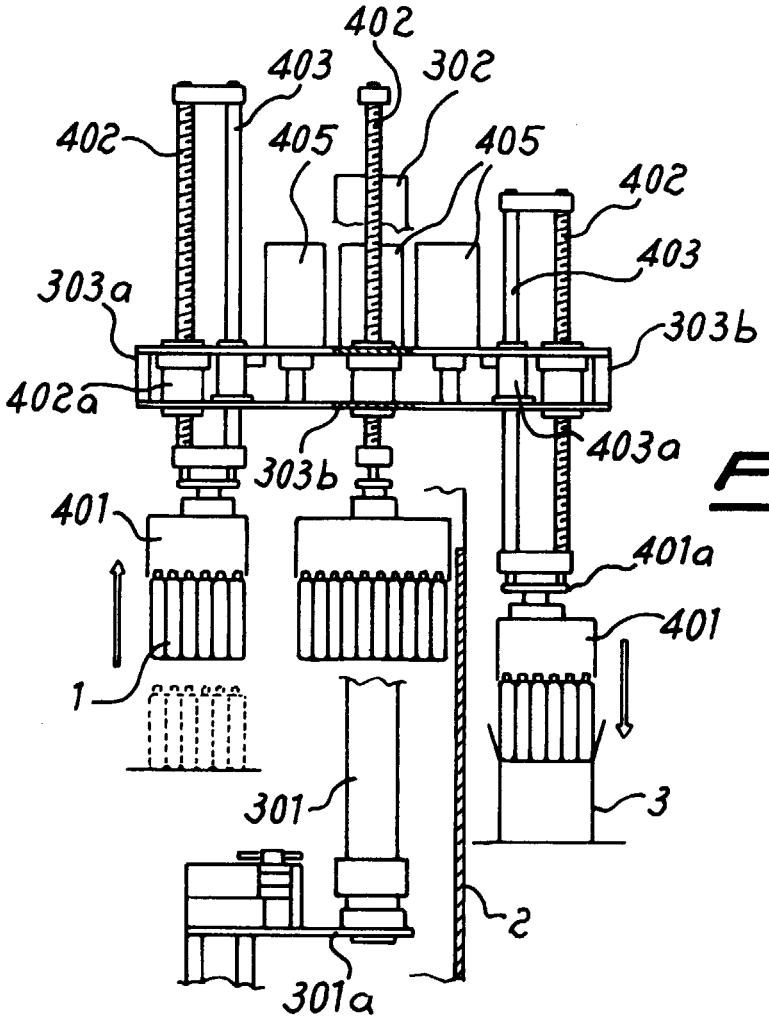


Fig.3

Fig.4


1
V
303a
401
300
303b
302
2
303a
405
3
303b
V


402
403
302
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303a
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402a
403a
303b
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401a
401
1
301
3
2
301a

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 0026

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 497 689 A (CAZAS) 5 August 1992 (1992-08-05)	1,2	B65B21/18
Y	* column 3, line 4 - line 51; figure 1 *	3-6	
X	FR 1 584 490 A (DELDON) 26 December 1969 (1969-12-26)	1,2	
Y	* the whole document *	3-6	
Y	US 5 743 068 A (MADARIAGA) 28 April 1998 (1998-04-28) * column 2, line 13 - column 3, line 2; figure 1 *	3-6	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 April 2000	Claeys, H

CATEGORY OF CITED DOCUMENTS

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