(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 913 328 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.05.1999 Bulletin 1999/18

(51) Int Cl.[6]: **B65B 19/20**

(21) Application number: **98830608.0**

(22) Date of filing: **13.10.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.10.1997 IT BO970621**

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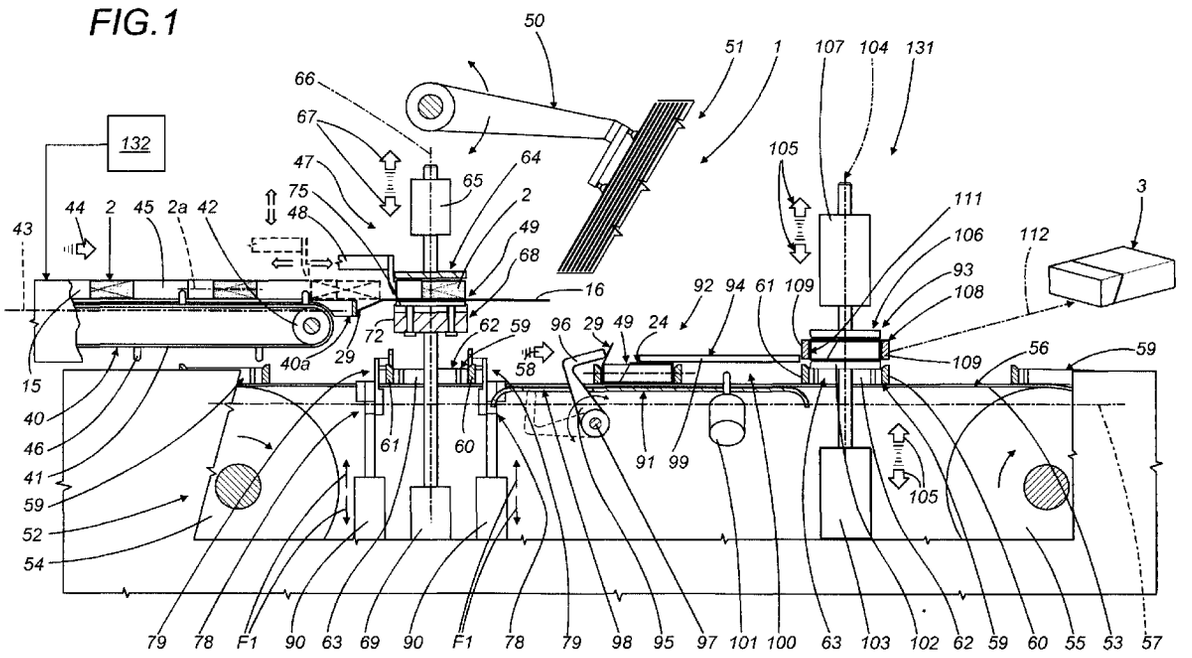
(54) A method and device for packaging products in rigid packets

(57) The method and device (1) for packaging products (2) in packets (3), according to which groups (2) of cigarettes are fed by a first conveyor (40;113), along a first path (43) and in a first direction (44), towards a processing station (47) located between the first conveyor (40;113) and a second conveyor (52) fitted with a plurality of equidistant dies (59); at the station (47) each group (2) meets a substantially rectangular blank (16), forming a set which is picked up by a counterpusher (68) and pusher (64), which make a first fold in the blank (16) about the relative group (2) and transfer the set (49) into a die (59) which makes a second fold in the blank (16); the folding of each blank (16) is completed by feeding each set (49) in a second direction (58) parallel with the longitudinal axis (16a) of the blank (16).

FIG.1



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Description

[0001] The present invention relates to a method for packaging products in rigid packets.

[0002] In particular, the present invention relates to a method for packaging preformed groups of long elements, in particular cigarettes, in rigid hinged-lid packets, to which the following description refers, although without limiting the general possibilities for application of the present invention.

[0003] Rigid hinged-lid cigarette packets usually have the shape of a rectangle parallelepiped and are divided into a lower container and a lid, both cup-shaped, the lid being hinged to a top open end of the container so that it can turn between a position in which it the container is open and a position in which it is closed.

[0004] Each packet is normally obtained from a substantially rectangular blank, whose longitudinal axis is longer than the transversal axis, and which has two preweakened longitudinal fold lines and a plurality of preweakened transversal lines, which between the afore-mentioned longitudinal lines define a front, end and back panel both for the container and the lid.

[0005] The known machines for packaging groups of cigarettes in rigid packets of the afore-mentioned type normally include a wrapper wheel rotating about a substantially horizontal axis, the edges of said wheel having a plurality of axial seats which, at a loading station for the wheel, pick up the said blanks and, at the same time, the said preformed groups of cigarettes, normally contained in a foil wrapper.

[0006] In accordance with a known packaging method, each of the blanks is positioned in the relative groove at a precise angle, so that its longitudinal axis lies parallel with the horizontal axis of rotation of the wrapper wheel; moreover, each blank is positioned in the respective seat in such a way that its front and end panels protrude on either side of the seats, and is fed along a substantially circular feed path and in a direction transversal to its longitudinal axis, through a series of folding stations, at which the blank is progressively folded about a group of cigarettes.

[0007] In particular, the front and end panel folds are made by fixed, helicoid ring folders, positioned on opposite sides of the said wheel and designed to gradually fold the front and end panels about the group of cigarettes as the blank is fed along the said circular path from the afore-mentioned loading station to an ejection station for the finished packets.

[0008] The above-mentioned method has disadvantages both in technical terms and in terms of the stability of the blanks as they are fed through the said series of folding stations.

[0009] In particular, the use of a wrapper wheel with fixed, helicoid folders on either side and axial seats in which the blanks are positioned at an angle such that their longitudinal axes are parallel with the axis of rotation of the wheel means that the wrapper wheel itself must be very large. Moreover, the front and end panel folding operations, effected by feeding each blank in a direction transversal to its longitudinal axis so that the said folders can operate by intercepting the panels in a direction transversal to the direction of folding, increases the possibility of deformations caused by torsion of the entire blank, and so reduces control of the position of the groups of cigarettes to be packaged. This necessitates the construction of fixed ring folders with a helicoid pitch that must increase gradually and smoothly, meaning that the said ring folders must have a large curvature radius; this increases the diameter of the wheel.

[0010] The object of the present invention is to provide a method for packaging products in rigid packets which overcomes the afore-mentioned disadvantages.

[0011] In accordance with the present invention, a method is provided for packaging products in rigid packets, each packet being obtained from a substantially rectangular blank with a given longitudinal axis which is longer than the transversal axis, the method characterised in that it includes stages involving the feeding of a succession of products along a first path and in a given first direction of feed to a first station for the meeting of each product with a relative blank; the feeding of a succession of blanks to the said first, meeting station, so as to juxtapose them, defining a set consisting of an individual product and the relative blank; partial folding of each blank about the product; completion of folding of each blank about the product, by feeding each set along a second path and in a given second direction of feed; the second direction of feed being parallel with the longitudinal axis of each blank.

[0012] The present invention also relates to a device for packaging products in rigid packets.

[0013] In accordance with the present invention, a device is made for packaging products in rigid packets, each packet being obtained from a substantially rectangular blank with a given longitudinal axis which is longer than the transversal axis, the device characterised in that it includes a first conveyor, designed to feed a succession of products along a first path in a given first direction of feed, to a first station at which each product meets a relative blank; pick-up means, designed to cyclically feed a succession of blanks to the first, meeting station, so as to juxtapose them, defining a set consisting of an individual product and the relative blank; the said first, meeting station being positioned between the first conveyor and a second, substantially horizontal conveyor, positioned at a different height to the first conveyor and having a plurality of first dies, and successively fed with a stepping movement to a second, folding station; the first station being alternatingly mobile, along a given middle path, located between the said first and second given paths, and in a given middle direction of feed which extends between the said given first and second directions of feed, between a first operating position in which the first station receives a blank and the relative group to form the said set, a middle position in which the

first station connects with the second, folding station, and a final operating position in which the first station passes through a first die, positioned so that it is aligned along the middle path and including two transversal walls and two longitudinal walls, said walls being parallel and opposite one another, defining a calibrated passage, thus effecting a succession of partial folds on each blank about the relative product; the second conveyor being designed to successively feed each set into the first die and along a second path in a given second direction of feed, to third and fourth folding stations, designed to complete the folding of each blank about the product, the second direction being parallel with the longitudinal axis of each blank.

[0014] The present invention is described below, with reference to the accompanying drawings, which illustrate several preferred embodiments, and in which:

- figure 1 is a schematic side view, with some parts in cross-section and other parts cut away to better illustrate others, of an embodiment of the device for packaging products in rigid packets disclosed;
- figure 2 is a scaled-down schematic plan view, with some parts cut away to better illustrate others, of the device in figure 1;
- figure 3 is a schematic side view, with some parts in cross-section and other parts cut away to better illustrate others, of a second embodiment of the device in figure 1;
- figure 3a is a scaled-up schematic side view of a detail in figure 3;
- figure 3b is a scaled-up schematic side view of another detail in figure 3;
- figure 4 is a schematic plan view, with some parts cut away to better illustrate others, of the device in figure 3;
- figure 5 is a schematic plan view, with some parts cut away to better illustrate others, of another embodiment of the device in figure 1;
- figure 6 is a schematic plan view, with some parts cut away to better illustrate others, of another embodiment of the device in figure 3;
- figure 7 is a perspective view of a succession of stages for folding a rigid packet about the relative product;
- figure 8 is a perspective view of a finished rigid packet; and
- figures 9a - 9e are schematic illustrations, with some parts in cross-section and other parts cut away to better illustrate others, of a detail in figures 1 and 3 in a succession of operating stages for the production of the packet seen in figure 7.

[0015] With reference to figure 1, the numeral 1 denotes as a whole a device for packaging products 2, in particular preformed groups 2 of cigarettes, in rigid packets 3, each of which, as better illustrated in figure 8, is substantially a rectangle parallelepiped and includes a lower container 4 and a lid 5, said lid being hinged to a top open end 6 of the container 4 so that it can turn between a position in which the container 4 is open and a position in which it is closed. The container 4 has a front 7, back 8, end 9 and two sides 10 and, similarly, the lid 5 has a front 11, back 12, end 13 and two sides 14.

[0016] The packet 3 also includes a U-shaped inner frame 15, which is secured to the internal surface of the front 7 and sides 10 of the container 4.

[0017] As illustrated in figure 7, each packet 3 is obtained from a blank 16 (figure 7a), substantially rectangular in shape and with a longitudinal axis 16a which is longer than the transversal axis, and having two pre-weakened longitudinal fold lines, labelled 17 and 18, and a plurality of pre-weakened transversal fold lines, labelled 19 to 23. Between the two longitudinal lines 17 and 18, the lines 19 to 23 define a plurality of panels, both for the container 4 and the lid 5.

[0018] More precisely, for the container 4, the lines 19 to 21 define a front panel 24 forming a front 7, an end panel 25 defining the end 9 and a rear panel 26 defining the back 8. Similarly, for the lid 5, lines 21 to 23 define a rear panel 27 forming the back 12, an end panel 28 defining the end 13 and a front panel 29 forming the front 11. The front panel 24 of the container 4 has two first opposite forward longitudinal side flaps 30, and the rear panel 26 has two second opposite rear longitudinal side flaps 31, each having first tabs 32 which reinforce the end 25, folded along the transversal line 20. Similarly, the front panel 29 of the lid 5 has two first opposite longitudinal forward flaps 33, and the rear panel 27 has two opposite longitudinal rear side flaps 34, each having second tabs 35 which reinforce the end panel 28, folded along the transversal line 22.

[0019] As shown in figure 7b, each preformed group 2 of cigarettes is contained in a wrapping material, usually foil, and has a front 36, back 37 two sides 38 and two ends 39.

[0020] With reference to figure 1, the device 1 constitutes a single packaging line 131 and includes a first, substantially horizontal conveyor 40, defined by a belt 41, closed in a loop around pulleys 42 (only one of which is illustrated in figure 1) and designed to feed a succession of preformed groups 2 of cigarettes along a first path 43 and in a substantially horizontal given first direction of feed 44, each group 2 of cigarettes being contained in a foil wrapper and having an inner frame 15.

[0021] As illustrated in figure 1, the inner frames 15 are fed by an inner frame feed unit 132, located near to and operating in conjunction with the first conveyor 40, to position the inner frames 15 on the preformed groups 2 of cigarettes in the known way.

[0022] With reference to figures 1 and 2, the groups 2 are fed so that they are all at the same angle and with their longitudinal axis 2a parallel with the direction of feed 44, and are kept aligned on the first conveyor 40 by two side conveyors 45, located on opposite sides of

the said conveyor 40 and above an upper conveying section of the belt 41. The outer surface of the belt 41 has a plurality of pusher protrusions 46 which are evenly distributed along the belt 41, so as to feed the groups 2 by a given step along the path 43 to a pusher arm 48.

[0023] The arm 48 is mobile with alternating motion along the path 43, to transfer the groups 2 from the conveyor 40 to a first station 47 for meeting and folding, at which each preformed group 2 of cigarettes meets a blank 16, to which it is juxtaposed (figure 7b) to define a set 49 consisting of an individual group 2 and the relative blank 16.

[0024] The blanks 16 are fed to the first station 47 by a pick-up arm 50, cyclically mobile between a position in which it picks up a blank 16 from a magazine 51, and a release position (not illustrated) in which it deposits the blank 16 in a stand-by position in which the blank 16 is substantially coplanar with the first conveyor 40, its longitudinal axis 16a (figures 1 and 7a) aligned with the said first direction 44, and has a panel 29a for reinforcing the lid 5 already folded so that it is in contact with the front panel 29, which rests against a stop 40a at the outfeed of the conveyor 40.

[0025] With reference to figures 1 and 2, the first station 47 is located between the first conveyor 40 and a second, substantially horizontal, conveyor 52, the latter being positioned at a height lower than that of the first conveyor 40. The second conveyor 52 is defined by a pair of adjacent belts 53, closed in a loop around respective pairs of adjacent first and second pulleys 54 and 55, the first pair of pulleys 54 being located directly below the first conveyor 40 and close to its out feed . The upper sections 56 of the belts 53 extend along a given second path 57, aligned with the said first path 43, and move with a stepping motion in a given second direction 58, substantially parallel with the said first direction 44.

[0026] As illustrated in figures 1 and 9a, the belts 53 support a plurality of first folding dies 59 which protrude and are evenly distributed along the belts 53. In particular, the dies 59 are distributed along the belts 53 with even spacing, calculated according to the spacing of the protrusions 46 along the belt 41 of the first conveyor 40; moreover, the two conveyors 40 and 52 are synchronised with one another and with the meeting station 47, so that when the pusher arm 48 juxtaposes a group 2 on the relative blank 16, a die 59 is vertically aligned with the station 47.

[0027] As illustrated in figures 1, 3 and 9a, each die 59 consists of a substantially rectangular frame which includes two folding walls 60 and 61, positioned so that they are transversal to the belts 53, and two longitudinal walls 62, which are supported by the internal longitudinal edges of the belts 53. The two folding walls 60 and 61 are supported at either end by the two belts 53 and, with reference to the direction of feed 58 of the second conveyor 52, the numeral 60 indicates the front wall and 61 the rear wall.

[0028] The two transversal walls 60 and 61 and the two longitudinal walls 62 of the die 59 define a calibrated passage 63, whose width, measured across the second path 57, is substantially equal to the distance between the internal edges of the two opposite belts 53.

[0029] As shown in figures 1, 9a and 9b, each die 59, when aligned with the station 47, is positioned next to a second, folding station 78, located along the given second path 57 and including two gripper folding heads 79, which are positioned and operate at the transversal wall 60 and, respectively, at the transversal wall 61 of the die 59 itself.

[0030] Figure 9a shows that each folding head 79 includes pairs of opposite jaws 80, L-shaped and defining two folding elements. The jaws 80 are positioned so that they are symmetrical with the given second path 57 and on opposite sides of the transversal walls 60 and 61, and are mounted on a side support 81, hinged to a support bracket 83 on a shaft 82.

[0031] Each jaw 80 includes an arm 84, one end of which is attached to the support 81, the other, free, end having a folder 85 positioned so that it is transversal to the arm 84. Each side support 81 has a projection 86, connected by a connecting rod 87 to a central support 88 which is supported by a shaft 89, the latter being moved by known drive means, schematically illustrated as a block 90 (figure 1), alternatingly and in a direction F1 substantially perpendicular to the second path 57, more precisely, as shown in figures 1, 3 and 9a - 9e, down so as to bring the jaws 80 together, and up in order to separate the jaws 80.

[0032] As illustrated in figures 1, 3, 7 and 9a - 9e, the meeting station 47 includes a first upper pusher 64, designed to rest against the front 36 of the group 2 of cigarettes and to move with an alternating motion, driven by known drive means represented by a block 65 (figure 1), along a given middle path 66 and in a given middle direction of feed 67 which is substantially vertical and perpendicular to the said first and second directions of feed 44 and 58, and a first lower counterpusher 68, positioned opposite to and aligned with the first pusher 64 along the middle path 66 and mobile with alternating motion in the same direction 67, driven by known drive means represented by a block 69, again in figure 1.

[0033] As is better illustrated in figures 3a, 3b and 9a - 9e, the counterpusher 68 includes a folder 70, which has a U-shaped cross-section and is defined by two opposite longitudinal walls 71 and a base 72, which combine to define a calibrated seat 73. The base 72 has four pins 74 which support and guide a support surface 75 for the said set 49 consisting of a blank 16 and preformed group 2 of cigarettes; the pins 74 can slide inside seats 76 made in the base 72, and allow the surface 75 to move between a raised position, in which the surface 75 is substantially coplanar with an upper free edge 71a of the walls 71, and a lowered position, in which the surface 75 is substantially in contact with the base 72 inside the calibrated seat 73. Each pin 74 is fitted with a spring 77 which operates between the surface 75 and base 72,

designed to keep the surface 75 raised in the said position in which the surface 75 is substantially coplanar with an upper free edge 71a of the walls 71.

[0034] In order to provide a complete description and to facilitate understanding of the description and operation of the device 1 for packaging preformed groups 2 of cigarettes in rigid packets 3, described in further detail below, the operation of the first, meeting station 47 is briefly described, starting with the configuration in which the blank 16 has already been deposited on the surface 75 of the counterpusher 68, the preformed group 2 of cigarettes has already been positioned on the blank 16 and a die 59 is standing by on the second path 57, vertically aligned with the first station 47 along the middle path 66 (figures 1, 3, 3a, 7b, 9a).

[0035] The pusher 64 begins its downstroke along the middle path 66, effecting a first step in direction 67, pushing the set 49 and surface 75 into the calibrated seat 73 of the counterpusher 68 until the surface 75 is in contact with the base 72, thus compressing the springs 77 fitted on the pins 74 which slide along the seats 76 made in the base 72 (figure 9b). On this first downstroke by the first pusher 64 in direction 67, the counterpusher 68 is stationary and the longitudinal walls 71 make a first partial fold in the blank 16 about the group 2. More precisely, as illustrated in figure 7c, the second rear longitudinal side flaps 31, the first reinforcing tabs 32, the second rear longitudinal side flaps 34 and second reinforcing tabs 35 are folded at right angles, folding them at the pre-weakened fold lines 17 and 18 until they make contact with the sides 38 of the group 2.

[0036] When this reciprocal position has been reached, the upper pusher 64 and lower counterpusher 68 move simultaneously, along the middle path 66 and in direction 67, towards the second conveyor 52 and go through the calibrated passage 63 of the die 59 (figures 9c - 9e).

[0037] As illustrated in figures 9d, 9e, during this transit stage, in which the set 49 is inserted in the die 59 and so forced to go through the calibrated passage 63, the transversal folding walls 60 and 61 effect a second partial folding operation on the blank 16. More precisely, the front wall 60 folds the end panel 25 of the container 4 at a right angle about the transversal fold line 20 and the rear wall 61 folds the end panel 28 of the lid 5 at a right angle about the transversal fold line 22, to obtain partial folding of the blank 16 about the preformed group 2, after which the blank 16 is substantially cup-shaped, as shown in figure 7e, in which the front panel 24 of the blank 16 for the container 4 of the packet 3 and the front panel 29 of the blank 16 for the lid 5 of the packet 3 are substantially perpendicular to the second conveyor 52.

[0038] As illustrated in figures 9b and 9c, simultaneous to and synchronised with the transit of the counterpusher 68 and set 49 through the calibrated passage 63 of the die 59, the two folding heads 79, by means of the respective folders 85, fold at right angles the first reinforcing tabs 32 for the second rear longitudinal side flaps 31, about a transversal fold line 20, until they are substantially in contact with the relative end 39 of the preformed group 2 and, similarly, fold at right angles the second reinforcing tabs 35 for the second rear longitudinal side flaps 34, about a transversal fold line 22, until they are substantially in contact with the relative end 39 of the preformed group 2, as illustrated in figure 7d.

[0039] With reference to the above, it must be emphasised that during the folding of the first reinforcing tabs 32, the second reinforcing tabs 35 and panels 25 and 28, a plurality of gumming devices, not illustrated since they are of the known type, apply a layer of adhesive on the internal surfaces of the panels 25 and 28 or on the surfaces of the tabs 32 and 35 designed to make contact with the relative panels 25 and 28.

[0040] As illustrated in figures 1 and 2 and with reference to the second direction 58, downstream of the folding station 78, the second conveyor 52 has a third station 92, which partially folds the blank 16, and a fourth station 93 to complete the folding of the blank 16, which then moves on along the second path 57. The second conveyor 52 also has a surface 91, positioned below the upper sections 56 of the belts 53 and extending along a section of the second path 57 from the second folding station 78 to the fourth, folding completion station 93, being designed to support the set 49 from below when, following the previous first and second stages for folding the blank 16 about the preformed group 2 of cigarettes, the set 49, its edges gripped by the die 59, is moved forward with the axis 16a of the blank 16 parallel with the second direction of feed 58 and along the second path 57, by the second conveyor 52, through the said third station 92 for partial folding and towards the fourth station 93 for completion of the folding of the blank 16 about the relative group 2.

[0041] The third folding station 92 includes a first, fixed folder 94 which, during operation, as the die 59 moves along the second path 57, makes contact with the front panel 24 of the blank 16 and folds it at right angles about the transversal fold line 19, so that it is substantially in contact with the front 36 of the preformed group 2 of cigarettes, and a second folder 95, which is "L" shaped and has a folding end 96. The folder 95 is keyed to a shaft 97 that moves it between two end positions, one being the home position (shown by the dashed line in figures 1 and 3), in which the folding end 96 is located below the surface 91 so that it does not interfere with the dies 59 as they move along the second path 57, and an operating position, in which the folder 95 protrudes from the surface 91 through a slot 98 in the surface 91 itself, and the folding end 96 follows the die 59, intercepting the front panel 29 so as to fold it at right angles about the transversal fold line 23 until it is substantially in contact with the front 36 of the preformed group 2 of cigarettes.

[0042] The first, fixed folder 94 consists of a plate 99 which is positioned opposite the surface 91 and on the

opposite side of the upper sections 56 of the belts 53 to the surface 91. The plate 99 is located higher than the surface 91, so that the two parts together form a folding channel 100 (figure 1), which extends from the mobile folder 95 almost to the fourth station 93. The height of the channel 100 is slightly greater than the thickness of the individual packets 3 measured across the respective sides 10, so that during the transfer of the individual sets 49 by the first dies 59, from the second, mobile folder 95 to the fourth folding station 93, the panels 24, 29, 26 and 27 of the blank 16 are held in contact with the front 36 and back 37 of the group 2.

[0043] Figures 1, 2, 3 and 4 show the third, folding station 92, which includes a pair of gumming devices 101 located on opposite sides of the belts 53, and designed to distribute a layer of adhesive directly on the internal surfaces of the first forward longitudinal side flaps 30 of the front panel 24 and the first forward longitudinal side flaps 33 of the front panel 29, which, as illustrated in figure 7g, following the third stage for partial folding of the blank 16, remain coplanar with the relative panels 24 and 29.

[0044] As illustrated in figures 1 and 3, the fourth station 93 for completion of the folding includes a second, lower, pusher 102, designed to move with alternating motion, driven by drive means of the known type, indicated schematically as a block 103, along a third path 104 and in a third direction of feed 105 which is substantially vertical and perpendicular with the said first and second directions of feed 44 and 58, and a second, upper, counterpusher 106 which is aligned with the second pusher 102 along the said third path 104 and moves with alternating motion in the said third direction of feed 105, driven by drive means 107 of the known type.

[0045] The fourth folding station 93 also includes a second die 108, positioned higher than the second conveyor 52 and vertically aligned, along the third path 104, with the said second pusher 102 and second counterpusher 106, with which the die 108 operates in order to complete the folding of the blank 16 about the preformed group 2 of cigarettes.

[0046] As illustrated in figures 1, 2, 3 and 4, the second dies 108 consist of a substantially rectangular rigid frame made of four walls, forming opposite, parallel pairs, the two transversal walls being transversal to the second path 57 and being labelled 109, the two longitudinal walls being parallel with the said path 57 and labelled 110.

[0047] The four walls 109, 110 form a calibrated passage 111 whose width and length are slightly greater than those of the packets 3.

[0048] As indicated in figures 1 and 2, the second pusher 102 and second counterpusher 106 grip the individual sets 49 in the dies 59 from opposite sides, being synchronised with one another and with the second conveyor 52 so that, during the stepping feed of the belts 53 along the second path 57 and each time a first die 59 is stopped so that it is vertically aligned with the second die 108, they move between a lowered position in which they grip an individual set 49 housed inside the respective die 59 (figure 3), and a raised position in which they force the individual set 49 through the calibrated passage 111 of the second die 108 (figure 1), so as to complete the folding of the blank 16 about the relative preformed group 2 of cigarettes and define the packet 3, as illustrated in figure 7h.

[0049] In operation, as indicated above and illustrated in figures 1, 2, 7 and 9a - 9e, the preformed groups 2 of cigarettes are fed, in an ordered fashion, already fitted with their inner frames 15, along the first path 43 and in the first direction of feed 44 by a first conveyor 40 to the first, meeting and folding station 47, where the pick-up arm 50 for blanks 16 cyclically positions a blank 16 on the surface 75 of the first counterpusher 68 and the pusher arm 48, synchronised with the pick-up arm 50 and first conveyor 40, cyclically juxtaposes a group 2 on the blank 16 to form a set 49, as shown in figure 7b.

[0050] According to figures 1 and 9b, as soon as the arm is retracted the first pusher 64, driven by respective drive means 65, pushes the set 49 in direction 67 and towards the first counterpusher 68, which remains stationary inside the calibrated seat 73 of the folder 70. On the downstroke of the pusher 64, the longitudinal walls 71 of the folder 70 fold at right angles the second rear longitudinal side flaps 31, the first reinforcing tabs 32, the second rear longitudinal side flaps 34 and the second reinforcing tabs 35, folding them about the preweakened longitudinal fold lines 17 until they are substantially in contact with the sides 38 of the group 2. When the surface 75 reaches the base 72 of the folder 70 (figure 9b), the lower counterpusher 68, driven by respective drive means 69, begins to move, simultaneous with the pusher 64, along the middle path 66 and towards the second conveyor 52, and the counterpusher 68 begins moving through the calibrated passage 63 of the die 59 (figure 9c), which was previously vertically aligned with the station 47 by the second conveyor 52 and is standing-by to receive the said set 49.

[0051] In the moment before the counterpusher 68 begins moving through the calibrated passage 63 of the die 59, the two folding heads 79 are activated and, to be precise, each shaft 89 begins its downstroke, shown by arrow F2 in figure 9b, driven by respective drive means 90. Each shaft 89 draws the respective central support 88 downwards, and by means of the two connecting rods 87 and two projections 86, the said central shaft causes the two side supports 81 to rotate about the shafts 82 and relative to brackets 83, said side supports causing the two jaws 80 to rotate in the direction shown by arrow F3 in figure 9b as they move towards one another; by means of the folders 85, the jaws 80 fold at right angles the first reinforcing tabs 32 of the second rear longitudinal side flaps 31 about a transversal fold line 20 until they are substantially in contact with the relative end 39 of the preformed group 2 and, similarly, fold at right angles the reinforcing tabs 35 of the

second rear longitudinal side flaps 34 about a transversal fold line 22 until they are substantially in contact with the relative end 39 of the preformed group 2 (figure 9c), to obtain partial folding of the blank 16 about the group 2, as illustrated in figure 7d.

[0052] As the counterpusher 68 moves through the calibrated passage 63 of the die 59, the shafts 89 begin their upstroke in the direction shown by arrow F4 in figure 9e, and the jaws 80 move away from one another in the direction shown by arrow F5 in figure 9e, whilst the said transversal folding walls 60 and 61 simultaneously effect a second partial folding of the blank 16, that is to say, the front wall 60 folds at right angles the end panel 25 of the container 4 about the transversal fold line 20 and the rear wall 61 folds at right angles the end panel 28 of the lid 5 about the transversal fold line 22, to obtain partial "cup-shaped" folding of the blank 16 about the preformed group 2, as shown in figure 7e, in which the front panel 24 of the blank 16 for the container 4 of the packet 3 and the front panel 29 of the blank 16 for the lid 5 of the packet 3 are substantially perpendicular to the second conveyor 52. At this point the pusher 64 stops and the counterpusher 68 continues its downstroke by a short length, sufficient to bring the edges 71a of the longitudinal walls 71 of the folder 70 to the same level as the belts 53, so that they do not interfere with the subsequent forward movement of the die 59.

[0053] As the counterpusher 68 moves down, the surface 75, driven by springs 77, moves away from the base 72 of the folder 70 and remains in its previous position, allowing the set 49 to remain coplanar with the belts 53 and support surface 91. When the jaws 80 have moved away, the pusher 64 moves up again in direction 67, thus moving away from the set 49, as shown in figure 9e.

[0054] Upon completion of the first partial folding stage for the blank 16, the second conveyor 52 begins moving in the second direction 58 again and, by means of the first die 59, transfers the set 49, feeding it along the second path 57 and in the second direction 58 which is parallel with the said longitudinal axis 16a of each blank 16, towards the third folding station 92 and the fourth station 93 for completion of folding.

[0055] During the transfer of the die 59 from the second station 78 to the third station 92, the set 49 slides on the surface 91 and, as illustrated in figure 1, passes the second folder 95 located in its home position and encounters the first fixed, folder 94 which, by means of the folding plate 99, intercepts the front panel 24 of the blank, for the container 4 of the packet 3 and, as the set 49 is fed along the folding channel 100, folds the panel 24 at right angles about the transversal fold line, as illustrated in figure 7f.

[0056] Before the set 49 is completely inside the channel 100, and as soon as the die 59 has passed the second folder 95, the shaft 97 turns the second folder 95 to its operating position; with its folding end 96, the said second folder 95 follows the set 49 at a speed greater than that of the forward movement of the die 59, intercepting the front panel 29 for the lid 5 of the packet 3, folding it at right angles about the transversal fold line 23, as shown in figure 7g. The set 49 continues to move along the folding channel 100 with the blank 16 almost completely folded about the relative group 2, with the exception of the first forward longitudinal side flaps 30, which are substantially coplanar with the panel 24 and the first forward longitudinal side flaps 33, which are substantially coplanar with the panel 29. When the die 59 which houses the set 49 approaches the fourth and last folding station 93, the second conveyor 52 stops, vertically aligning the die 59 with the second die 108 along the third path 104; at this point, the second, lower, pusher 102 and the second, upper, counterpusher 106, driven by respective drive means 103 and 107, move in the third direction 105, towards one another, and grip the set 49.

[0057] When this pick-up operation is complete, the synchronised pusher 102 and counterpusher 106 move simultaneously upwards in the said third direction 105, transferring the set 49 into the calibrated passage 111 of the second die 108 (figure 1), where the longitudinal walls 108 of the die 108 (figure 2) intercept the flaps 30 and 33 of the blank 16 and fold them at right angles about the respective fold lines 17 and 18, bringing them into contact with the respective second rear longitudinal side flaps 31 and 34.

[0058] At this point the blank 16 is completely folded about the relative preformed group 2 of cigarettes and the now finished packet 3 is picked up by suitable pick-up and transfer means (not illustrated) and transferred along a final path 112 towards another station or machine, not illustrated, for example, so that the packet 3 can be wrapped in cellophane.

[0059] Obviously, the operating sequence of the device 1 described above is repeated cyclically for each group 2 fed by the first conveyor 40 to the first, meeting and folding station 47.

[0060] In the embodiment shown in figures 3 and 4, which refer to a single packaging line 131, the conveyor 40 is substituted with a substantially horizontal conveyor 113, formed by a belt 114 which is closed in a loop around pulleys 115 (only one of which is illustrated in figure 3), and designed to feed a succession of preformed groups 2 of cigarettes in foil wrappers along the first path 43 and in the first direction 44. The groups 2 are kept aligned on the conveyor 113 by two side conveyors 116, located on opposite sides of the conveyor 113, and are fed in an ordered fashion, by a given step, and substantially in contact with one another, to a pick-up device 117 which is synchronised with the conveyor 113 to cyclically pick up the individual groups 2 and feed them to a transfer device 118, again synchronised, located between the conveyor 113 and the said meeting and folding station 47.

[0061] The transfer device 118 includes a carousel 119 which turns with a stepping motion, driven in an anti-

clockwise direction in figures 3 and 4, by known means which are not illustrated, about a substantially vertical axis 120. The carousel 119 has a plurality of radial through-seats 121, designed to house and support the individual groups 2 which are cyclically picked up from the conveyor 113 and inserted in the respective seats 121 by the pick-up device 117.

[0062] The pick-up device 117 includes a recovery element 122, positioned at the outfeed of the conveyor 113 and having a through-seat 123 designed to house the groups 2 which arrive from the conveyor 113. The through-seat 123 is centred so that it is vertically aligned, along a given transfer path 126, with the through-seats 121 of the carousel 119 which, in operation, rotate cyclically at the outfeed of the conveyor 113. As illustrated in figure 3, the device 117 also includes a lower pusher 124 and a counterpusher 125, which are synchronised with the conveyor 113 and carousel 119, are aligned with and opposite one another and operate together to grip the opposite sides of the individual groups 2 housed in the seat 123 and transfer them to the relative seats 121 of the carousel 119. In particular, the pusher 124 moves alternatingly along the path 126 and in a direction 127 between a position in which it is lowered beneath the seat 123 of the recovery element 122 (illustrated by the dashed line in figure 3), in which the pusher 124 receives and supports the groups 2 arriving from the conveyor 113 and stands by for the arrival of the counterpusher 125, which moves along the same path 126 and in the same direction 127, towards the pusher 124 to grip the groups 2 on opposite sides, and a raised position in which both the pusher 124 and counterpusher 125 position and release the group 2 in the respective seat 121 of the carousel 119.

[0063] As shown in figure 4, the carousel 119 moves with a stepping motion, rotating about its axis 120 so that it successively brings all of the seats 121 to a loading position, which sees it connected to the pick-up device, and in which the pick-up device 117 is aligned with the pusher 124 and counterpusher 125 to receive a preformed group 2 of cigarettes, and a release position, in which the pick-up device 117 is aligned with the meeting and folding station 47 and releases the group 2 to the counterpusher 68 and pusher 64. In particular, during the rotary stepping movement of the carousel 119 between the said two positions, for loading and release, the seats 121, which house a group 2, are brought to intermediate positions which connect them with a conveyor 128 of the known type, synchronised with the carousel and designed to cyclically feed the inner frames 15 to the groups 2, and connected with a conveyor 129, also of the known type and synchronised with the carousel 119 and designed to feed any coupons 130 to the groups 2. Both the conveyor 128 and the conveyor 129 have means (not illustrated) which pick up and position the inner frames 15 and coupons 130 on the groups 2.

[0064] From the meeting and folding station 47, the device 1 illustrated in figures 3 and 4 has the same structure and operation as the device 1 in the embodiment illustrated in figures 1 and 2, therefore, the description is omitted.

[0065] With reference to the above, and with reference to figures 3 and 4, it should be noticed that, as the carousel 119 transfers the preformed groups 2 of cigarettes from the conveyor 113 to the station 47, the groups 2 are turned through 180 degrees in their plane relative to the position in which they are fed along the first conveyor 113. It is for this reason that, at the first station 47, the groups 2 meet the relative blank 16 with the inner frames 15 fitted in a position specular to that in the embodiment illustrated in figures 1 and 2 and, as a result, the blanks 16 are also fed by the arm 50 already turned through 180° in their plane.

[0066] Thus, as illustrated in figures 3 and 4, the sets 49 are fed along the second path 57 and in the direction 58, with the panels and flaps of the blank 16 for the lid 5 of the packet 3 facing forward. This does not create any kind of change relative to the embodiment illustrated in figures 1 and 2, in which the sets 49 are fed along the second path 57 and in the direction 58, with the panels and flaps of the blank 16 for the lid 5 of the packet 3 facing backward; the only difference derives from the fact that the folding end 96 of the second, mobile folder 95 folds the front panel 24 for the container 4 of the packet 3 and the folding plate 99 on the first, fixed folder 94 folds the front panel 29 for the lid 5 of the packet 3 and, similarly, the rear wall 61 of the die 59 folds at right angles the end panel 25 of the container 4 about the transversal fold line 20 and the front wall 60 folds at right angles the end panel 28 of the lid 5 about the transversal fold line 22.

[0067] In operation, as illustrated in figures 3 and 4, the groups 2, arranged with their longitudinal axis 2a parallel with the direction 44 and aligned with one another, are fed in an ordered succession and in contact with one another to the pick-up device 117; during this feed stage, the groups 2 remain inside the seat 123 of the recovery element 122, resting on the third pusher 124, which is in the receiving position (illustrated by the dashed line in figure 3) and the carousel 119 is positioned so that one of its seats 121 is vertically aligned with the seat 123 along the fourth path 126.

[0068] The pusher 124 and counterpusher 125 (the counterpusher 125 moves towards the pusher 124, passing through the seat 121) pick up and transfer the group 2 to the seat 121 of the carousel 119, then move away again. As a result, the carousel 119 rotates with a stepping motion about its axis 120, transferring the group 2 to the station 47, stopping each time so that the seat 121 which houses the group 2 is aligned with the conveyor 128, where the inner frame 15 is fed and attached to the group 2 and, respectively, with the conveyor 129, where any coupons 130 are fed and applied to the group 2. The above-mentioned operations are repeated cyclically for each group 2, the group 2 feed by the conveyor 113 having to be synchronised with the

pick-up device 117, the transfer device 118 and the station 47.

[0069] From the first station 47, the functioning of the device 1 does not differ from that described relative to the embodiment illustrated in figures 1 and 2, and so is not described.

[0070] Finally, in the embodiments illustrated in figures 5 and 6, the device 1 envisages doubling of the said first, single packaging line 131 with two individual lines 131a and 131b, arranged and operating in a parallel fashion. In particular, in the embodiment illustrated in figure 6, the carousel 119 has pairs of seats 121, although the structure and functioning of the devices 1 do not differ from those described with reference to single-line 131 packaging devices.

Claims

1. A method for packaging products in rigid packets, each packet (3) being obtained from a substantially rectangular blank (16) whose longitudinal axis (16a) is longer than the transversal axis, the method being characterised in that it includes stages involving the feeding of a succession of products (2) along a first path (43) and in a first given direction of feed (44) to a first station (47) where each product (2) meets a relative blank (16); the feeding of a succession of blanks (16) to the said first, meeting station (47), juxtaposing them and defining a set (49) consisting of an individual product (2) and the relative blank (16); partial folding of each blank (16) about the product (2); completion of folding of each blank (16) about the product (2), by feeding each set (49) along a second path (57) and in a given second direction of feed (58); the second direction of feed (58) being parallel with the longitudinal axis (16a) of each blank (16).

2. The method for packaging products in rigid packets, the products consisting of groups (2) of long elements, in particular cigarettes, and the packets (3) being of the type with a hinged lid (5), each packet (3) having the shape of a rectangle parallelepiped and including a container (4) and a lid (5), the latter being hinged to a top open end (6) of the container (4) and the packet being obtained from a substantially rectangular blank (16), whose longitudinal axis (16a) is longer than the transversal axis, and having two pre-weakened longitudinal fold lines (17,18) and a plurality of pre-weakened transversal fold lines (19-23), which between the afore-mentioned longitudinal lines (17,18) define a front (24,29), end (25,28) and back panel (26,27) both for the container (4) and the lid (5); each front panel (24,29) having two first opposite forward longitudinal side flaps (30,33); each back panel (26,27) having two second opposite rear longitudinal side flaps (31,34); each second opposite rear longitudinal side flap (31) of the back panel (26) of the container (4) having first reinforcing tabs (32) which reinforce the end panel (25) of the container (4) and each second opposite rear longitudinal side flap (34) of the back panel (27) of the lid (5) having second reinforcing tabs (35) which reinforce the end panel (28) of the lid (5); the method being characterised in that it includes stages for feeding a succession of preformed groups (2) of long elements in wrappers along a first path (43) and in a given first direction of feed (44) to a first station (47) where each group (2) meets a relative blank (16); feeding of a succession of blanks (16) to the said first, meeting station (47), juxtaposing them and defining a set (49) consisting of an individual preformed group (2) and the relative blank (16), each individual preformed group (2) being in contact with the said back panels (26,27) of the blank (16); partial folding of each blank (16) about the preformed group (2); completion of folding of each blank (16) about the preformed group (2), by feeding each set (49) along a second path (57) and in a given second direction of feed (58); the second direction of feed (58) being parallel with the longitudinal axis (16a) of each blank (16).

3. The method as described in claim 1 or 2, in which each product (2) has a front (36), back (37) two sides (38) and two ends (39) and each packet (3) has the shape of a rectangle parallelepiped, including a container (4) and a lid (5), the latter being hinged to a top open end (6) of the container (4) and each blank having two pre-weakened longitudinal fold lines (17,18) and a plurality of pre-weakened transversal fold lines (19-23), which between the afore-mentioned longitudinal lines (17,18) define a front (24,29), end (25,28) and back panel (26,27) both for the container (4) and the lid (5); each front panel (24,29) having two first opposite forward longitudinal side flaps (30,33); each back panel (26,27) having two second opposite rear longitudinal side flaps (31,34); each second opposite rear longitudinal side flap (31) of the back panel (26) of the container (4) having first reinforcing tabs (32) which reinforce the end panel (25) of the container (4) and each second opposite rear longitudinal side flap (34) of the back panel (27) of the lid (5) having second reinforcing tabs (35) which reinforce the end panel (28) of the lid (5); characterised in that it includes, relative to the partial folding of each blank (16), sub-stages for folding at right angles and about the said pre-weakened longitudinal fold lines (17,18) each second opposite rear longitudinal side flap (31,34) until they make contact with the sides (38) of the said group (2); folding at right angles and towards the respective ends (39) of the group (2) of each first reinforcing tab (32) for the end (25) of the container (4) and each second reinforcing tab (35)

for the end (28) of the lid (5); folding at right angles and about the pre-weakened transversal fold lines (20,22) of each end panel (25,28) of the container (4) and lid (5) of the packet (3); and characterised in that, relative to the stage for completing the folding of each blank (16), it includes a stage for feeding each set (49) previously defined along the given second path (57) and in the given second direction (58), the front panels (24,29) of the container (4) and lid (5) being substantially perpendicular to the second direction of feed (58).

4. The method as described in claim 3, characterised in that, relative to the stage for the completion of folding of each blank (16) and during the feeding of the set (49) along the given second path (57) and in the given second direction (58), it includes sub-stages for folding at right angles and about respective pre-weakened transversal lines (19,23) of each front panel (24,29) for the container (4) and lid (5), until they are substantially parallel with each back panel (26,27); and folding at right angles and about respective pre-weakened longitudinal fold lines (17,18) of each first opposite forward longitudinal side flap (30,33) of each front panel (24,29) for the container (4) and lid (5), until they are substantially overlapping the said second opposite rear longitudinal side flaps (31,34).

5. The method as described in claim 4, characterised in that, relative to the stage for the completion of folding of each blank (16), the sub-stage for the folding at right angles of each first opposite forward longitudinal side flap (30,33) of each front panel (24,29) is effected before the sub-stage for folding at right angles about the said pre-weakened transversal lines (19,23) of each front panel (24,29) and by feeding each set (49) previously defined, along a third path (104) and in a given third direction of feed (105), being angled substantially perpendicular to the said given second direction of feed (58).

6. The method as described in claim 3, characterised in that the said partial folding stage for each blank (16), including the sub-stages, is effected by feeding each set (49) along a given middle path (66), located between the said given first (43) and second (57) paths, and in a given middle direction of feed (67) which extends between the said given first (44) and second (58) directions of feed.

7. The method as described in claim 3, characterised in that the said partial folding stage for each blank (16) is effected when the set (49) is inside the first, meeting station (47), said station being positioned between a first conveyor (40;113), this being designed to feed the groups (2) along the first path (43) and in the first direction (44), and a second conveyor (52), having a plurality of first folding dies (59), and being designed to move the first dies (59) with a stepping motion along a second path (57) and in a second direction of feed (58) to a second, folding station (78); the first station (47) being alternatingly mobile, along a given middle path (66), located between the said given first (43) and second (57) paths, and in a given middle direction of feed (67) extending between the said given first (44) and second (58) directions of feed, between a first operating position in which the first station (47) receives a blank (16) and the relative group (2), thus forming the said set (49), a middle position in which the first station (47) connects with the second, folding station (78), and a final operating position in which the first station (47) passes through a first die (59), positioned so that it is aligned along the middle path (66) and including two transversal walls (60,61) and two longitudinal walls (62), said walls being parallel and opposite one another, defining a calibrated passage (63).

8. The method as described in claim 7, characterised in that the first, meeting station (47) includes a first pusher (64) and a first counterpusher (68), the latter being positioned opposite and aligned with the first pusher (64) along the middle path (66), said first pusher (64) and first counterpusher (68) being designed to grip the set (49) and being mobile with alternating motion in the said middle direction (67), moving both towards and away from one another, and towards the folding die (59) on a forward and return stroke; the counterpusher (68) including a folder (70), said folder having a U-shaped cross-section and being defined by two opposite, longitudinal walls (71) and a base (72), together defining a calibrated seat (73); the base (72) having respective support and guide means (74,77) for a support surface (75) for the set (49); the surface (75) being mobile, driven by the first pusher (64) when it moves towards the first counterpusher (68), between a raised position, in which the surface (75) is substantially coplanar with an upper free edge (71a) of the walls (71), and a lowered position, in which the surface (75) is substantially in contact with the base (72) and with the set inside the calibrated seat (73); and the said sub-stage for folding at right angles of each second opposite rear longitudinal side flap (31,34) being obtained, by means of the longitudinal walls (71), during insertion of the set (49) inside the calibrated seat (73).

9. The method as described in claim 7, characterised in that the second, folding station (78) is located on the given second path (57) and includes two gripper folding heads (79), these being positioned at the die (59); each folding head (79) including respective pairs of opposite jaws (80), these being L-shaped

and positioned symmetrically relative to the given second path (57) and on opposite sides of the transversal walls (60) and, respectively, (61) of the die (59); each pair of jaws (80) having folders (85) and being able to move towards and away from the set (49); the sub-stage for folding at right angles and towards the respective ends (39) of the group (2) of each reinforcing tab (32) of the end panel (25) of the container (4) and each second reinforcing tab (35) of the end panel of the lid (5), being obtained by the respective folders (85) as the two jaws (80) move towards one another; and the sub-stage for folding at right angles of each end panel (25,28) for the container (4) and lid (5) of the packet (3), being obtained by the walls (61,60) as the first counterpusher (68) moves through the relative die (59).

10. The method as described in claim 3 or 4, characterised in that the said stage for completing the folding of each blank (16) is effected when the set (49) has been inserted in the relative die (59) and fed by the second conveyor (52) along the second path (57) and in the second direction (58), towards a third, folding station (92) and a fourth, folding completion station (93); the third, folding station (92) including a first, fixed folder (94), being designed to make contact with the front panel (24) of the blank (16) as the die (59) moves forward, folding the said panel at right angles about the transversal fold line (19) until it is substantially in contact with the front (36) of the preformed group (2) of cigarettes; and a second "L"-shaped folder (95) with folding end (96); the folder (95) being mobile between two end positions, one being the home position, in which it does not interfere with the die (59), and an operating position, in which the folding end (96) of the folder follows the die (59), intercepting the front panel (29) and folding it at right angles about the transversal fold line (23) until it is substantially in contact with the front (36) of the preformed group (2) of cigarettes; the fourth, folding completion station (93) including a second pusher (102), this being designed to move with alternating motion along a given third path (104) and in a given third direction of feed (105), a second counterpusher (106), this being aligned with the second pusher (102) along the said third path (104) and being mobile with alternating motion in the third direction (105), and a second folding die (108), consisting of four walls, two opposite, parallel pairs, two being transversal (109) and two longitudinal (110), defining a calibrated passage (111), and being vertically aligned along the third path (104) with a first die (59) and the second pusher (102) and second counterpusher (106), the latter moving between a first operating position, in which they grip an individual set (49) which is housed in the first die (59), and a second operating position, in which they force the set (49) through the calibrated passage (111) of the second die (108), thus causing the longitudinal walls (110) to fold at right angles each first forward longitudinal side flap (30,33) of each front panel (24,29) until they are substantially overlapping the second rear longitudinal side flaps (31,34), and so also completing folding of the blank (16) about the preformed group (2) of cigarettes, thus defining the packet (3).

11. The method as described in any of the claims from 7 to 10, characterised in that during the stage for feeding the products (2) or preformed groups (2) of cigarettes to the first, meeting station (47), the products or groups (2) are turned through 180° in their plane relative to the position in which they are fed along the first conveyor (40;113) by a transfer device (118), said device being mobile, with a stepping motion, between a first operating position in which the transfer device (118) connects with the first conveyor (40;113) and a second operating position in which the transfer device (118) connects with the first station (47), passing through intermediate positions in which the transfer device (118) successively connects with a third conveyor (128), this being designed to cyclically feed inner frames (15) to the groups (2), and with a fourth conveyor (129), being designed to feed any coupons (130) to the groups (2).

12. The method as described in claim 11, characterised in that the inner frames (15) are fed by an inner frame feed unit (132), this being located near to and operating with the first conveyor (40;113) to position the inner frames (15) on the preformed groups (2) of cigarettes.

13. The method as described in any of the claims from 7 to 10, characterised in that each product (2) or group (2) is unloaded from the first conveyor (40; 113) towards the first, meeting station (47) by a pusher arm (48), this being mobile with alternating motion substantially along the first path (43).

14. The method as described in claim 11, characterised in that each product (2) or group (2) is picked up by a pick-up device (117), said device being synchronised with the first conveyor (40;113), in order to cyclically pick up the individual groups (2) and feed them, still synchronised, to the transfer device (118), this being located between the first conveyor (40;113) and the first, meeting station (47).

15. The method as described in any of the claims from 1 to 14, characterised in that the stages for feeding the products (2) or preformed groups (2) of cigarettes and the relative blanks (16), and the stages for partial and complete folding of the blank (16) are effected along a single packaging line (131).

16. The method as described in any of the claims from 1 to 14, characterised in that the stages for feeding the products (2) or preformed groups (2) of cigarettes and the relative blanks (16), and the stages for partial and complete folding of the blank (16) are effected along a double packaging line, consisting of two single lines (131a,131b), being arranged and operating in a parallel fashion.

17. A device for packaging products in rigid packets, each packet (3) being obtained from a substantially rectangular blank (16), whose longitudinal axis (16a) is longer than the transversal axis, the device (1) being characterised in that it includes a first conveyor (40;113), being designed to feed a succession of products (2) along a first path (43) and in a given first direction of feed (44) to a first, meeting station (47), where each product (2) meets a blank (16); a pick-up arm (50), this being designed to cyclically feed a succession of blanks (16) to the first, meeting station (47), juxtaposing them and so defining a set (49) consisting of an individual product (2) and the relative blank (16); said first, meeting station (47) being positioned between the first conveyor (40;113) and a second, substantially horizontal, conveyor (52), the latter being located at a different height to the first conveyor (40;113) and having a plurality of first dies (59), these being moved with a stepping motion towards a second, folding station (78); said first station (47) being alternatingly mobile, along a middle path (66), positioned between the said first (43) and second (57) paths, and in a given middle direction of feed (67) extending between the said given first (44) and second (58) directions of feed, between a first operating position, in which the first station (47) receives a blank (16) and a group (2) to form the set (49), a middle position in which the first station (47) connects with the second, folding station (78), and a final operating position in which the first station (47) passes through a first die (59), this being aligned on the middle path (66) and including two transversal walls (60,61) and two longitudinal walls (62), said walls being opposite one another and parallel and defining a calibrated passage (63), successively effecting the partial folding of each blank (16) about the relative product (2); said second conveyor (52) being designed to feed each set (49) positioned inside the relative die (59) along a second path (57) and in a given second direction of feed (58) towards third (92) and fourth (93) folding stations, these being designed to complete the folding of each blank (16) about the relative product (2), and the second direction (58) being angled parallel with the longitudinal axis (16a) of the blank (16).

18. The device for packaging products in rigid packets, the products consisting of preformed groups (2) of long elements, in particular cigarettes, and the packets (3) being of the type with a hinged lid (5), each packet (3) having the shape of a rectangle parallelepiped and including a container (4) and a lid (5), the latter being hinged to an end (6) of the container (4) and the whole being obtained from a substantially rectangular blank (16), whose longitudinal axis (16a) is longer than the transversal axis, said blank having two pre-weakened longitudinal fold lines (17,18) and a plurality of pre-weakened transversal fold lines (19-23), the latter defining, between the two longitudinal lines (17,18), a front panel (24,29), an end panel (25,28) and a back panel (26,27), both for the container (4) and the lid (5); each front panel (24,29) having, respectively, two first opposite forward longitudinal side flaps (30,33); each back panel having two second opposite rear longitudinal side flaps (31,34); each second opposite rear longitudinal side flap (31) of the back panel (26) of the container (4) having first reinforcing tabs (32) which reinforce the end panel (25) of the container (4) and each second opposite rear longitudinal side flap (34) of the back panel (27) of the lid (5) having second reinforcing tabs (35) which reinforce the end panel (28) of the lid (5), the device (1) being characterised in that it includes a first conveyor (40; 113), being designed to feed a succession of preformed groups (2) of long elements in wrappers along a first path (43) and in a first direction (44) to a first, meeting station (47) where each product (2) meets a blank (16), each individual preformed group (2) being put into contact with the back panels (26,27) of the blank (16); a pick-up arm (50), this being designed to cyclically feed a succession of blanks (16) to the first, meeting station (47), juxtaposing them and defining a set (49) consisting of an individual group (2) and relative blank (16); said first, meeting station (47) being located between the first conveyor (40;113) and a second, substantially horizontal, conveyor (52), the latter being located at a height lower than that of the first conveyor (40; 113), and having a plurality of first dies (59), these being moved with a stepping motion towards a second, folding station (78); said first station (47) being alternatingly mobile, along a given middle path (66), located between the said given first (43) and second (57) paths, and in a given middle direction of feed (67) extending between the said given first (44) and second (58) directions of feed, between a first operating position in which the first station (47) receives a blank (16) and the relative group (2), thus forming the said set (49), a middle position in which the first station (47) connects with the second, folding station (78), and a final operating position in which the first station (47) passes through a first die (59), positioned so that it is aligned along the middle path (66) and including two transversal walls (60,61) and two longitudinal walls (62), said walls

being parallel and opposite one another, defining a calibrated passage (63), for the partial folding of each blank (16) about the relative product (2); said second conveyor (52) being designed to feed each set (49) positioned inside the relative die (59) along a second path (57) and in a given second direction of feed (58) towards third (92) and fourth (93) folding stations, these being designed to complete the folding of each blank (16) about the relative product (2), and the second direction (58) being angled parallel with the longitudinal axis (16a) of the blank (16).

19. The device as described in claim 18, characterised in that the first, meeting station (47) includes a first pusher (64) and a first counterpusher (68), the latter being positioned opposite and aligned with the first pusher (64) on the middle path (66), said first pusher (64) and first counterpusher (68) being designed to grip the set (49) and being mobile, with alternating motion in the middle direction (67), both towards and away from one another, and towards the first folding die (59), on a forward and return stroke; the counterpusher (68) including a folder (70), said folder having a U-shaped cross-section and being defined by two opposite longitudinal walls (71) and a base (72), these elements together forming a calibrated seat (73); the base (72) having support and guide means (74,77) for a support surface (75) for the set (49); the surface (75) being mobile, when driven by the first pusher (64) as it moves towards the first counterpusher (68), between a raised position in which the surface (75) is substantially coplanar with the top edge (71a) of the longitudinal walls (71), and a lowered position in which the surface (75) is substantially in contact with the base (72) and the set inside the calibrated seat (73), and in which the longitudinal walls (71) are designed to fold at right angles each rear longitudinal side flap (31,34).

20. The device as described in claim 19, characterised in that the first pusher (64) and first counterpusher (68) are designed to grip the set (49), being mobile with alternating motion in the middle direction (67), both towards and away from one another, and towards the first folding die (59), so that the transversal walls (60,61) of the die (59) fold at right angles the end panel (25,28) of both the container (4) and lid (5) of the packet (3).

21. The device as described in claim 19, characterised in that the second, folding station (78) is located on the given second path (57), said station including two gripper folding heads (79), these being positioned and operating at the die (59); each folding head (79) including a respective pair of opposite jaws (80), said jaws being L-shaped and positioned symmetrically relative to the given second path (57) and on opposite sides of the transversal walls (60) and, respectively (61) of the die (59); each pair of jaws (80) having folders (85) and being mobile between a first operating position, in which they move towards one another, the respective folders (85) folding at right angles towards the ends (39) of the group (2) each first reinforcing tab (32) which reinforces the end panel (25) of the container (4) and each second reinforcing tab (35) which reinforces the end panel (28) of the lid (5), and a second operating position in which the jaws move away from one another and from the set (49).

22. The device as described in any of the claims from 18 to 21, characterised in that the third, folding station (92) includes a first, fixed folder (94), being designed so that, during the forward movement of the die (59), it makes contact with the front panel (24) of the blank (16), folding said panel at right angles about a transversal fold line (19) until it is substantially in contact with the front (36) of the preformed group (2) of cigarettes, and a second folder (95), this being L-shaped and having a folding end (96); the folder (95) being mobile between two end positions, one being the home position, in which it does not interfere with the die (59), and an operating position, in which the folding end (96) of the folder follows the die (59), intercepting the front panel (29) and folding it at right angles about the transversal fold line (23) until it is substantially in contact with the front (36) of the preformed group (2) of cigarettes; the fourth, folding completion station (93) including a second pusher (102), this being designed to move with alternating motion along a given third path (104) and in a given third direction of feed (105), a second counterpusher (106), this being aligned with the second pusher (102) along the said third path (104) and being mobile with alternating motion in the third direction (105), and a second folding die (108), consisting of four walls, two opposite, parallel pairs, two being transversal (109) and two longitudinal (110), defining a calibrated passage (111), and being vertically aligned along the third path (104) with a first die (59) and the second pusher (102) and second counterpusher (106), the latter moving between a first operating position, in which they grip an individual set (49) which is housed in the first die (59), and a second operating position, in which they force the set (49) through the calibrated passage (111) of the second die (108), thus causing the longitudinal walls (110) to fold at right angles each first forward longitudinal side flap (30,33) of each front panel (24,29) until they are substantially overlapping the second rear longitudinal side flaps (31,34), and so also completing folding of the blank (16) about the preformed group (2) of cigarettes, defining the packet (3).

23. The device as described in any of the claims from 18 to 22, characterised in that it includes a transfer device (118), said device being mobile, with a stepping motion, between a first operating position in which the transfer device (118) connects with the first conveyor (40;113) and a second operating position in which the transfer device (118) connects with the first station (47), passing through intermediate positions in which the transfer device (118) successively connects with a third conveyor (128), this being designed to cyclically feed inner frames (15) to the groups (2), and with a fourth conveyor (129), being designed to feed any coupons (130) to the groups (2).

24. The device as described in claim 23, characterised in that the said transfer device (118) includes a carousel (119), turning with a stepping motion, about a substantially vertical axis (120), said carousel (119) having a plurality of radial through-seats (121), these being designed to house and support, with sufficient friction, the individual groups (2) which are cyclically picked up from the conveyor (40;113) and inserted in the respective seats (121) by the pick-up device (117).

25. The device as described in claim 24, characterised in that the pick-up device (117) includes a recovery element (122), being positioned at the out feed of the first conveyor (40;113) and having a through-seat (123), this being designed to house the groups (2), said through-seat (123) being centred so that it is vertically aligned, along a given fourth, transfer path (126), with the through-seats (121) of the carousel (119) and these, in operation, rotating cyclically at the outfeed of the first conveyor (40;113); the pick-up device (117) also including a third pusher (124) and a third counterpusher (125), being synchronised with the conveyor (113) and carousel (119), and being aligned with and opposite one another and operating together to grip the opposite sides of the individual groups (2) housed in the seat (123) of the recovery element (122), transferring them to the relative seats (121) of the carousel (119) .

26. The device as described in any of the claims from 17 to 25, characterised in that the said device (1) consists of a single packaging line (131).

27. The device as described in any of the claims from 17 to 25, characterised in that the said device (1) consists of a double packaging line, consisting of two lines (131a,131b), said lines being arranged and operating in a parallel fashion.

28. The device as described in any of the claims from 18 to 27, characterised in that it includes a feed unit (132) for the inner frames (15), said unit being located near to and operating in conjunction with the first conveyor (40;113) to position the inner frames (15) on the preformed groups (2) of cigarettes.

29. The device as described in any of the claims from 18 to 27, characterised in that each product (2) or group (2) is unloaded from the first conveyor (40; 113) and transferred to the first, meeting station (47) by a pusher arm (48), said arm being mobile with alternating motion substantially along the said first path (43).

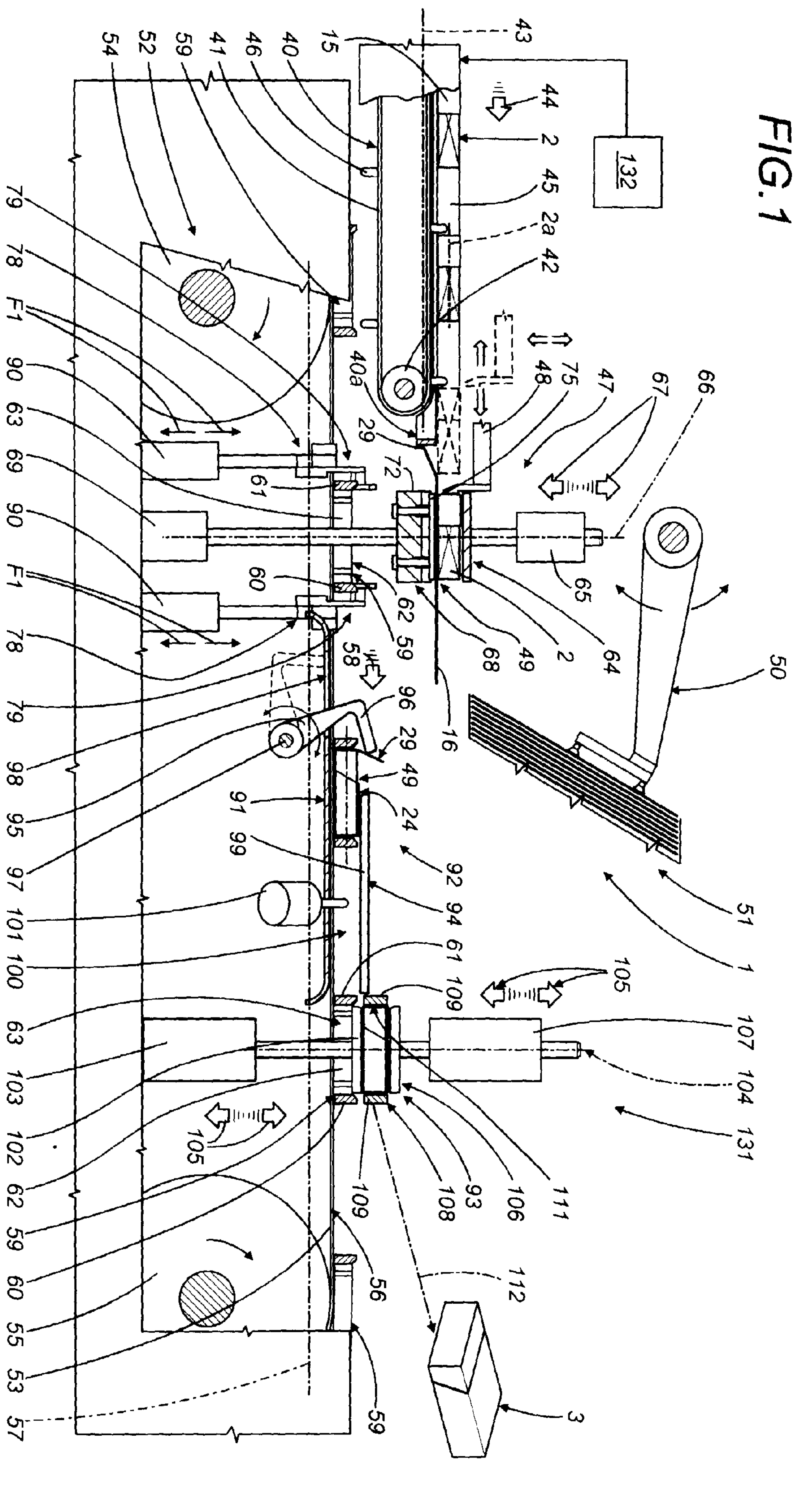


FIG.1

FIG.3

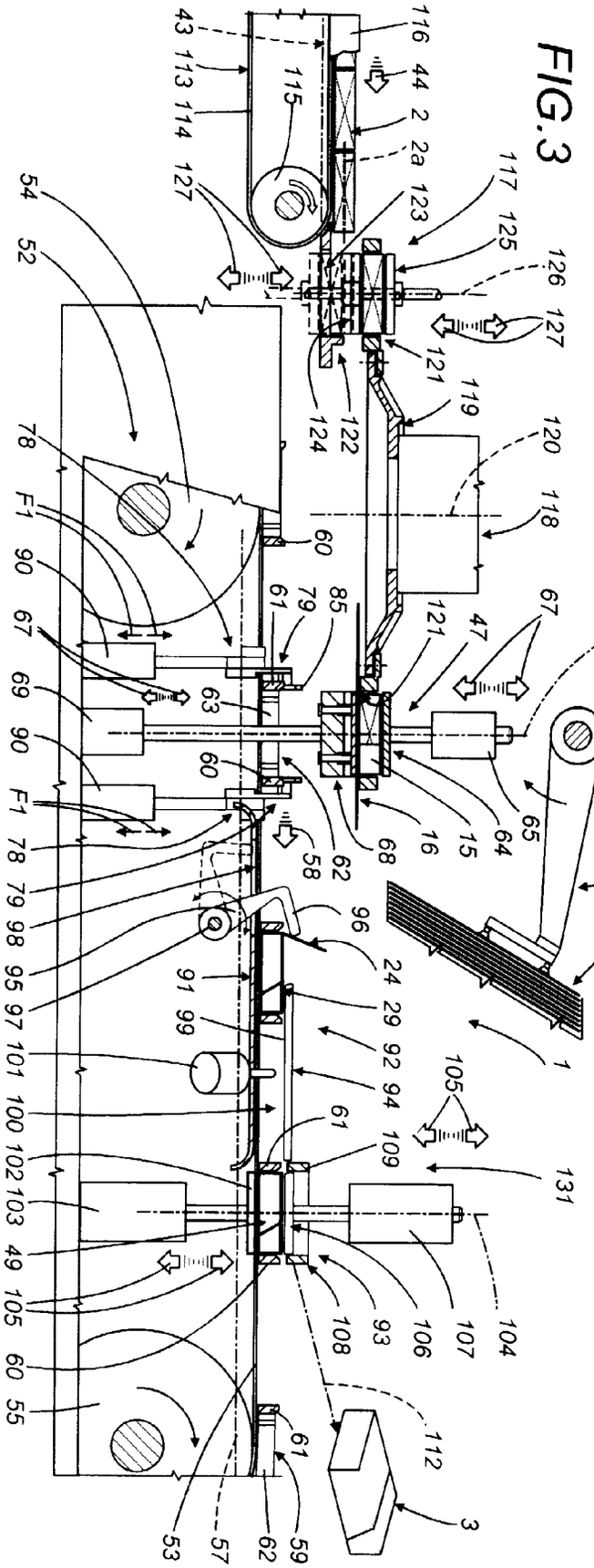


FIG.3a

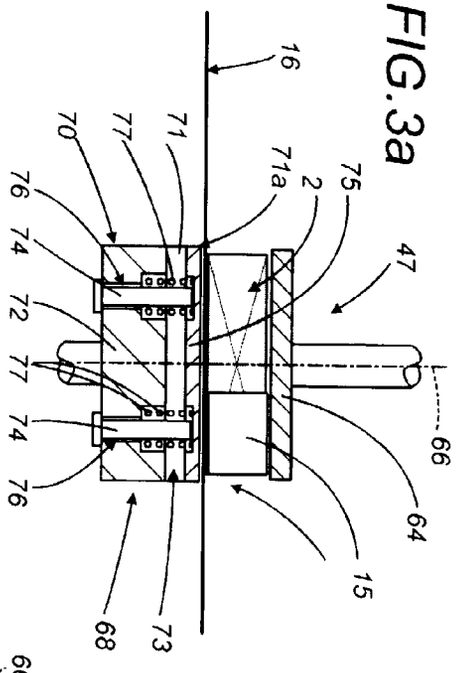
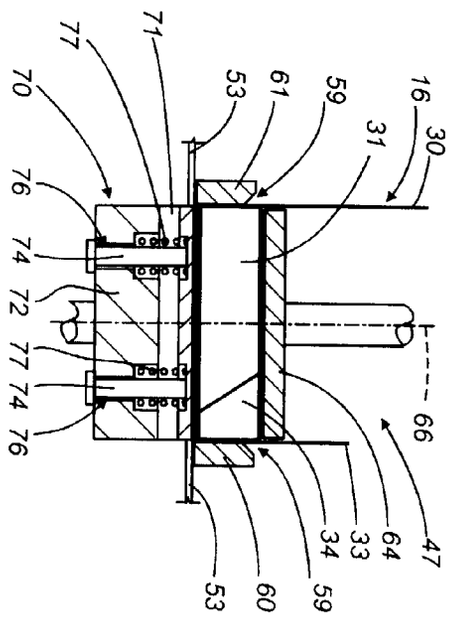


FIG.3b



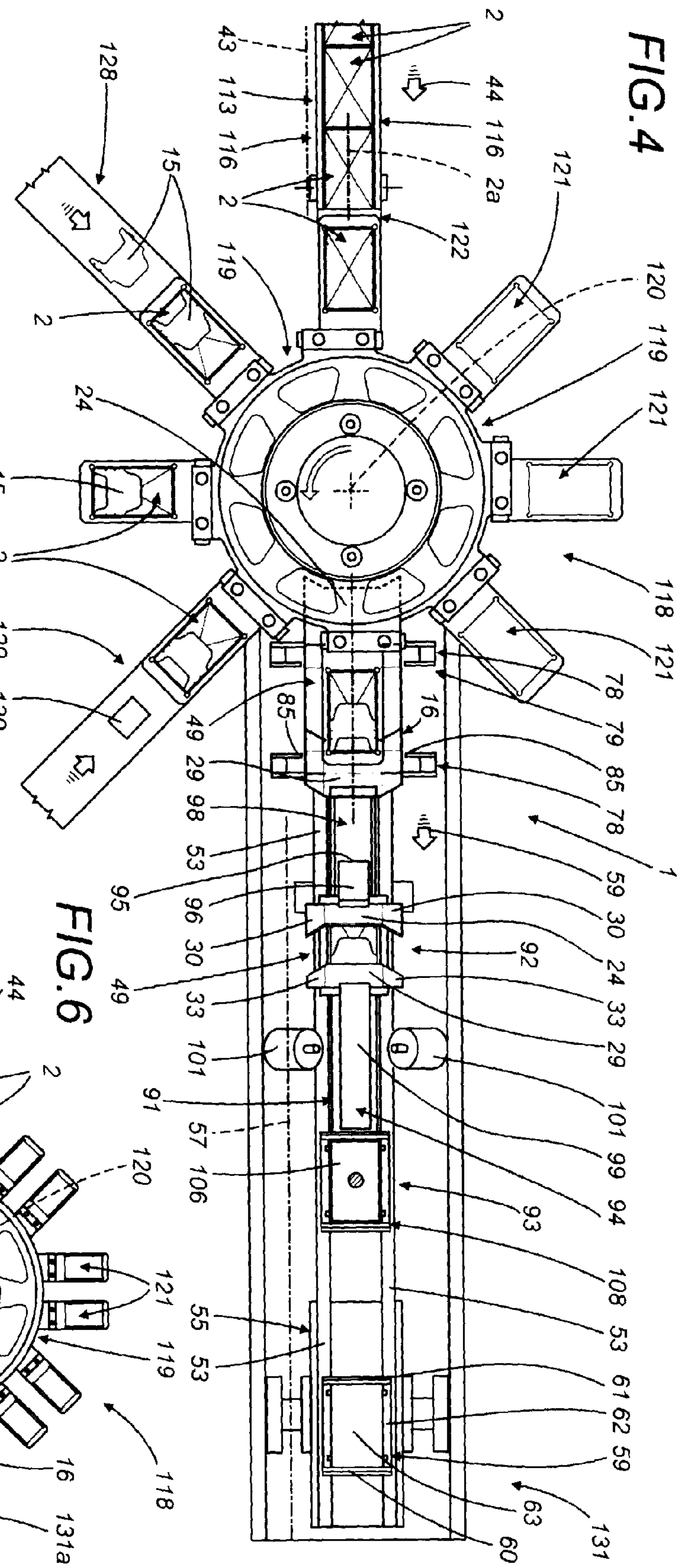


FIG.4

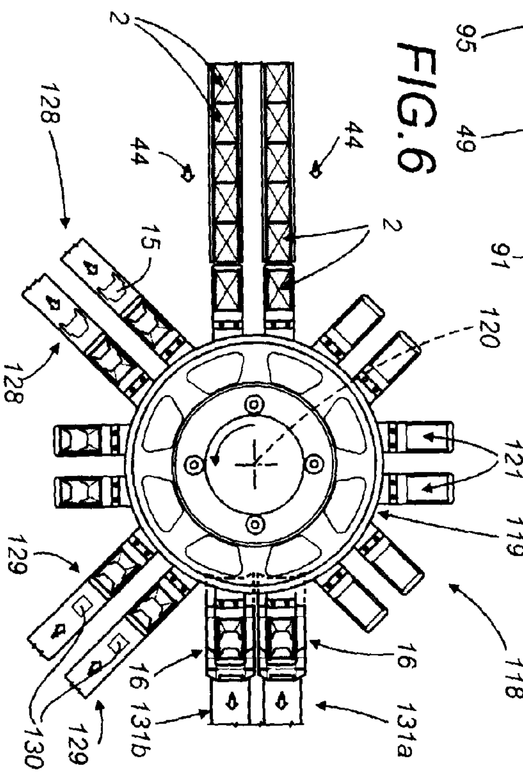


FIG.6

FIG.5

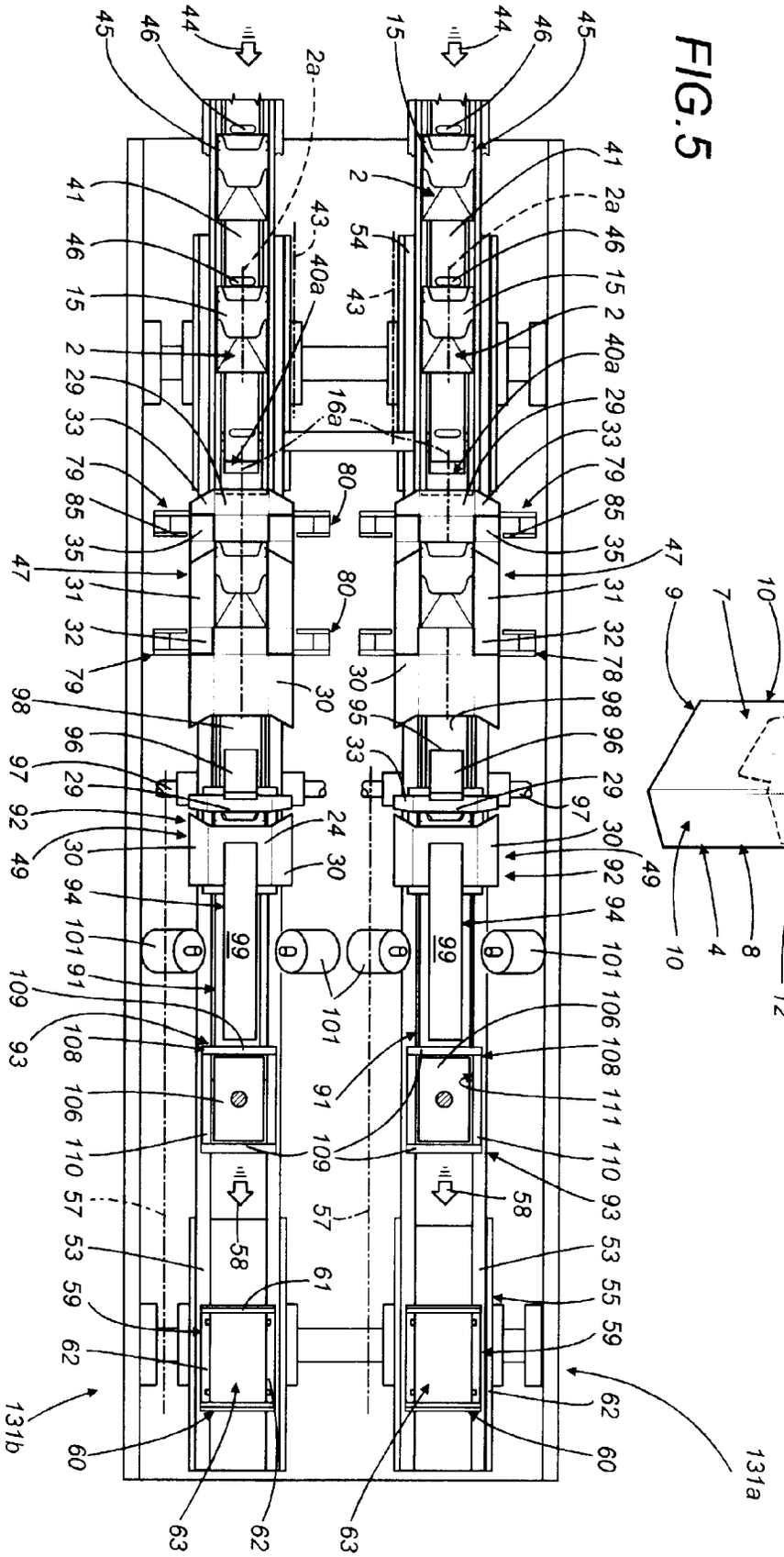
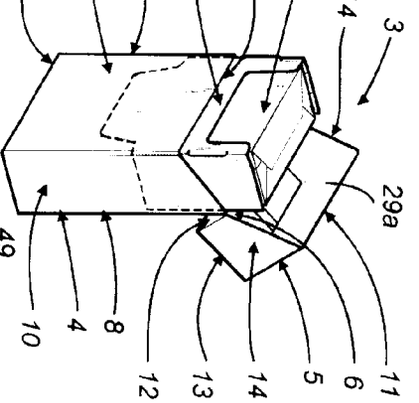


FIG.8



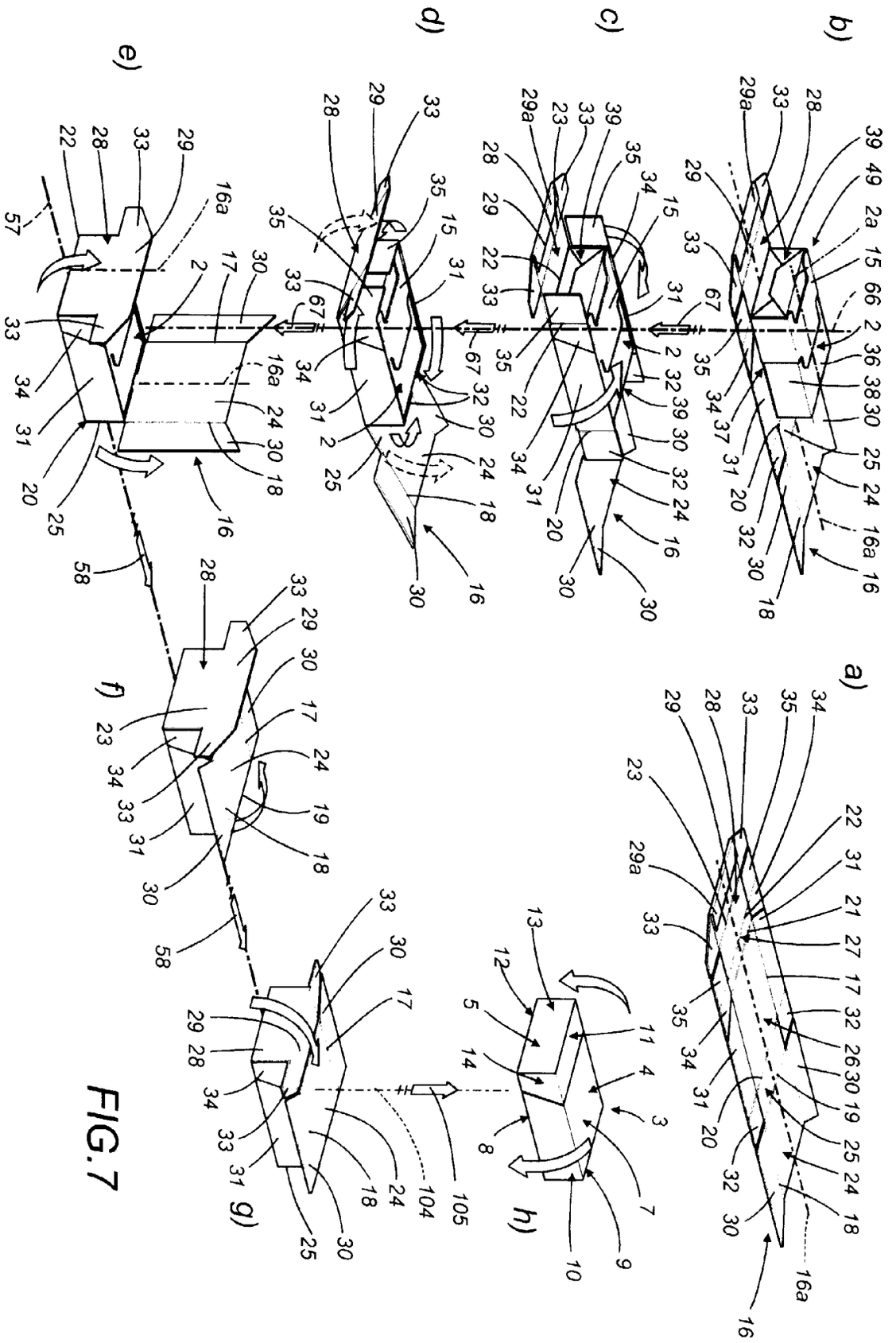


FIG.7

FIG.2

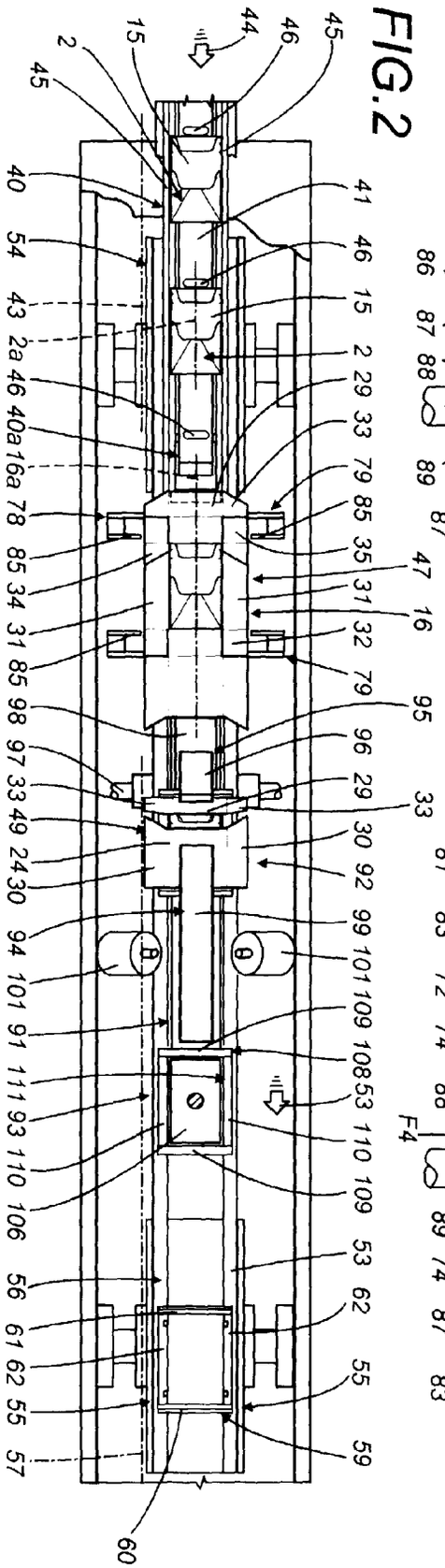


FIG.9d

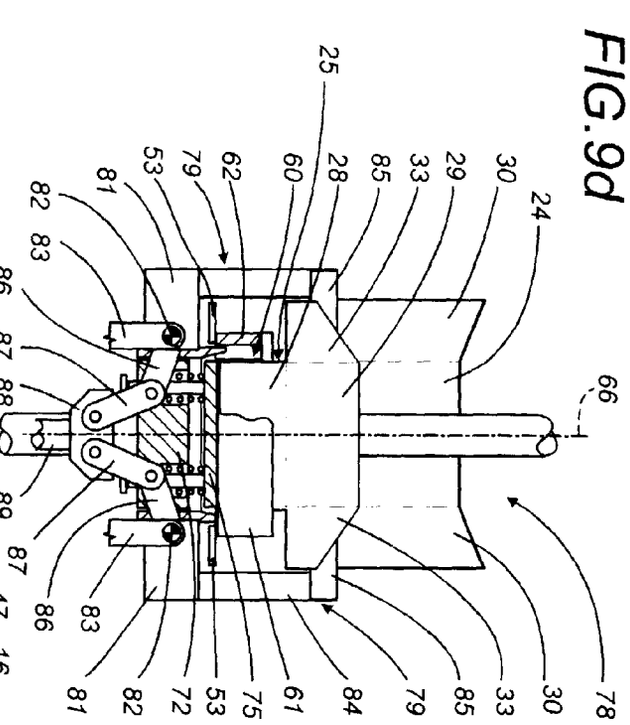


FIG.9e