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(54) **Machine and method for folding closing flaps of a package**

(57) A machine for folding flaps of a package (100) comprises extensible conveyor means, first (2) and second (3), aligned and provided with respective extensible portions, faced first (12) and second (13). The conveyor means (2, 3) support and move said package (100) and each extensible portion (12, 13) is operated between

two extreme conditions, respectively of maximum extension (A) and of minimum extension (B), for folding flaps (101, 102) transversal with respect to the direction of longitudinal motion of said package (100).

A method for folding flaps of a package (100) using such machine.

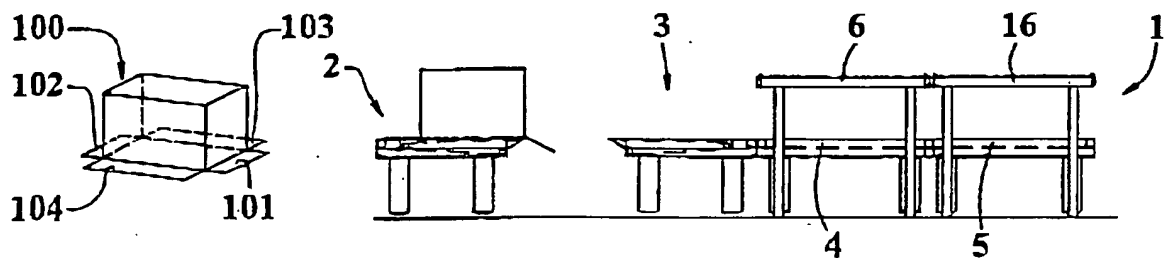
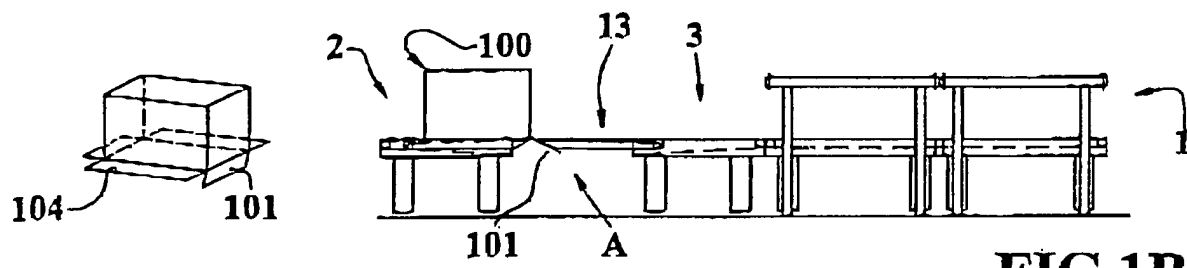


FIG.1A



Description

[0001] The present invention relates to machines and apparatuses fit for packaging articles or products in boxes or packages, and particularly it refers to a machine and method for folding closing flaps of a package, such as a carton box or similar, and to perform its complete closing.

[0002] Apparatuses and machines are known for the automatic folding of closing flaps or edges of a carton box, that is deposited on a carrier or a conveyor belt in overturned position to contain the object or the objects to be packaged. In such position, the closing flaps, longitudinal and transversal with respect to the direction of advancement of the box, extend substantially perpendicular toward the outside, beginning from the lower end of the respective side walls.

[0003] These apparatuses generally include a couple of conveyor belts positioned end against end and fit to swing independently to the top. More precisely, due to said partial rotation, the faced end of the two conveyor belts can lower or rise, one respect the other. In this way, the transversal edges of the package, supported by such conveyor belts, through subsequent movements of advancement and withdrawal of the same package can be refolded toward the inside during closing.

[0004] The longitudinal edges are refolded by suitable articulated means proceeding during operation after releasing the base portions on which each longitudinal edge is refolded.

[0005] A disadvantage of such apparatuses and machines is that they need accurate moving and control means in order to precisely regulate height or rotation of the conveyor belts and to allow the retrograde motion of the package.

[0006] Other disadvantage, connected to such operation, consists in the high time required for folding up the closing flaps causing a reduced machine productivity.

[0007] Further disadvantage consists in that said machines are equipped with articulated and complexes moving and support means, therefore of expensive realization and assemblage.

[0008] A purpose of the present invention is to propose a machine and a method for folding closing flaps of carton packages, allowing to get an elevated productive ability without package withdrawals.

[0009] Other purpose is to propose a machine equipped with simple and effective moving means, a reliable and economic machine to be realized and assembled.

[0010] The cited purposes are obtained according to the content of the claims.

[0011] The characteristics of the invention are underlined in the following, with reference to attaches drawings, in which:

Figures from 1A to 1G illustrate frontal schematic

views of the machine for folding flaps of a package in subsequent operational phases, each view comprising besides an axonometric view of the package in the corresponding phase;

Figure 2 illustrates a schematic plant view of the machine of figure 1A;

Figures from 3A to 3C illustrate axonometric and partial schematic views of the machine of figure 1A in further subsequent operational folding phases, each of which in association with an axonometric view of the partially refolded package;

Figures 4A and 4B illustrate a schematic enlarged frontal view of extensible portions of first and second conveyor means in two end conditions respectively of maximum and minimum extension;

Figure 5 illustrates a partial enlarged axonometric schematic view of the machine of figure 3 A in association with a package;

Figures 6 and 7 illustrate schematic enlarged views respectively frontal and plant of the machine of figure 5.

[0012] With reference to figures from 1A to 7, reference 1 indicates the machine for folding flaps of a package 100 object of the present invention, comprising substantially extensible conveyor means, first 2 and second 3, aligned there between and third 4 and fourth 5 conveyor means downwardly the second extensible conveyor means 3, said conveyor means 2, 3, 4, 5 being fit for moving and supporting the package 100.

[0013] The conveyor means first 2 and second 3 are provided of extensible portions, respectively first 12 and second 13, mutually faced; each portion 12, 13 is mobile among two extreme conditions, respectively of maximum extension A and of minimum extension B, so that to reciprocally approach and fold the transversal flaps 101, 102, with respect to the longitudinal motion direction of said package 100.

[0014] The extensible conveyor means 2, 3 include carrier means first 23 and second 33, constituted by a conveyor belt or a plurality of conveyor belts or belts placed side by side, destined to support and translate the package 100.

[0015] The first carrier means 23 are enveloped around a series of pulleys, first motorized 24, and free second 25, third 21 and fourth 22. The third 21 and fourth 22 pulleys are fixed to first carriage means 20, realizing the first extensible portion 12 of the first extensible conveyor means 2. The carriage means 20 are, in fact, sliding and operated, from actuating means known and not illustrated, between two extension conditions, maximum A and minimum B of the respective extensible portion 12. The particular disposition of the free pulleys second

25, third 21 and fourth 22 allows, after fixing the extension length of the carrier means 23, to extend or shorten the extensible portion 12 to form a support surface more or less long.

[0016] In a totally similar way, the second carrier means 33 are wound around a series of pulleys motorized fifth 34 and free sixth 35, seventh 31 and eighth 32, the free pulleys seventh 31 and eighth 32 have fixed to second carriage means 30, which constitute the second extensible portion 13 and are operated by actuating means, known and not illustrated.

[0017] The third 4 and fourth 5 conveyor means are positioned downstream the second conveyor means 3 and are mutually parallels and staggered in the longitudinal motion direction of the package 100. They have a width lower than the second conveyor means 3, preferably equal to around the half width of these latter, so freeing the base portion of the package 100 on which the corresponding longitudinal edge 103, 104 must be refolded during closing.

[0018] Such operation is made also possible thanks to the containing means first 6 and second 16, at sides respectively of third 4 and fourth 5 conveyor means, laterally supporting the package 100.

[0019] Said containing means 6, 16 are self-centering and include, in correspondence of each side of the corresponding conveyor means 4, 5, motorized belt guides or smooth sliding block having free wheels, known and not illustrated, for facilitating and checking the translation of the package 100.

[0020] Third containing means 26 can be provided for laterally supporting the packages 100 in correspondence of the first 2 and second 3 conveyor means.

[0021] The conveyor means third 4 and fourth 5 have a length greater than the longitudinal dimension of the package 100 to allow folding means, first 17 and second 18, such as known, for instance, rotating brackets or movable or fixed shaped arms, as illustrated in the enclosed figures, to refold the longitudinal flaps 103, 104 of the package 100, during its passage above the conveyor means respectively third 4 and fourth 5.

[0022] Downstream of the fourth conveyor means 5 can be provided transfer means 8 which output the package 100 from the machine 1 with edges 101, 102, 103, 104 refolded closed. Typically such transfer means 8 are of a taping machine that seals the package 100, applying a band of adhesive tape at least on the longitudinal flaps 103, 104.

[0023] The machine includes sensor means, known and not illustrated, fit to determine at least the position and the speed of the carrier means 23, 33 and the position of the extensible portions 12, 13 and the containing means 6, 16.

[0024] Computational and control electronic means are provided, connected to sensor means and fit to check the phase relationship between the conveyor means 2, 3, 4, 5, the containing means 6, 16 for the automatic operation of the machine.

[0025] The method for folding flaps of a package 100 using the machine above described includes the following phases:

- 5 - to translate the package 100 on first extensible conveyor means 2, in condition of minimum extension B of the first extensible portion 12, operating the respective carrier means 23;
- 10 - to move a second extensible portion 13 of the second conveyor means 3 in direction of the first conveyor means 2, from the condition of minimum extension B to the condition of maximum extension A near the first conveyor means 2, to match a front transversal flap 101 of the package 100, protruding over the first conveyor means 2, partially folded up downwardly, because of its own weight and of the natural withdrawal of the folding carried out on the carton;
- 15 - to maintain in movement the carrier means first 23 and second 33 of the respective conveyor means 2, 3 with continuous and constant advancement, to allow the translation of the package 100 and the simultaneous closing refolding of the front transversal flap 101 inside the package 100, up its supporting by means of the second conveyor means 3;
- 20 - to stop the second carrier means 33 and to move the second extensible portion 13 from the condition of maximum extension A till the rear transversal flap 102 protrudes and folds downwardly, in the space between the two extensible portions 12, 13;
- 25 - to move the first extensible portion 12 of the first conveyor means 2 in direction of the second conveyor means 3 beginning from the minimum extension condition B up to match the rear transversal flap 102, near the second conveyor means 3;
- 30 - to move the extensible portions 12, 13 with continuous and constant advancement in the same direction, till the conditions respectively of maximum extension A and minimum extension B, and simultaneously to move the carrier means 23, 33 in opposite direction, to refold inwardly the rear transversal flap 102;
- 35 - in correspondence of the minimum extension condition B of the second extensible portion 13, to reverse the motion direction of the carrier means 23, 33, in order to transfer the package 100 to the second conveyor means 3 and subsequently to the third conveyor means 4.

50 **[0026]** The method further provides:

- 55 - to move the third conveyor means 4, supporting the package 100 in association with the first containing means 6, to refold inwardly a first longitudinal flap 103 by first folding means 17;
- to move the fourth conveyor means 5, supporting the package 100 in association with the second containing means 16, to refold inwardly a second

longitudinal flap 104 by second folding means 18.

[0027] Particularly, with reference to the last two phases, the longitudinal flaps 103, 104, due to the partial support of the package 100 furnished by the conveyor means 4, 5, are free and can be refolded inside the box by the folding means 17, 18 suitably shaped, during the translation of the same package.

[0028] The method provides, during the movement of the third conveyor means 4, to move the first containing means 6, so centering and sideways supporting the package 100. Likewise the second containing means 16 are moved, to center and sideways support said package 100 when is arrived onto the fourth conveyor means 5.

[0029] When the package 100 is completely supported by the fourth conveyor means 5 and by the second containing means 16, the first containing means 6 can be re-positioned for adapting to the width of a new package 100 coming from the second conveyor means 3, allowing an increase of the machine speed.

[0030] It is important to underline that the folding method above described allows to easily and quickly re-fold the flaps of a package with an unidirectional motion, without withdrawals and therefore with a time optimization.

[0031] An advantage of the present invention is to furnish a machine and a method for folding edges of carton packages obtaining an elevated productivity, with a moving without withdrawals of the package.

[0032] Other advantage is to furnish a machine equipped with means of simple and effective moving, therefore reliable and also of economic realization and assemblage.

Claims

1. Machine for folding flaps of a package (100) **characterized in that** comprises at least extensible conveyor means, first (2) and second (3), aligned and provided with respective extensible portions, first (12) and second (13), mutually faced; said conveyor means (2, 3) supporting and moving said package (100) and each extensible portion (12, 13) being operable between two extreme conditions, respectively of maximum extension (A) and of minimum extension (B), to refold transversal flaps (101, 102) inwardly of the package (100).

2. Machine according to claim 1 **characterized in that** comprises conveyor means, third (4) and fourth (5), displaced downstream of the second conveyor means (3) and mutually parallel and staggered in the direction of longitudinal motion of the package (100).

3. Machine according to claim 2 **characterized in that**

the conveyor means, third (4) and fourth (5), have a width smaller than the second conveyor means (3).

4. Machine according to claim 2 **characterized in that** the conveyor means, third (4) and fourth (5), have a greater length than the longitudinal dimension of the package (100).

5. Machine according to claim 2 **characterized in that** comprises movable containing means, at least first (6) and second (16), positioned to the sides of the conveyor means respectively third (4) and fourth (5), and destined to center and sideways support the package (100) during its translation.

6. Machine according to claim 5 **characterized in that** the containing means (6) are self-centering and comprise, in correspondence of each side of the conveyor means (4, 5), motorized belt guides or smooth sliding block or free wheels, to facilitate the translation of the package (100).

7. Machine according to claim 1 **characterized in that** each extensible portion, first (12) and second (13), comprises respective carriage means first (20) and second (30), provided at least of free pulleys, respectively third (21), fourth (22) and seventh (31) and eighth (32); said carriage means (20, 30) being motorized for moving between the two extreme conditions (A, B).

8. Machine according to claim 7 **characterized in that** the extensible conveyor means, first (2) and second (3), respectively comprise carrier means, first (23) and second (33), and respectively first motorized pulley (24), second free pulley (25) and fifth motorized pulley (34), sixth free pulley (35); said carrier means (23, 33) enveloping to the respective motorized pulleys (24, 34) and free pulleys (21, 22, 25; 31, 32, 35).

9. Machine according to claim 1 **characterized in that** comprises folding means, first (17) and second (18), fit to refold longitudinal flaps first (103) and second (104) of the package (100), in correspondence of the conveyor means respectively third (4) and fourth (5).

10. Machine according to the preceding claims **characterized in that** comprises computational and checking electronic fit for checking the phase relationship at least among the conveyor means (2, 3, 4, 5), the containing means (6, 16) and the folding means.

11. Method for folding flaps of a package (100) using the machine according to any one of the preceding

claims **characterized in that** comprises the following phases:

- to translate the package (100) on first extensible conveyor means (2), in the condition of minimum extension (B) of the first extensible portion (12), operating the respective carrier means (23); 5
- to move a second extensible portion (13) of the second conveyor means (3) in direction of the first conveyor means (2), from the condition of minimum extension (B) to the condition of maximum extension (A), to match a front transversal flap (101) of the package (100), protruding over the first conveyor means (2), partially folded up downwardly; 10
- to maintain in movement the carrier means first (23) and second (33) of the conveyor means first (2) and second (3), to allow the translation of the package (100) and the simultaneous closing refolding of the front transversal flap (101) inside the package (100), up its supporting by means of the second conveyor means (3); 15
- to stop the second carrier means (33) and to move the second extensible portion (13) from the condition of maximum extension (A) till the rear transversal flap (102) protrudes and folds downwardly; 20
- to move the first extensible portion (12) of the first conveyor means (2) in direction of the second conveyor means (3) beginning from the minimum extension condition (B) up to match the rear transversal flap (102), near the second conveyor means (3); 25
- to move the extensible portions (12, 13) with continuous and constant advancement in the same direction, till the conditions respectively of maximum extension (A) and minimum extension (B), and simultaneously to move the carrier means (23, 33) in opposite direction, to refold inwardly the rear transversal flap (102); 30
- in correspondence of the minimum extension condition (B) of the second extensible portion (13), to reverse the motion direction of the carrier means (23, 33), in order to transfer the package (100) to the second conveyor means (3) and subsequently to the third conveyor means (4). 35

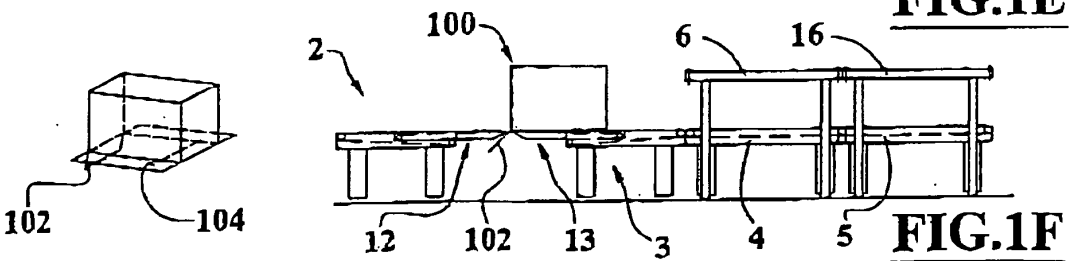
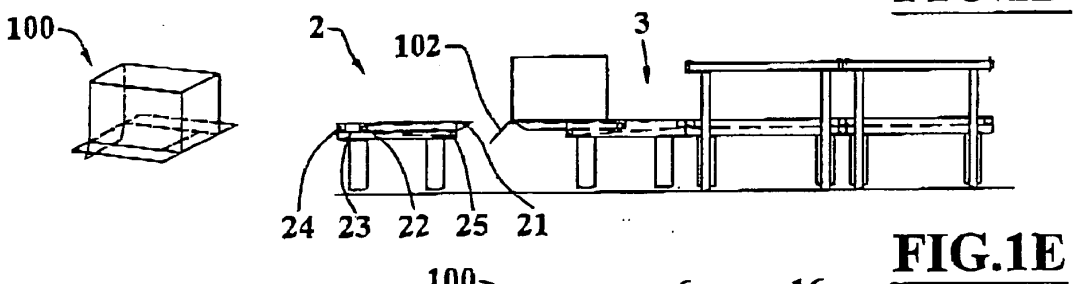
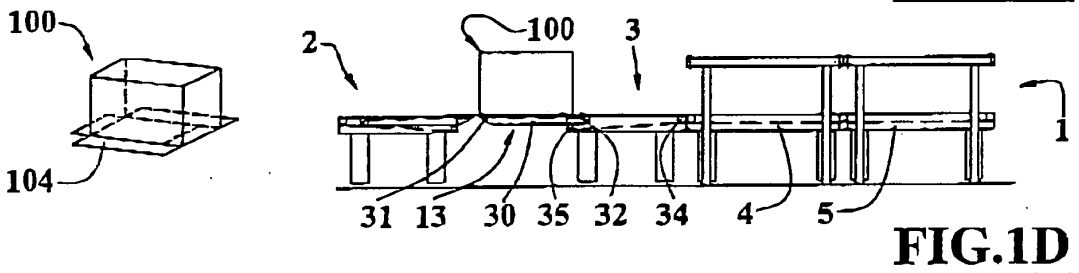
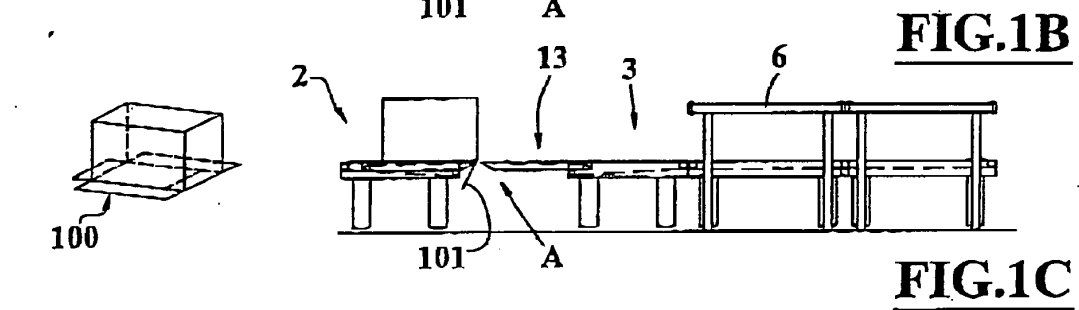
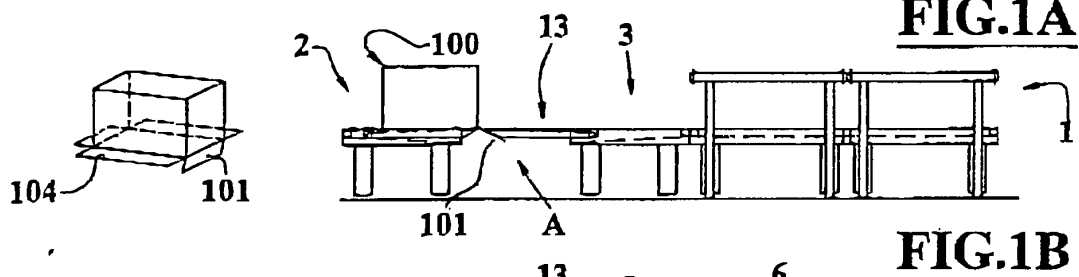
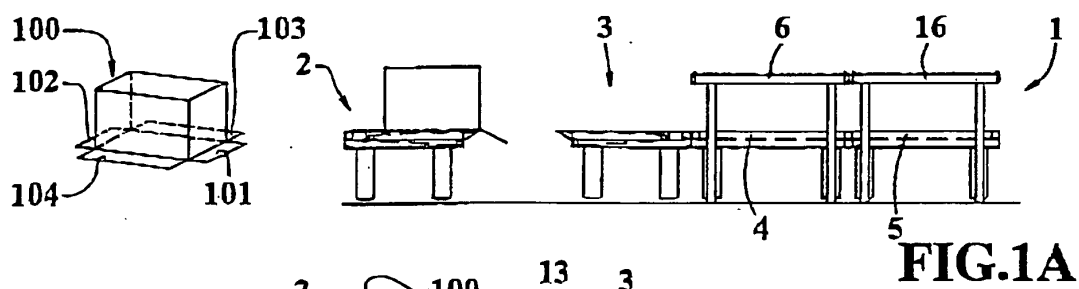
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12. Method according to claim 11 **characterized in that** includes:

- to move the third conveyor means (4), supporting the package (100) in association with the first containing means (6), to refold inwardly a first longitudinal flap (103) by first folding means (17); 55

- to move the fourth conveyor means (5), supporting the package (100) in association with the second containing means (16), to refold inwardly a second longitudinal flap (104) by second folding means (18).

13. Method according to claim 12 **characterized in that** provides, during the moving of the conveyor means, third (4) and fourth (5), to move the respective containing means first (6) and second (16), to center and to sideways support said package (100).



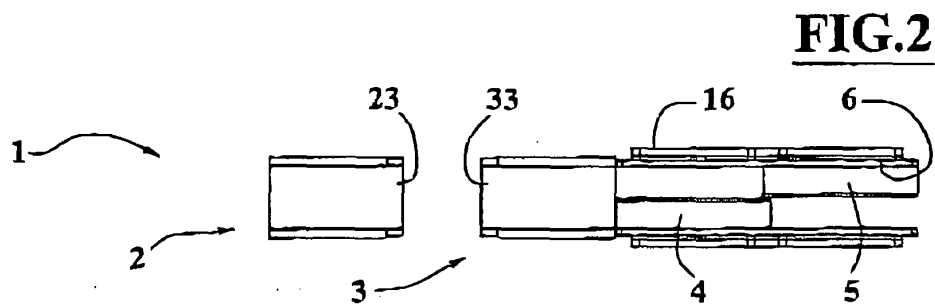
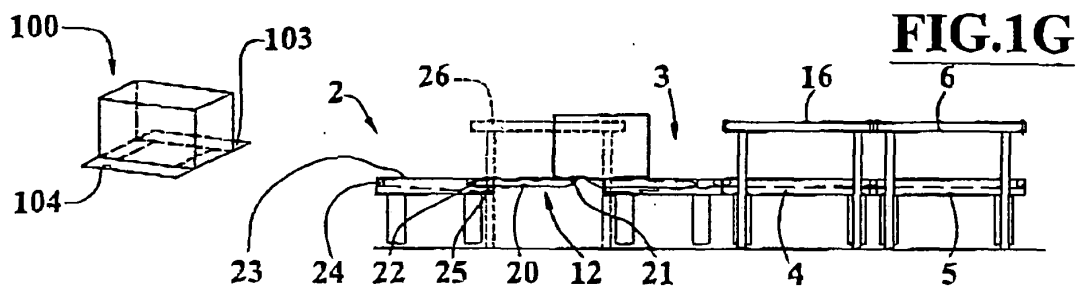


FIG. 3A

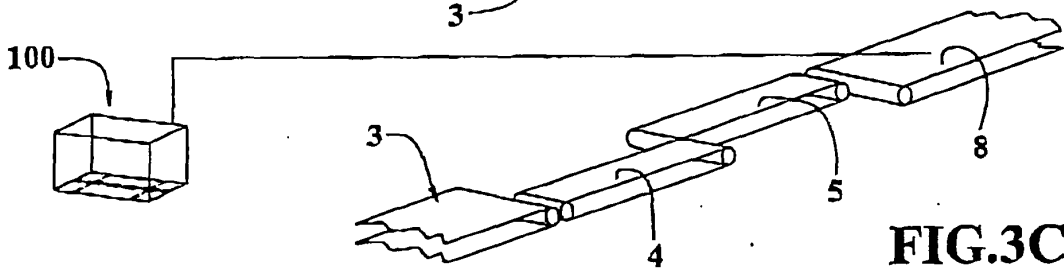
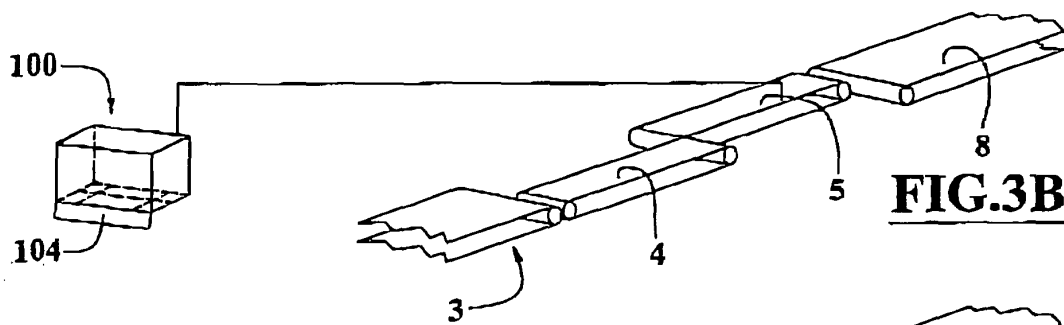
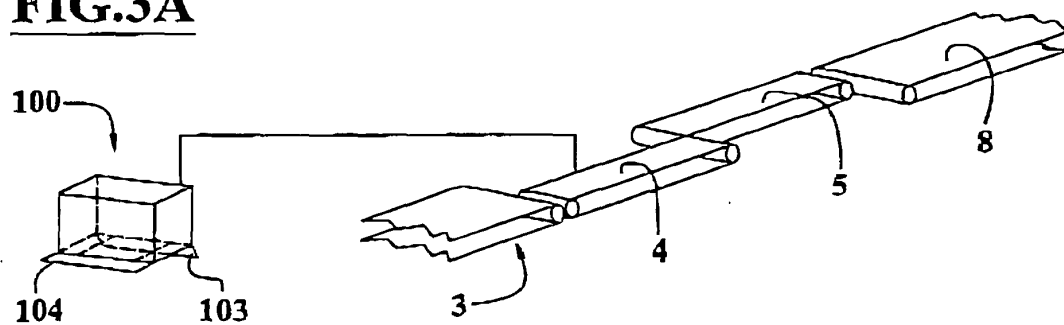


FIG.4A

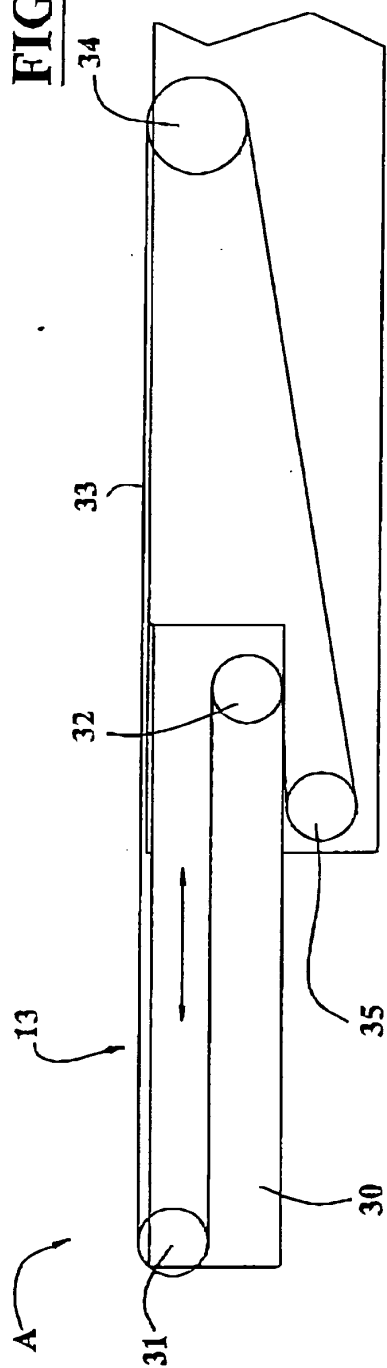
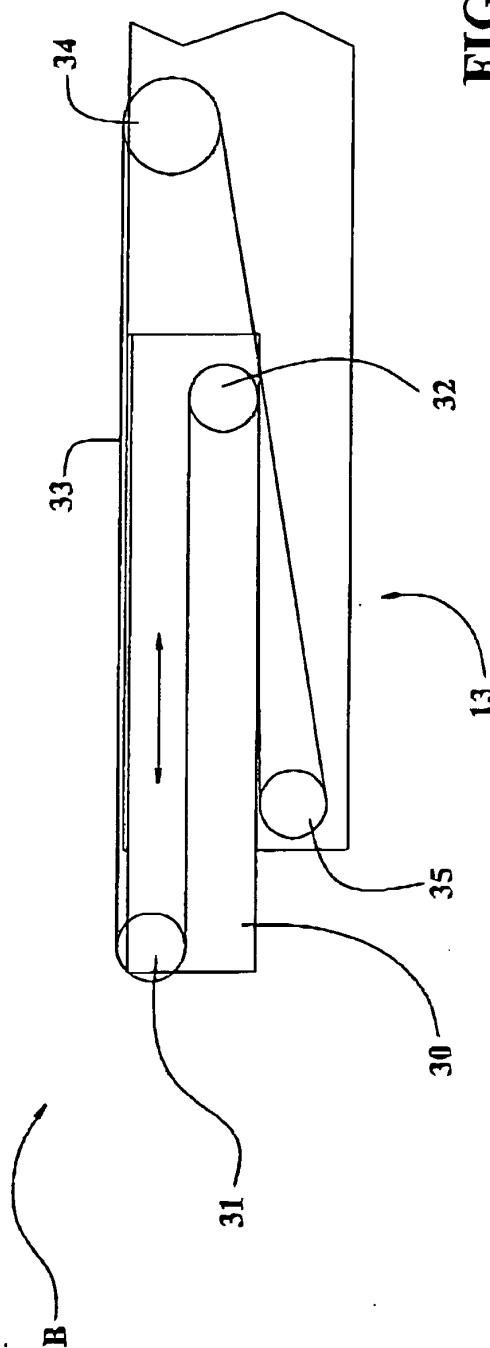


FIG.4B



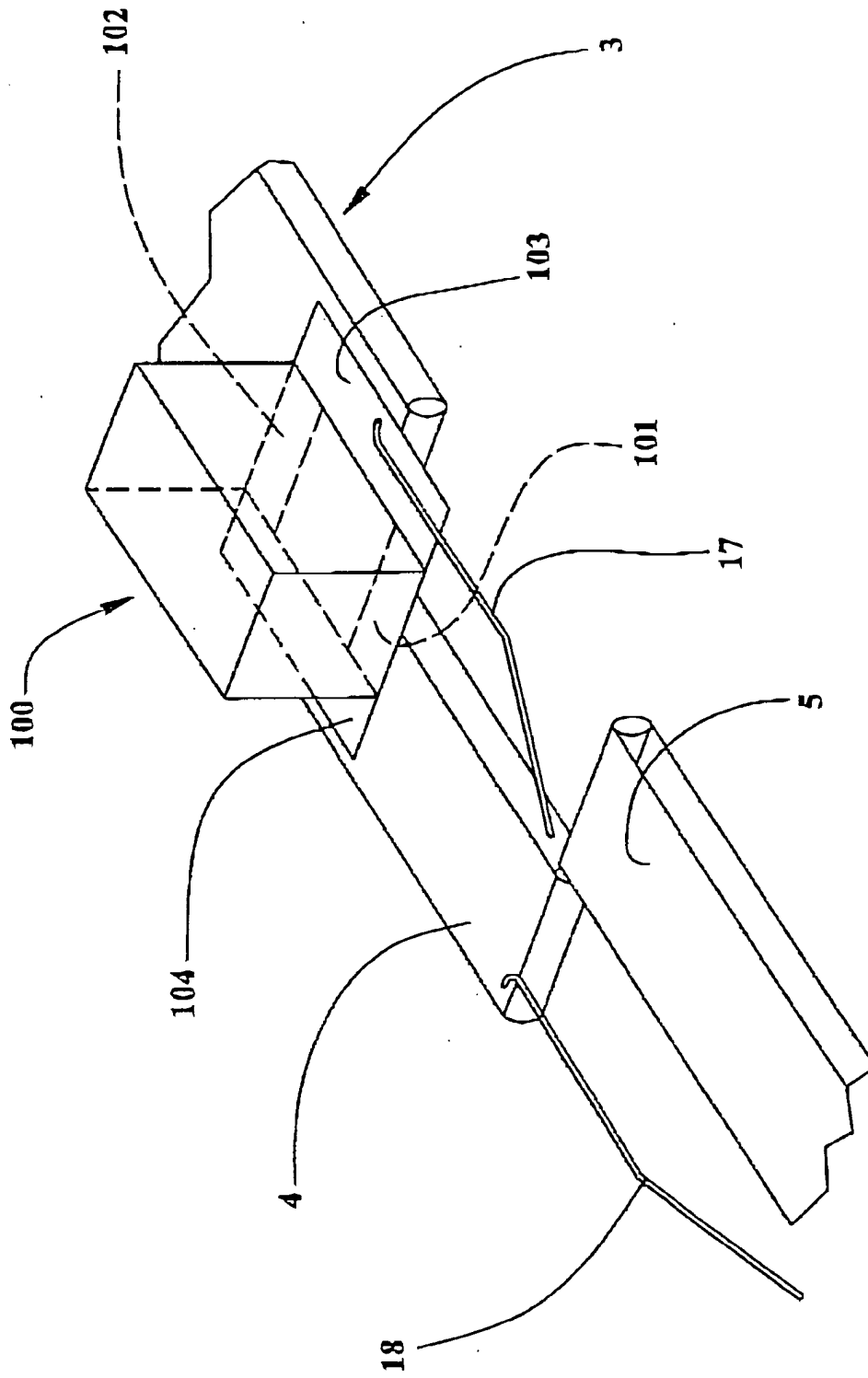


FIG.5

FIG.6

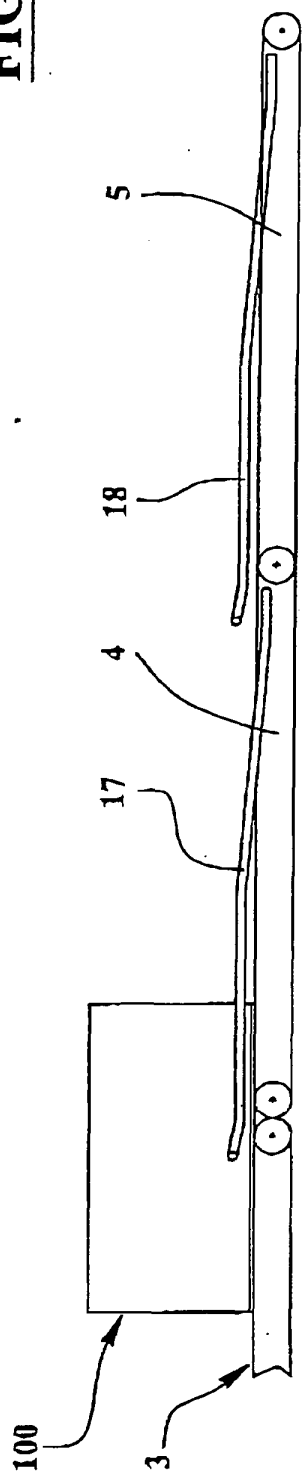
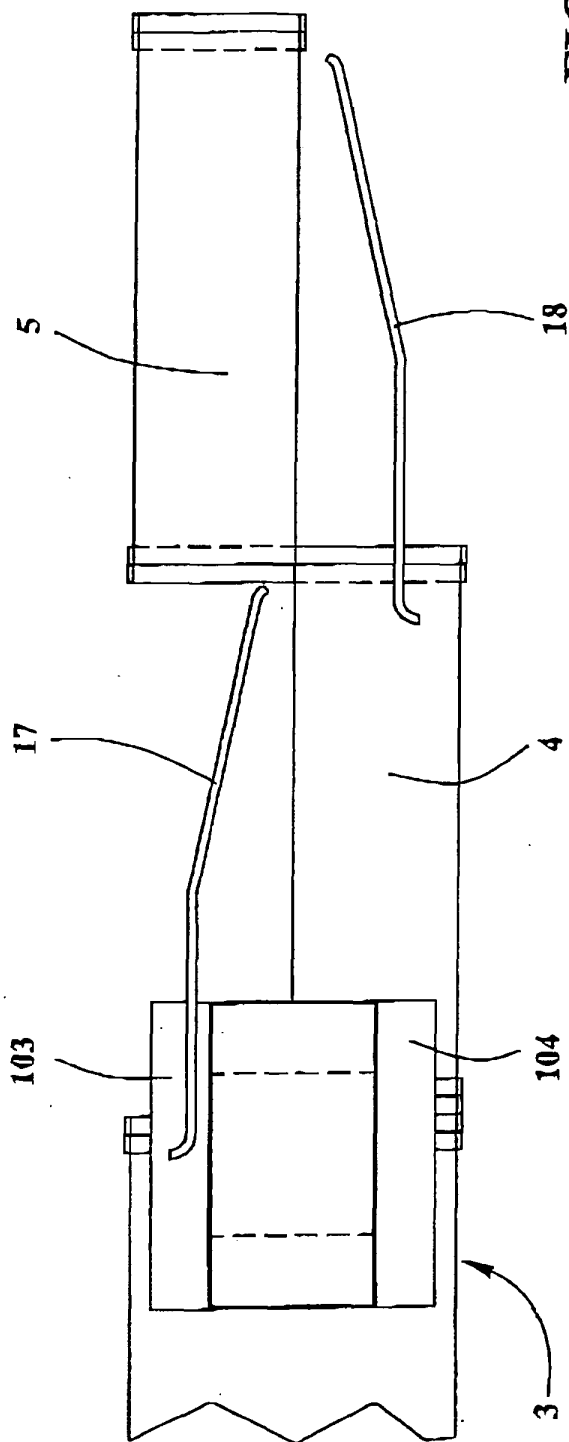


FIG.7





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 00 7763

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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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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