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(54) Packing machine and method for producing a slide-open package of smoking articles

(57) A packing machine (30) and method for producing a slide-open package (1) of smoking articles; the packing machine (30) having : a first packing unit (31) for producing a wrapped group (2) of smoking articles; a second packing unit (32) which, by folding an inner blank (22) around the wrapped group (2) of smoking articles, forms an inner container (3) housing the group (2) of smoking articles and having an open top end (6); and a third packing unit (33) which, by folding an outer blank (23) around the inner container (3), forms an outer container (4) in which the inner container (3) is housed slidably.

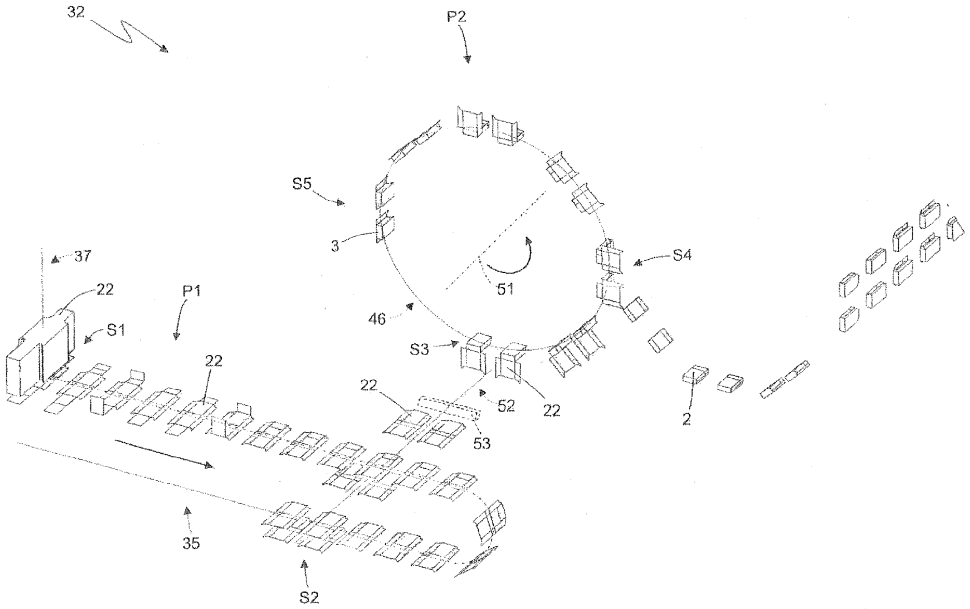

Fig. 9

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Description

TECHNICAL FIELD

[0001] The present invention relates to a packing machine and method for producing a slide-open package of smoking articles.

[0002] In the following description, reference is made, for the sake of simplicity and purely by way of example, to a slide-open packet of cigarettes with a hinged box lid.

BACKGROUND ART

[0003] Rigid, hinged-lid packets of cigarettes are currently the most widely marketed, by being easy to produce and easy and practical to use, and by effectively protecting the cigarettes inside.

[0004] In addition to the above rigid, hinged-lid packets of cigarettes, rigid slide-open packets have been proposed comprising two separable containers, one inserted inside the other. In other words, a rigid, slide-open packet of cigarettes comprises an inner container, which houses a foil-wrapped group of cigarettes and is housed inside an outer container to slide, with respect to the outer container, between a closed configuration, in which the inner container is inserted inside the outer container, and an open configuration, in which the inner container is partly expelled from the outer container.

[0005] A rigid, hinged-lid, slide-open packet of cigarettes has also been proposed in which the inner container (or outer container) has a hinged lid, which rotates between a closed position and an open position closing and opening an open top end of the inner container. The lid has a connecting tab connected at one end to the lid, and at the other end to the outer container (or inner container), to 'automatically' rotate the lid (i.e. without the user having to touch the lid) as the inner container slides with respect to the outer container.

[0006] One example of a hinged-lid, slide-open packet of cigarettes is described in Patent Application EP2325093A1, in which the lid has front and lateral 'box' walls so as to fit in airtight manner inside the open top end of the inner container.

[0007] Currently used methods of producing hinged-lid, slide-open packets of cigarettes do not permit high output levels (i.e. the number of packets of cigarettes produced per unit of time), especially if a high quality standard is to be maintained. As a result, known packing machines for producing hinged-lid, slide-open packets of cigarettes are extremely slow-operating and only suitable for producing limited special series lots.

[0008] Moreover, but no less important, known packing machines for producing hinged-lid, slide-open packets of cigarettes are not very 'flexible', i.e. are difficult to modify to switch from one to another type of slide-open packet of cigarettes (with or without a hinged lid).

[0009] Patent Application WO2009101120A1 describes a cigarette packing machine for producing rigid, hinged-lid, slide-open packets, and which comprises a first packing unit for folding an inner blank about a group of cigarettes to form an inner container with a hinged lid; and a second packing unit for folding an outer blank about the inner container to form an outer container which encloses and slides axially with respect to the inner container. The outer container has a transmission member, which has a first end integral with the lid; a second end opposite the first end and integral with the outer container; and a U-shaped fold between the inner container and the outer container.

DESCRIPTION OF THE INVENTION

[0010] It is an object of the present invention to provide a packing machine and method for producing a slide-open package of smoking articles, designed to eliminate the above drawbacks, and which are cheap and easy to implement.

[0011] According to the present invention, there are provided a packing machine and method for producing a slide-open package of smoking articles, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a front view in perspective of a rigid, hinged-lid, slide-open packet of cigarettes in a closed configuration;

Figure 2 shows a front view in perspective of the Figure 1 packet of cigarettes in an open configuration;

Figure 3 shows a top plan view of the Figure 1 packet of cigarettes in an open configuration;

Figure 4 shows a front view in perspective of an outer container of the Figure 1 packet of cigarettes;

Figure 5 shows a front view in perspective of an inner container of the Figure 1 packet of cigarettes without the group of cigarettes and with a connecting tab;

Figure 6 shows a plan view of an inner blank from which to form an inner container of the Figure 1 packet of cigarettes;

Figure 7 shows a plan view of an outer blank from which to form an outer container of the Figure 1 packet of cigarettes;

Figure 8 shows a schematic in perspective of a packing machine, in accordance with the present invention, for producing the Figure 1 packet of cigarettes;

Figure 9 shows a schematic in perspective of a first packing unit of the Figure 8 packing machine;

Figure 10 shows a larger-scale detail of Figure 9, and a first packing conveyor of the first packing unit in Figure 9;

Figure 11 shows a plan view of a Figure 6 inner blank

prefolding sequence shown in Figure 10;
Figure 12 shows a view in perspective of a belt conveyor of the first packing conveyor in Figure 10;
Figure 13 shows a larger-scale detail of Figure 9, and a second packing conveyor of the first packing unit in Figure 9;
Figure 14 shows a schematic view in perspective of a Figure 7 outer blank prefolding sequence on a second packing unit of the Figure 8 packing machine;
Figure 15 shows a larger-scale detail of Figure 14 showing the Figure 7 outer blank prefolding sequence;
Figure 16 shows a plan view of a Figure 7 outer blank prefolding sequence shown in Figure 15;
Figure 17 shows a view in perspective of a first packing conveyor of the second packing unit in Figure 14;
Figure 18 shows a larger-scale detail of Figure 14 showing a final Figure 7 outer blank folding sequence;
Figure 19 shows a larger-scale detail of Figure 14 and a second packing conveyor of the second packing unit in Figure 14;
Figures 20 and 21 show two larger-scale views in perspective of one step in the final Figure 7 outer blank folding sequence in Figure 18;
Figures 22 and 23 show two schematic side views corresponding to the perspective views in Figures 20 and 21 respectively;
Figure 24 shows a front view in perspective, and in an open configuration, of a different type of rigid, hinged-lid, slide-open packet of cigarettes producible on the Figure 8 packing machine;
Figure 25 shows a rear view in perspective of the Figure 24 packet of cigarettes in an open configuration;
Figure 26 shows a plan view of an inner blank from which to form an inner container of the Figure 24 packet of cigarettes;
Figure 27 shows a plan view of an outer blank from which to form an outer container of the Figure 24 packet of cigarettes;
Figure 28 shows a schematic view in perspective of a Figure 26 inner blank prefolding sequence on a first packing unit of the Figure 8 packing machine;
Figure 29 shows a plan view of the Figure 26 inner blank prefolding sequence shown in Figure 28;
Figure 30 shows a schematic view in perspective of a variation of the Figure 26 inner blank prefolding sequence on a first packing unit of the Figure 8 packing machine;
Figure 31 shows a plan view of the Figure 26 inner blank prefolding sequence shown in Figure 30.

PREFERRED EMBODIMENTS OF THE INVENTION

[0013] Number 1 in Figures 1 and 2 indicates as a whole a rigid, slide-open packet of cigarettes, which opens in a translatory (linear) movement.

[0014] The Figure 1 packet 1 of cigarettes comprises a wrapped, i.e. foil-wrapped group 2 of cigarettes (shown in Figure 2). Packet 1 of cigarettes also comprises a rigid inner container 3 actually containing the wrapped group 2 of cigarettes; and a rigid outer container 4, which houses inner container 3 to allow inner container 3 to slide in a translatory movement, with respect to outer container 4, between a closed configuration (Figure 1), in which inner container 3 is inserted fully inside outer container 4, and an open configuration (Figure 2), in which inner container 3 is expelled partly from outer container 4 to allow access to wrapped group 2 of cigarettes.

[0015] As shown in Figure 5, inner container 3 is parallelepiped-shaped, and comprises a bottom wall 5; an open top end 6 opposite bottom wall 5; a front wall 7 and rear wall 8 opposite and parallel to each other; and two parallel lateral walls 9 interposed between walls 7 and 8.

[0016] As shown in Figure 4, outer container 4 has an open top end 10; and a lid 11 hinged to outer container 4 along a hinge 12 to rotate, with respect to outer container 4, between an open position (Figures 2, 3 and 4) and a closed position (Figure 1) respectively opening and closing open top end 10 of outer container 4 and, at the same time, also open top end 6 of inner container 3. Outer container 4 is parallelepiped-shaped, and comprises a bottom wall 13 opposite open top end 10; a front wall 14 and rear wall 15 opposite and parallel to each other; and two parallel lateral walls 16 interposed between walls 14 and 15.

[0017] Lid 11 comprises a top wall 17 which, when the lid is closed, closes open top end 10 of outer container 4 (and, at the same time, open top end 6 of inner container 3); a front wall 18; and two lateral walls 19. Top wall 17 of lid 11 is 'flat' (i.e. is formed from one cardboard panel or a number of compacted cardboard panels, and is therefore solid); whereas walls 18 and 19 of lid 11 are 'box' walls (i.e. are made of two cardboard panels spaced apart, and are therefore hollow) with a triangular cross section. When lid 11 is closed, walls 18 and 19 of lid 11 fit inside open top end 10 of outer container 4 so that top wall 17 of lid 11 is flush with the top edges of walls 14, 15 and 16 of outer container 4. It is important to note that lid 11 is a 'box' lid, i.e. comprises walls 17, 18, 19 perpendicular to one another, so as to impart a 'box' shape to lid 11.

[0018] In a preferred embodiment, rear wall 8 of inner container 3 is connected to top wall 17 of lid 11 by a connecting tab 20 to rotate lid 11 'automatically' (i.e. without the user having to touch lid 11) as inner container 3 slides with respect to outer container 4. In other words, by means of connecting tab 20 connecting top wall 17 of lid 11 mechanically to rear wall 8 of inner container 3, inner container 3, as it slides with respect to outer container 4 from the closed to the open configuration, pushes lid 11 from the closed to the open position 'automatically' (i.e. without the user having to touch lid 11); and similarly, as inner container 3 slides with respect to outer container 4 from the open to the closed configuration, lid 11 is drawn

by inner container 3 from the open to the closed position 'automatically' (i.e. without the user having to touch lid 11). The user therefore need simply exert sufficient thrust to slide inner container 3 with respect to outer container 4, without having to touch lid 11, which is rotated 'automatically'. Preferably, connecting tab 20 is connected seamlessly to lid 11, and is glued to rear wall 8 of inner container 3.

[0019] As shown in Figures 1, 2 and 4, front wall 14 of outer container 4 has a through window 21 allowing access to underlying front wall 7 of inner container 3 facing front wall 14 of outer container 4, to exert thrust on inner container 3 to move it between the closed and open configurations. In other words, to use packet 1 of cigarettes, the user holds outer container 4 with one hand and, with the thumb of the same hand, pushes on front wall 7 of inner container 3 through window 21 in front wall 14 of outer container 4, to exert thrust on inner container 3 and slide it with respect to outer container 4.

[0020] Containers 3 and 4 of the Figure 1-5 packet 1 of cigarettes are formed from corresponding blanks 22 and 23 as shown in Figures 6 and 7. Among other things, each blank 22, 23 comprises a number of parts, which are indicated, where possible, using the same reference numbers, with superscripts, as for the corresponding walls of respective container 3, 4.

[0021] With reference to Figure 6, inner blank 22 has two longitudinal fold lines 24, and a number of transverse fold lines 25 which define, between the two longitudinal fold lines 24, a panel 7' forming front wall 7 of inner container 3; a panel 5' forming bottom wall 5 of inner container 3; and a panel 8' forming rear wall 8 of inner container 3. Panel 7' is connected along a transverse fold line 25 to a reinforcing panel 7", in turn connected along a transverse fold line 25 to a further reinforcing panel 7"'. Reinforcing panels 7" and 7"' are folded 180° about respective transverse fold lines 25 and glued onto an inner surface of panel 7' to thicken (reinforce) front wall 7. A different embodiment, not shown, has no reinforcing panels 7" and 7"'. Panel 8' is connected along a transverse fold line 25 to a reinforcing panel 8", in turn connected along a transverse fold line 25 to a further reinforcing panel 8"'. Reinforcing panels 8" and 8"' are folded 180° about respective transverse fold lines 25 and glued onto an inner surface of panel 8' to thicken (reinforce) rear wall 8. A different embodiment, not shown, has no reinforcing panels 8" and 8"'.

[0022] Panel 7' has two lateral wings 9', which form respective outer portions of lateral walls 9, are located on opposite sides of panel 7', and are separated from panel 7' by longitudinal fold lines 24. Panel 8' has two lateral wings 9", which are glued to corresponding wings 9', form respective inner portions of lateral walls 9, are located on opposite sides of panel 8', and are separated from panel 8' by longitudinal fold lines 24. Each lateral wing 9" of panel 8' has a tab 26 separated from respective lateral wing 9" by a transverse fold line 25.

[0023] With reference to Figure 7, outer blank 23 has two longitudinal fold lines 27, and a number of transverse fold lines 28 which define, between the two longitudinal fold lines 27, a panel 17' forming top wall 17 of lid 11; a panel 15' forming rear wall 15 of outer container 4; a panel 13' forming bottom wall 13 of outer container 4; and a panel 14' forming front wall 14 of outer container 4. Panel 14' is connected along a transverse fold line 28 to a reinforcing panel 14", which is folded 180° about respective transverse fold line 28 and glued onto an inner surface of panel 14' to thicken (reinforce) front wall 14 of outer container 4. A different embodiment, not shown, has no reinforcing panel 14".

[0024] Panel 17' is connected along a transverse fold line 28 to a panel 18', in turn connected along a transverse fold line 28 to a panel 18"; panels 18' and 18" form front wall 18 of lid 11, and more specifically the outer portion and inner portion respectively of front wall 18. Panel 18" is connected along a transverse fold line 28 to connecting tab 20, which comprises four panels 20', 20", 20"' and 20"" separated by respective transverse fold lines 28. Panel 20' of connecting tab 20 is glued to an inner surface of top wall 17 of lid 11 (i.e. to an inner surface of panel 17'), and panel 20"' of connecting tab 20 is glued to an outer surface of rear wall 8 of inner container 3 (after being folded 180° and glued onto panel 20"").

[0025] Panel 14' has two lateral wings 16', which form respective outer portions of lateral walls 16, are located on opposite sides of panel 14', and are separated from panel 14' by longitudinal fold lines 27. Panel 15' has two lateral wings 16", which are glued to corresponding wings 16', form respective inner portions of lateral walls 16, are located on opposite sides of panel 15', and are separated from panel 15' by longitudinal fold lines 27. Each lateral wing 16" of panel 15' has a tab 29 separated from respective lateral wing 16" by a transverse fold line 28.

[0026] Panel 17' has two lateral appendixes, which are located on opposite sides of panel 17', are separated from panel 17' by longitudinal fold lines 27, comprise respective wings 19', 19", 19"' separated by further longitudinal fold lines, and form lateral walls 19 of lid 11. Each lateral appendix of panel 17' has two wings 19', 19", which form the outer portion and inner portion respectively of a lateral wall 19; and a wing 19"', which is glued to an inner surface of top wall 17 of lid 11, with the interposition of panel 20' of connecting tab 20 (i.e. panel 20' is glued directly to the inner surface of panel 17', and wings 19"' are glued to panel 20').

[0027] Through window 21 in panel 14' is surrounded by four reinforcing tabs 21' connected to panel 14' along respective fold lines along the perimeter of window 21. Reinforcing tabs 21' are folded 180° about the corresponding fold lines and glued onto an inner surface of panel 14' to thicken (reinforce) front wall 14 of outer container 4. A different embodiment, not shown, has no reinforcing tabs 21'.

[0028] Figure 8 shows a schematic of a cigarette packing machine 30 for producing packets 1 of cigarettes. Packing machine 30 comprises, in succession, a packing

unit 31 for forming wrapped groups 2 of cigarettes; a packing unit 32 for forming inner containers 3 by folding inner blanks 22 about corresponding wrapped groups 2 of cigarettes; a packing unit 33 for forming outer containers 4 (and so completing packets 1 of cigarettes) by folding outer blanks 23 about corresponding inner containers 3; and, finally, a processing unit 34, which receives packets 1 of cigarettes from packing unit 33 and opens (i.e. slides inner container 3 for the first time with respect to outer container 4, to partly expel inner container 3 and so rotate lid 11 into the open position) and closes each packet 1 of cigarettes.

[0029] Processing unit 34 opens and closes each packet 1 of cigarettes to 'flex' the packing material (i.e. to break or at least partly loosen the mechanical bonds inside the packing material) along the hinge line, so that first-time opening of packet 1 of cigarettes by the end user is made easier (by not having to also exert the force required to 'flex' the packing material along the hinge line).

[0030] As shown in Figure 9, packing unit 32 comprises a packing conveyor 35 with a number of packing pockets 36 (Figure 12), each for housing an inner blank 22 and for feeding inner blank 22 along a packing path P1 extending between an input station S1 and an output station S2. A hopper 37 at input station S1 houses a stack of inner blanks 22, and feeds inner blanks 22 cyclically from a bottom outlet into packing pockets 36 on packing conveyor 35. More specifically, each inner blank 22 at the bottom outlet of hopper 37 is withdrawn by a vertically-moving suction gripping head, and is fed into an underlying packing pocket 36 of packing conveyor 35, arrested at input station S1 and aligned with the bottom outlet of hopper 37.

[0031] It is important to note that packing conveyor 35 conveys each inner blank 22 crosswise along the whole of packing path P1, i.e. with transverse fold lines 25 parallel at all times to the travelling direction. In other words, packing conveyor 35 never changes the orientation of inner blank 22 with respect to the travelling direction, so inner blank 22 is positioned along the whole of packing path P1 with its transverse fold lines 25 parallel to the travelling direction (and, therefore, with longitudinal fold lines 24 perpendicular to the travelling direction). Maintaining the same orientation of inner blank 22 along the whole of packing path P1 simplifies both the folding process and the structure of packing conveyor 35.

[0032] As shown in Figure 10, packing conveyor 35 is equipped with a gumming device 38 located along packing path P1, downstream from input station S1, to deposit glue 39 (Figure 11) on panel 7" and panel 8" of each inner blank 22. Packing conveyor 35 is equipped with a folding device 40 located downstream from gumming device 38 along packing path P1, and which folds panel 7"' with respect to and onto panel 7" to glue panels 7" and 7"' together, and folds panel 8"' with respect to and onto panel 8" to glue panels 8" and 8"' together. Packing conveyor 35 is equipped with a pressure device 41 located downstream from folding device 40 along packing path P1, and which keeps panels 7" and 7"' pressed together to ensure they are glued firmly, and keeps panels 8" and 8"' pressed together to ensure they are glued firmly.

[0033] Packing conveyor 35 is equipped with a gumming device 42 located along packing path P1, downstream from pressure device 41, to deposit glue 43 (Figure 11) on panel 7"' and panel 8"' of each inner blank 22. Packing conveyor 35 is equipped with a folding device 44 located downstream from gumming device 42 along packing path P1, and which folds the superimposed panels 7" and 7"' with respect to and onto panel 7' to glue panels 7', 7" and 7"' together, and folds the superimposed panels 8" and 8"' with respect to and onto panel 8' to glue panels 8', 8" and 8"' together. Packing conveyor 35 is equipped with a pressure device 45 located downstream from folding device 44 along packing path P1, and which keeps panels 7', 7" and 7"' pressed together to ensure they are glued firmly, and keeps panels 8', 8" and 8"' pressed together to ensure they are glued firmly.

[0034] In a preferred embodiment shown in Figure 12, packing conveyor 35 is defined by a conveyor belt looped about two end pulleys and supporting a number of packing pockets 36, so packing path P1 is U-shaped and extends between input station S1 located along a straight initial portion of packing path P1, and output station S2 located along a straight end portion of packing path P1 connected to the straight initial portion by a semicircular intermediate portion.

[0035] As shown in Figure 9, packing unit 32 comprises a packing conveyor 46 with a number of packing pockets 47 (shown schematically in Figure 13), each for housing an inner blank 22 and a corresponding wrapped group 2 of cigarettes, and for feeding inner blank 22 and wrapped group 2 of cigarettes along a packing path P2 extending between an input station S3 and an output station S5. At input station S3, a partly prefolded inner blank 22 from packing conveyor 35 is fed into a packing pocket 47 to further fold inner blank 22. At a feed station S4 between input station S3 and output station S5, a wrapped group 2 of cigarettes is fed into a packing pocket 47 and onto a previously inserted inner blank 22. More specifically, a rear wall of wrapped group 2 of cigarettes is positioned resting on panel 8' of inner blank 22. At output station S5, the inner container 3 (formed by folding inner blank 22 about wrapped group 2 of cigarettes) is expelled from packing pocket 47 and fed to packing unit 33.

[0036] As shown in Figure 13, at input station S3, a folding device 48 folds tabs 26 of inner blank 22 ninety degrees (about corresponding transverse fold lines 25) with respect to wings 9", and then, by inserting inner blank 22 inside packing pocket 47, folds panel 5' ninety degrees (about corresponding transverse fold line 25), and folds the two wings 9" ninety degrees (about corresponding longitudinal fold lines 24). In other words, after tabs 26 are folded 90°, insertion of inner blank 22 inside packing pocket 47 folds panel 5' and the two wings 9" ninety de-

grees.

Between feed station S4 and output station S5, a folding device 49 folds panel 7' (onto which panels 7" and 7"' have already been folded and glued) 90° (about corresponding transverse fold line 25). Folding inner blank 22 is completed at output station S5 as inner container 3 is expelled from packing pocket 47 : as inner container 3 is expelled, a folding device 50 folds wings 9' ninety degrees (about corresponding longitudinal fold lines 24) onto wings 9" to form lateral walls 9 of inner container 3. A gumming device (not shown) is preferably provided directly upstream from folding device 50 to deposit glue between wings 9' and 9" just before wings 9' are folded.

[0037] In a preferred embodiment shown in the attached drawings, packing conveyor 46 is defined by a wheel which rotates in steps about a central horizontal axis of rotation 51, so packing path P2 extending from input station S3 to output station S5 is circular.

[0038] As shown in Figure 9, packing unit 32 comprises a transfer conveyor 52, which transfers the prefolded inner blanks 22 from output station S2 of packing conveyor 35 to input station S3 of packing conveyor 46. A gumming device 53 along transfer conveyor 52 and upstream from input station S3 of packing conveyor 46 deposits glue between tabs 26 and panel 5' of inner blank 22.

[0039] In a preferred embodiment, hopper 37 feeds one inner blank 22 at a time to packing conveyor 35 at input station S1 along packing path P1, and transfer conveyor 52 transfers two inner blanks 22 at a time from packing conveyor 35 to packing conveyor 46, which in this embodiment handles two inner blanks 22 at a time at each step. In an alternative embodiment not shown, hopper 37 feeds two inner blanks 22 at a time to packing conveyor 35 at input station S1 along packing path P1.

[0040] As shown in Figures 14 and 17, packing unit 33 comprises a packing conveyor 54 with a number of packing pockets 55, each for housing an outer blank 23, and for feeding outer blank 23 along a packing path P3 extending between an input station S6 and an output station S7. At input station S6, a hopper 56 houses a stack of outer blanks 23, and feeds outer blanks 23 cyclically from a bottom outlet into packing pockets 55 on packing conveyor 54. More specifically, each outer blank 23 at the bottom outlet of hopper 56 is withdrawn by a vertically-moving suction gripping head, and is fed into an underlying packing pocket 55 of packing conveyor 54, arrested at input station S6 and aligned with the bottom outlet.

[0041] It is important to note that packing conveyor 54 conveys each outer blank 23 crosswise along the whole of packing path P3, as shown in Figure 15, i.e. with transverse fold lines 28 parallel at all times to the travelling direction. In other words, packing conveyor 54 never changes the orientation of outer blank 23 with respect to the travelling direction, so outer blank 23 is positioned along the whole of packing path P3 with its transverse fold lines 28 parallel to the travelling direction (and, therefore, with longitudinal fold lines 27 perpendicular to the travelling direction). Maintaining the same orientation of outer blank 23 along the whole of packing path P3 simplifies both the folding process and the structure of packing conveyor 54.

[0042] As shown in Figure 17, packing conveyor 54 is equipped with a gumming device 57 located along packing path P3, downstream from input station S6, to deposit glue 58 (Figure 16) on panel 20"' and panel 14' of each outer blank 23. Packing conveyor 54 is equipped with a folding device 59 located downstream from gumming device 57 along packing path P3, and which folds panel 20"" with respect to and onto panel 20"' to glue panels 20"' and 20"" together, folds panel 14" with respect to and onto panel 14' to glue panels 14" and 14' together, and folds reinforcing tabs 21' with respect to and onto panel 14' to glue reinforcing tabs 21' to panel 14'. Packing conveyor 54 is equipped with a pressure device 60 located downstream from folding device 59 along packing path P3, and which keeps panels 20"' and 20"" pressed together to ensure they are glued firmly, keeps panels 14" and 14' pressed together to ensure they are glued firmly, and keeps reinforcing tabs 21' and panel 14' pressed together to ensure reinforcing tabs 21' are glued firmly to panel 14'.

[0043] Packing conveyor 54 is equipped with a gumming device 61 located along packing path P3, downstream from pressure device 60, to deposit glue 62 (Figure 16) on panel 17' of each outer blank 23. Packing conveyor 54 is equipped with a folding device 63 located downstream from gumming device 61 along packing path P3, and which folds panels 20', 20", 20"' and 20"" (the latter two superimposed and glued to each other) so that panels 20"' and 20"" (superimposed and glued to each other) rest on panel 15' to form front wall 18 of lid 11. More specifically, folding device 63 simultaneously folds panel 18' with respect to panel 17', panel 18" with respect to panel 18', and panel 20' with respect to panel 18" so as to bring panel 20' into contact with and glue it to panel 17' (by means of glue 62) and at the same time form front box wall 18 of lid 11, with panel 18' and panel 18" inclined with respect to each other. Packing conveyor 54 is equipped with a pressure device 64 located downstream from folding device 63 along packing path P3, and which keeps panels 20' and 17' pressed together to ensure they are glued firmly. In a preferred embodiment, folding device 63 comprises a contrasting body about which panels 18' and 18" are folded to form front wall 18 of lid 11, as described in detail in Patent Application BO2011A000426, which is included herein by way of reference.

[0044] Packing conveyor 54 is equipped with a gumming device 65 located along packing path P3, downstream from pressure device 64, to deposit glue 66 (Figure 16) on panel 20' (already folded and glued onto panel 17') of each outer blank 23. Packing conveyor 54 is equipped with a folding device 67 located downstream from gumming device 65 along packing path P3, and which, on each lateral appendix of panel 17', simultaneously folds wing 19' with respect to panel 17', wing

19" with respect to wing 19', and wing 19"' with respect to wing 19", so as to bring wing 19"' into contact with panel 20' and at the same time form lateral box wall 19 of lid 11, with wing 19' and wing 19" inclined with respect to each other. Packing conveyor 54 is equipped with a pressure device 68 located downstream from folding device 67 along packing path P3, and which keeps wings 19"' and panel 20' (already folded and glued onto panel 17') pressed together to ensure they are glued firmly. Folding device 67 is located at the end of a straight portion of packing path P3; and pressure device 68 is located along a curved portion, and comprises grippers mounted to rotate and accompany each outer blank 23 along an arc of the curved portion of packing path P3. In a preferred embodiment, folding device 67 comprises two contrasting bodies about which wings 19' and 19" are folded to form lateral walls 19 of lid 11, as described in detail in Patent Application BO2011A000426, which is included herein by way of reference.

[0045] In a preferred embodiment shown in Figure 17, packing conveyor 54 is defined by a conveyor belt looped about two end pulleys and supporting a number of packing pockets 55, so packing path P3 is U-shaped and extends between input station S6 located along a straight initial portion of packing path P3, and output station S7 located along a straight end portion of packing path P3 connected to the straight initial portion by a semicircular intermediate portion. Folding device 67 and pressure device 68 are located along this semicircular intermediate portion.

[0046] As shown in Figures 18 and 19, packing unit 33 comprises a packing conveyor 69 with a number of packing pockets 70, each for housing an outer blank 23 and corresponding inner container 3, and for feeding outer blank 23 and inner container 3 along a packing path P4 extending between an input station S8 and an output station S10. At input station S8, a partly prefolded outer blank 23 from packing conveyor 54 is fed into a packing pocket 70 so as to further fold outer blank 23. At a feed station S9 between input station S8 and output station S10, an inner container 3 is fed into a packing pocket 70 and onto the previously inserted outer blank 23. More specifically, rear wall 8 of inner container 3 is positioned resting on panel 15' of outer blank 23. At output station S10, outer container 4 (formed by folding outer blank 23 about inner container 3) is expelled from packing pocket 70 and fed to processing unit 34.

[0047] At input station S8, a folding device 71 folds tabs 29 of outer blank 23 ninety degrees (about corresponding transverse fold lines 28) with respect to wings 16", and then, by inserting outer blank 23 inside packing pocket 70, folds panel 13' ninety degrees (about corresponding transverse fold line 28), and folds the two wings 16" ninety degrees (about corresponding longitudinal fold lines 27, while panel 17' of outer blank 23 remains coplanar with panel 15'). In other words, after tabs 29 are folded 90°, insertion of outer blank 23 inside packing pocket 70 folds panel 13' and the two wings 16" ninety degrees.

[0048] Between feed station S9 and output station S10, a folding device 72 folds panel 17' of outer blank 23 (i.e. lid 11) 90° (about corresponding transverse fold line 28) with respect to panel 15', and at the same time slides inner container 3 axially with respect to outer blank 23 (as explained more clearly below). Directly downstream from folding device 72, a folding device 73 folds panel 14' ninety degrees (about corresponding transverse fold line 28). Folding outer blank 23 is completed at output station S10 as outer container 4 is expelled from packing pocket 70 : as outer container 4 is expelled, a folding device 74 folds wings 16' ninety degrees (about corresponding longitudinal fold lines 27) onto wings 16" to form lateral walls 16 of outer container 4. A gumming device (not shown) is preferably provided directly upstream from folding device 74 to deposit glue between wings 16' and 16" just before wings 16' are folded.

[0049] In a preferred embodiment shown in the attached drawings, packing conveyor 69 is defined by a wheel which rotates in steps about a central horizontal axis of rotation 75, so packing path P4 extending from input station S8 to output station S10 is circular.

[0050] As shown in Figure 17, packing unit 33 comprises a transfer conveyor 76, which transfers the prefolded outer blanks 23 from output station S7 of packing conveyor 54 to input station S8 of packing conveyor 69. Transfer conveyor 76 is located beneath packing conveyor 69, and comprises two parallel conveyor belts spaced apart and supporting pairs of pockets, each of which carries an outer blank 23 from output station S7 of packing conveyor 54 to input station S8 of packing conveyor 69. Transfer conveyor 52 of packing unit 32 (only shown schematically in Figure 9) is preferably substantially the same as transfer conveyor 76 of packing unit 33 in Figure 17.

[0051] Along transfer conveyor 76 and upstream from input station S8 of packing conveyor 69, a gumming device 77 deposits glue between tabs 29 and panel 13' of outer blank 23. Gumming device 77 also deposits glue 78 and glue 79 (Figure 16) onto panel 20"' (previously superimposed and glued onto panel 20"") of connecting tab 20 previously folded onto panel 15'. Glue 78 and glue 79 glue rear wall 8 of inner container 3 to connecting tab 20 (i.e. to panel 20"' of connecting tab 20) as inner container 3 is fed onto panel 15' of outer blank 23 at feed station S9 of packing conveyor 69.

[0052] In a preferred embodiment, hopper 56 feeds one outer blank 23 at a time to packing conveyor 54 at input station S6 along packing path P3, and transfer conveyor 76 transfers two outer blanks 23 at a time from packing conveyor 54 to packing conveyor 69, which in this embodiment handles two outer blanks 23 at a time at each step. In an alternative embodiment not shown, hopper 56 feeds two outer blanks 23 at a time to packing conveyor 54 at input station S6 along packing path P3.

[0053] As shown in Figures 20, 21, 22 and 23, folding device 72 folds panel 17' of outer blank 23 (i.e. lid 11)

90° with respect to panel 15', and at the same time slides inner container 3 axially with respect to outer blank 23 (the axial sliding movement of inner container 3 with respect to outer blank 23 can be seen clearly by comparing the position of inner container 3 in Figures 20 and 22, before lid 11 is folded, and in Figures 21 and 23, after lid 11 is folded). The axial sliding movement of inner container 3 with respect to outer blank 23 as lid 11 is rotated about hinge 12 is the result of inner container 3 (more specifically, rear wall 8 of inner container 3) being connected mechanically to lid 11 (more specifically, to top wall 17 of lid 11) by connecting tab 20. So rotation of lid 11 about hinge 12 always results in a corresponding translatory movement of inner container 3 according to the transmission ratio produced by the mechanics of connecting tab 20.

[0054] The sliding movement of inner container 3 is necessary to also allow the 'box' lid 11 to fit back inside outer container 4 when packet 1 of cigarettes is in the closed configuration, as shown in Figure 1.

[0055] Folding device 72 is associated with an actuator 80, which rests on front wall 7 of inner container 3 and is movable in two perpendicular directions (more specifically, translates both perpendicular to and parallel to front wall 7 of inner container 3). Actuator 80 comprises a suction head 81 (Figures 22 and 23) in which suction can be turned on/off. When a packing pocket 70 containing an outer blank 23 and respective inner container 3 reaches folding device 72, actuator 80 is moved towards inner container 3 to contact front wall 7 of inner container 3. Once actuator 80 is positioned contacting front wall 7 of inner container 3, suction is activated through suction head 81 to connect suction head 81 mechanically (by suction) to front wall 7 of inner container 3.

[0056] Once suction is activated through suction head 81, actuator 80 and folding device 72 are moved together (as shown in Figures 22 and 23) and in coordinated manner to fold lid 11 and simultaneously slide inner container 3 with respect to outer blank 23 : more specifically, actuator 80 is translated parallel to front wall 7 of inner container 3 to push inner container 3 axially (by pushing on front wall 7 of inner container 3), while folding device 72 is rotated about its axis of rotation (coaxial with hinge 12 of lid 11) to rotate lid 11. Lid 11 of outer container 4 being connected mechanically to inner container 3 by connecting tab 20, operation of actuator 80 and folding device 72 must be coordinated (i.e. translation of actuator 80 must always correspond to rotation of folding device 72 according to the transmission ratio produced by the mechanics of connecting tab 20) to prevent deformation and/or tearing.

[0057] It is important to note that, besides housing outer blank 23 and corresponding inner container 3, each packing pocket 70 also clamps (retains) at least panel 15' of outer blank 23 mechanically, to prevent axial movement of panel 15' in the translation direction of inner container 3 when folding lid 11 ninety degrees.

[0058] As stated, gumming device 77 deposits glue 78 and glue 79 simultaneously onto panel 20"' (previously superimposed and glued onto panel 20"") of connecting tab 20 previously folded onto panel 15'. Glue 78 and glue 79 glue rear wall 8 of inner container 3 to connecting tab 20 (i.e. to panel 20"' of connecting tab 20) as inner container 3 is fed onto panel 15' of outer blank 23 at feed station S9 of packing conveyor 69. Glue 78 is permanent, drying glue, i.e. a certain length of time after it is deposited, the volatile components of glue 78 evaporate to form a permanent connection that can only be separated by irreparably tearing the connection apart; whereas glue 79 is non-dry, re-stick glue, i.e. even a long time after it is deposited, the characteristics of glue 79 remain unchanged, allowing the glued parts to be separated and stuck back together repeatedly. Preferably, permanent, drying glue 78 is a cold, vinyl-based glue.

[0059] In a preferred embodiment, non-dry, re-stick glue 79 is deposited far from a hinge of connecting tab 20 (the hinge of connecting tab 20 is defined by the transverse fold line 28 separating panels 20" and 20"'), whereas permanent, drying glue 78 is deposited close to the hinge of connecting tab 20, so that, as folding device 72 folds lid 11, non-dry, re-stick glue 79 is subjected to shear (i.e. greater) stress, while permanent, drying glue 78 is subjected to tensile (i.e. less) stress. Because non-dry, re-stick glue 79 is capable of achieving maximum grip much faster (practically instantaneously), it is important that it be subjected to the greater stress; and, similarly, it is important that permanent, drying glue 78 be subjected to less stress, by taking a relatively long time to achieve adequate grip.

[0060] In a preferred embodiment, the above combination of permanent, drying glue 78 and non-dry, re-stick glue 79 is not limited to the particular case described, but may be used to advantage in any application involving gluing together two separate parts to form a package by folding a blank (i.e. a sheet of packing material) about a group of articles. By way of example, each of glues 39, 43, 58, 62, 66 deposited on blanks 22 and 23 may comprise a portion of permanent, fast-dry (i.e. hot-melt) glue, and a portion of permanent, slow-dry (i.e. cold) glue. Alternatively, in each of glues 39, 43, 58, 62, 66 deposited on blanks 22 and 23, a portion of non-dry, re-stick glue, analogous to non-dry, re-stick glue 79 described, may be substituted for the portion of permanent, fast-dry glue.

[0061] It is important to note the similarity between packing units 32 and 33 : both have the same structure comprising a first packing conveyor (packing conveyors 35 and 54) defined by a conveyor belt and for prefolding the blank; a second packing conveyor (packing conveyors 46 and 69) defined by a wheel and for folding the already partly folded blank about the content; and a transfer conveyor (transfer conveyors 52 and 76) connecting the two packing conveyors. Moreover, the two second packing conveyors (packing conveyors 46 and 69) of packing units 32 and 33 perform almost all the packing operations in the same way and in the same areas, which means packing units 32 and 33 may share numerous

component parts, i.e. the same identical component part is very often present in both packing units 32 and 33 (more specifically, packing units 32 and 33 may share at least 70-80% of their component parts), thus enabling a big reduction in the production, assembly, and maintenance cost of packing machine 30.

[0062] A major advantage of cigarette packing machine 30 is its flexibility, i.e. its ability to adapt quickly and easily to the manufacture of different types of slide-open packets 1 of cigarettes (with or without hinged lids). This is due, among other things, to each packing unit 32, 33 comprising a first packing conveyor 35, 54 for prefolding blank 22, 23; and a second packing conveyor 46, 69 for completing the folding of blank 22, 23. That is, on the first packing conveyor 35, 54, blank 22, 23 can be prefolded relatively easily to form lid 11; and, once lid 11 is formed, folding blank 22, 23 may be completed 'conventionally' (i.e. in the same way as a standard blank) with no particular complications.

[0063] The flexibility of packing machine 30 is such as to enable it to easily produce both the hinged-lid, slide-open packet 1 of cigarettes in Figures 1-5, in which lid 11 is hinged to outer container 4 (and therefore 'integral' with outer blank 23), and the hinged-lid, slide-open packet 1 of cigarettes in Figures 24 and 25, in which lid 11 is hinged to inner container 3 (and therefore 'integral' with inner blank 22). The main alteration to packing machine 30, to switch production over from the Figure 1-5 to the Figure 24-25 packet 1 of cigarettes, consists in forming lid 11 on packing conveyor 35 of packing unit 32 as opposed to packing conveyor 54 of packing unit 33. And since both packing conveyors 35 and 54 have the same identical basic structure, this alteration can be made without seriously affecting packing machine 30.

[0064] For the sake of simplicity, the parts of the Figure 24-25 packet 1 of cigarettes are indicated using the same reference numbers as for packet 1 of cigarettes in Figures 1-5 : the Figure 24-25 packet 1 of cigarettes comprises a wrapped group 2 of cigarettes (shown in Figure 24); a rigid inner container 3 actually housing wrapped group 2; and a rigid outer container 4 housing inner container 3 in sliding manner.

[0065] Inner container 3 is parallelepiped-shaped, and comprises a bottom wall 5 (not shown in Figures 24 and 25); an open top end 6 opposite bottom wall 5; a front wall 7 and rear wall 8 opposite and parallel to each other; and two parallel lateral walls 9 interposed between walls 7 and 8. Inner container 3 has a lid 11 hinged to inner container 3 along a hinge 12 to rotate, with respect to inner container 3, between an open position and a closed position opening and closing open top end 6 of inner container 3 respectively. Lid 11 has a top wall 17, a rear wall 82, and two lateral walls 19. It is important to note that lid 11 is a 'box' lid, i.e. has walls 17, 19 and 82 perpendicular to one another to form a 'box-shape' lid 11, i.e. to bound a three-dimensional inner space.

[0066] Outer container 4 is parallelepiped-shaped, and has an open top end 10 through which inner container 3 moves; a bottom wall 13 opposite open top end 10; a front wall 14 and rear wall 15 opposite and parallel to each other; and two parallel lateral walls 16 interposed between walls 14 and 15.

[0067] Rear wall 15 of outer container 4 is connected to top wall 17 of lid 11 by a connecting tab 20 to rotate lid 11 'automatically' (i.e. without the user having to touch lid 11) as inner container 3 slides with respect to outer container 4.

[0068] Front wall 14 of outer container 4 has a through window 21 allowing access to underlying front wall 7 of inner container 3 facing front wall 14 of outer container 4, to exert thrust on inner container 3 to move it between the open and closed configurations.

[0069] Containers 3 and 4 of the Figure 24-25 packet 1 of cigarettes are formed from corresponding blanks 22 and 23 as shown in Figures 26 and 27. Among other things, each blank 22, 23 comprises a number of parts, which are indicated, where possible, using the same reference numbers, with superscripts, as for the corresponding walls of respective container 3, 4.

[0070] With reference to Figure 26, inner blank 22 has two longitudinal fold lines 24, and a number of transverse fold lines 25 which define, between the two longitudinal fold lines 24, a panel 7' forming front wall 7 of inner container 3; a panel 5' forming bottom wall 5 of inner container 3; a panel 8' forming rear wall 8 of inner container 3; a panel 82' forming an outer portion of rear wall 82 of lid 11; a panel 17' forming an outer portion of top wall 17 of lid 11; a panel 17" forming an inner portion of top wall 17 of lid 11; a panel 82" forming an inner portion of rear wall 82 of lid 11; and a reinforcing panel 8", which is superimposed and glued onto the inside of panel 8' to thicken (reinforce) rear wall 8 of inner container 3.

[0071] Panel 7' has two lateral wings 9', which form respective outer portions of lateral walls 9 of inner container 3, are located on opposite sides of panel 7', and are separated from panel 7' by longitudinal fold lines 24. Panel 8' has two lateral wings 9", which are glued to corresponding wings 9', form respective inner portions of lateral walls 9 of inner container 3, are located on opposite sides of panel 8', and are separated from panel 8' by longitudinal fold lines 24. Each lateral wing 9" of panel 8' has a tab 26 separated from respective lateral wing 9" by a transverse fold line 25, and which is superimposed and glued onto the inside of panel 5'.

[0072] Panel 82' has two lateral wings 19', which form lateral walls 19 of lid 11, are located on opposite sides of panel 82', and are separated from panel 82' by longitudinal fold lines 24. Each lateral wing 19' of panel 82' has a tab 83 separated from respective lateral wing 19' by a transverse fold line 25, and which is superimposed and glued onto the inside of panel 17'.

[0073] Panel 8" has two lateral wings 84, which are superimposed and glued onto the inside of corresponding wings 9", are located on opposite sides of panel 8", and are separated from panel 8" by longitudinal fold lines 24.

[0074] With reference to Figure 27, outer blank 23 has two longitudinal fold lines 27, and a number of transverse fold lines 28 which define, between the two longitudinal fold lines 27, a panel 14' forming front wall 14 of outer container 4; a panel 13' forming bottom wall 13 of outer container 4; and a panel 15' forming rear wall 15 of outer container 4. Panel 15' is connected along a transverse fold line 28 to a reinforcing panel 15", which is folded 180° about respective transverse fold line 28 and glued onto an inner surface of panel 15' to thicken (reinforce) rear wall 15 of outer container 4.

[0075] Panel 14' has two lateral wings 16', which form respective outer portions of lateral walls 16, are located on opposite sides of panel 14', and are separated from panel 14' by longitudinal fold lines 27. Panel 15' has two lateral wings 16", which are glued to corresponding wings 16', form respective inner portions of lateral walls 16, are located on opposite sides of panel 15', and are separated from panel 15' by longitudinal fold lines 27. Each lateral wing 16" of panel 15' has a tab 29 separated from respective lateral wing 16' by a transverse fold line 28.

[0076] The way in which inner blank 22 is prefolded on packing unit 32, as blank 22 is fed by packing conveyor 35 along packing path P1, will now be described with reference to Figures 28 and 29.

[0077] Firstly, the two tabs 83 are folded 90° about corresponding transverse fold lines 25 and with respect to wings 19'; and the two wings 19' (together with the previously folded tabs 83) are folded 90° about corresponding longitudinal fold lines 24 and with respect to panel 82'. At this point, glue 85 is deposited on panel 17", and glue 86 is deposited on panel 17'. Panel 17' (together with panels 17", 82" and 8") is then folded 90° about corresponding transverse fold line 25 and with respect to panel 82', so as to bring panel 17' into contact with, and glue it to, tabs 83 by means of glue 86.

[0078] At this point, glue 87 is deposited on wings 9", glue 88 is deposited on panel 82', and glue 89 is deposited on panel 8'. And, finally, in a single folding operation, panel 17" is folded 180° about corresponding transverse fold line 25 and with respect to panel 17', and, at the same time, panel 82" is folded 90° about corresponding transverse fold line 25 and with respect to panel 17". As a result, panel 17" is brought into contact with, and glued to, tabs 83 by means of glue 85; panel 82" is brought into contact with, and glued to, panel 82' by means of glue 88; panel 8" is brought into contact with, and glued to, panel 8' by means of glue 89; and wings 84 are brought into contact with, and glued to, wings 9" by means of glue 87.

[0079] It is important to note that tabs 83 are inserted between panels 17' and 17", and are glued to the topside of panel 17' by glue 86, and to the underside of panel 17" by glue 85.

[0080] Figures 30 and 31 show a variation in the way in which inner blank 22 is prefolded on packing unit 32, as blank 22 is fed by packing conveyor 35 along packing path P1, and which differs solely by first folding the two wings 19' (together with tabs 83 not yet folded) 90° about corresponding longitudinal fold lines 24 and with respect to panel 82', and then folding the two tabs 83 ninety degrees about corresponding transverse fold lines 25 and with respect to wings 19' (folded previously). In other words, the only difference lies in the order in which wings 19' and corresponding tabs 83 are folded.

[0081] Once inner blank 22 is prefolded on packing unit 32, as blank 22 is fed by packing conveyor 35 along packing path P1 (i.e. once lid 11 on inner blank 22 is formed), the prefolded inner blank 22 is fed, as described above, to packing conveyor 46 where it is folded about wrapped group 2 of cigarettes, i.e. to complete inner container 3, in exactly the same way as described with reference to Figure 13.

[0082] Outer blank 23 in Figure 27 is much easier to fold than outer blank 23 in Figure 7 : prefolding the Figure 27 outer blank 23 along packing path P3 comprises simply folding reinforcing panel 15" 180° onto panel 15', and the prefolded outer blank 23 is folded about inner container 3 in exactly the same way as described with reference to Figures 18 and 19.

[0083] The packing method and corresponding packing machine 30 described above have numerous advantages, by enabling high-output production of hinged-lid, slide-open packets 1 of cigarettes (i.e. a large number of packets 1 of cigarettes per unit of time) while still maintaining a high quality standard. This is achieved by virtue of the design of packing unit 33, which, by completing the box walls 18 and 19 of lid 11 on packing conveyor 54 (i.e. before applying outer blank 23 to inner container 3), enables box walls 18 and 19 to be formed easily and effectively, while at the same time making outer blank 23 much easier to fold about inner container 3. More specifically, box walls 18 and 19 of lid 11 are easier (and therefore faster) to form along a straight packing path (such as packing path P3 of packing conveyor 54), whereas outer blank 23 is easier (and therefore faster) to fold about inner container 3 along a circular packing path (such as packing path P4 of packing conveyor 69). By virtue of the design of packing unit 33, all the folding operations are therefore performed in the most favourable conditions, and therefore faster (thus ensuring a high output rate of the packing process), while still maintaining a high quality standard.

[0084] What is said above, relative to packing unit 33 for forming lid 11 of the Figure 1-5 packet 1 of cigarettes, obviously also applies to packing unit 32 for forming lid 11 of the packet 1 of cigarettes in Figures 24 and 25.

[0085] Also important to note is the effectiveness of pressure devices 41, 45, 60, 64 and 68, which, directly downstream from the point at which the corresponding portions of blanks 22 and 23 are superimposed, hold the superimposed portions together to ensure they are glued firmly, even at high packing cycle speeds (i.e. high packing output rates). Without pressure devices 41, 45, 60, 64 and 68, corresponding folding devices 40, 44, 59, 63 and 67 would have to be slowed down to give the corre-

sponding superimposed portions more time to achieve adequate grip, thus seriously reducing the output rate of the packing process.

[0086] Last but not least, the packing method and corresponding packing machine 30 described are extremely 'flexible', i.e. provide for switching quickly and easily from one type of slide-open packet 1 of cigarettes to another (e.g. from the Figure 1-5 to the Figure 24-25 packet 1 of cigarettes).

Claims

1. A packing machine (30) for producing a slide-open package (1) of smoking articles with a hinged box lid (11); the packing machine (30) comprising:

a first packing unit (31) for producing a wrapped group (2) of smoking articles;
a second packing unit (32) which, by folding an inner blank (22) around the wrapped group (2) of smoking articles, forms an inner container (3) housing the group (2) of smoking articles and having an open top end (6) allowing access to the smoking articles and closable by the hinged lid (11); and
a third packing unit (33) which, by folding an outer blank (23) around the inner container (3), forms an outer container (4) in which the inner container (3) is housed slidably;
wherein the second packing unit (32) or third packing unit (33) comprises :

a first packing conveyor (35; 54) which receives a corresponding flat blank (22; 23) and feeds the blank (22; 23) along a first packing path (P1; P3);
at least one first folding device (40, 44; 59, 63, 67) located along the first packing path (P1; P3) to pre-fold the blank (22; 23);
a second packing conveyor (46; 69) which receives the blank (22; 23) folded partly along the first packing conveyor (35; 54), receives a corresponding content (2; 3), and feeds the blank (22; 23) and the content (2; 3) along a second packing path (P2; P4); and
at least one second folding device (48, 49, 50; 71, 72, 73, 74) located along the second packing path (P2; P4), and which folds the blank (22; 23) about the content (2; 3) to form the container (3; 4);
the packing machine (30) being **characterized by** comprising:

a hopper (37; 56) which feeds one blank (22; 23) at a time to the first packing conveyor (35; 54) at an input station (S1; S6) of the first packing path (P1; P3); and
a transfer conveyor (52; 76) which transfers two partly folded blanks (22; 23) at a time from the first packing conveyor (35; 54) to the second packing conveyor (46; 69), and is located between an output station (S2; S7) of the first packing path (P1; P3) and an input station (S3; S8) of the second packing path (P2; P4).

2. A packing machine (30) according to Claim 1, wherein the second packing unit (32) or third packing unit (33) comprises at least one gumming device (57, 61, 65) located along the first packing path (P1; P3), upstream from the first folding device (40, 44; 59, 63, 67), to apply glue (58, 62, 66; 85, 86, 87, 88, 89) to the blank (22; 23).

3. A packing machine (30) according to Claim 1 or 2, wherein:

the blank (22; 23) has at least two longitudinal fold lines (24; 27); and a number of transverse fold lines (25; 28) perpendicular to the longitudinal fold lines (24; 27) and parallel to a hinge (12) of the hinged lid (11); and
the first packing conveyor (35; 54) feeds the blank (22; 23) crosswise at all times along the first packing path (P1; P3), i.e. with the transverse fold lines (25; 28) parallel to the travelling direction.

4. A packing machine (30) according to Claim 1 or 2, wherein:

the blank (22; 23) has at least two longitudinal fold lines (24; 27); and a number of transverse fold lines (25; 28) perpendicular to the longitudinal fold lines (24; 27) and parallel to a hinge (12) of the hinged lid (11); and
the first packing conveyor (35; 54) feeds the blank (22; 23) longitudinally at all times along the first packing path (P1; P3), i.e. with the longitudinal fold lines (24; 27) parallel to the travelling direction.

5. A packing machine (30) according to one of Claims 1 to 4, wherein:

the first packing conveyor (35; 54) comprises a conveyor belt looped around two end pulleys and supporting a number of first packing pockets (36; 55); and
the first packing path (P1; P3) is U-shaped, and extends between an input station (S1; S6) located along a straight initial portion of the first pack-

ing path (P1; P3), and an output station (S2; S7) located along a straight end portion of the first packing path (P1; P3) connected to the straight initial portion by a semicircular intermediate portion.

6. A packing machine (30) according to one of Claims 1 to 5, wherein:

the second packing conveyor (46; 69) is defined by a rotary wheel supporting a number of second packing pockets (47; 70); and
the second packing path (P2; P4) is circular, and extends between an input station (S3; S8) and an output station (S5; S10).

7. A packing machine (30) according to one of Claims 1 to 6, and comprising:

an input station (S3; S8) of the second packing path (P2; P4), where the partly folded blank (22; 23) is fed into a second packing pocket (47; 70) of the second packing conveyor (46; 69) to fold the blank (22; 23); and
a feed station (S4; S9) of the second packing path (P2; P4), which is located downstream from the input station (S8), and in which the content (2; 3) is fed into the second packing pocket (47; 70) of the second packing conveyor (46; 69) and paired with the blank (22; 23).

8. A packing machine (30) according to Claim 7, wherein, on entering the second packing pocket (46; 70), a first panel (5'; 13') of the blank (22; 23) forming a bottom wall (5; 13) of the container (3; 4) is folded 90°, and two wings (9"; 16") of the blank (22; 23) forming lateral walls (9; 16) of the container (3; 4) are folded 90°.

9. A packing machine (30) according to Claim 8, wherein, on entering the second packing pocket (70), the inner container (3) is placed on a second panel (15') of the outer blank (23) forming a rear wall (15) of the outer container (4), while a third panel (17') of the outer blank (23) forming a top wall (17) of the lid (11) is coplanar with the second panel (15').

10. A packing machine (30) according to Claim 9, wherein, downstream from the feed station (S9) of the second packing path (P4), the second folding device (71, 72, 73, 74) folds the third panel (17') of the outer blank (23) 90° with respect to the second panel (15'), to simultaneously slide the inner container (3) with respect to the blank (22; 23).

11. A packing machine (30) according to Claim 10, and comprising an actuator (80), which contacts a wall (7) of the inner container (3) and, simultaneously and in coordination with folding the third panel (17') of the outer blank (23) 90°, exerts thrust on the inner container (3) to slide the inner container (3) with respect to the outer blank (23).

12. A packing method for producing a slide-open package (1) of smoking articles with a hinged lid (11); the packing method comprising the steps of:

producing a wrapped group (2) of smoking articles by means of a first packing unit (31);
producing, by means of a second packing unit (32) and by folding an inner blank (22) around the wrapped group (2) of smoking articles, an inner container (3) housing the group (2) of smoking articles and having an open top end (6); and
producing, by means of a third packing unit (33) and by folding an outer blank (23) around the inner container (3), an outer container (4) in which the inner container (3) is housed slidably;
wherein the step of producing the inner container (3) or the step of producing the outer container (4) comprises the further steps of:

feeding a corresponding flat blank (22; 23) along a first packing path (P1; P3) by means of a first packing conveyor (35; 54);
pre-folding the blank (22; 23) by means of at least one first folding device (40, 44; 59, 63, 67) located along the first packing path (P1; P3);
transferring the partly folded blank (22; 23) from the first packing conveyor (35; 54) to a second packing conveyor (46; 69);
transferring a corresponding content (2; 3) from the second packing unit (32) to the second packing conveyor (46; 69);
feeding the blank (22; 23), together with the content (2; 3), along a second packing path (P2; P4) by means of the second packing conveyor (46; 69); and
folding the blank (22; 23) around the content (2; 3) to form the container (3; 4) by means of at least one second folding device (48, 49, 50; 71, 72, 73, 74) located along the second packing path (P2; P4);
the packing method being **characterized by** comprising the further steps of :

feeding one blank (22; 23) at a time to the first packing conveyor (35; 54) by means of a hopper (37; 56) at an input station (S1; S6) of the first packing path (P1; P3); and
transferring two partly folded blanks (22; 23) at a time from the first packing conveyor (35; 54) to the second pack-

ing conveyor (46; 69) by means of a transfer conveyor (52; 76) located between an output station (S2; S7) of the first packing path (P1; P3) and an input station (S3; S8) of the second packing path (P2; P4).

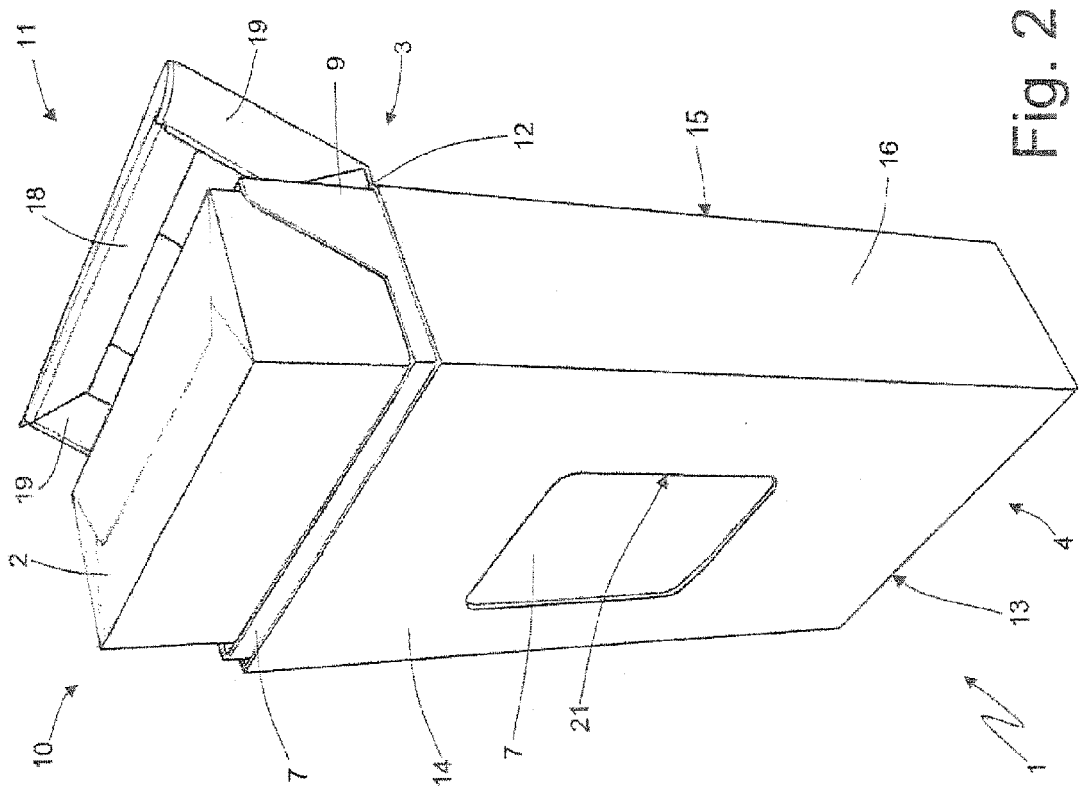


Fig. 2

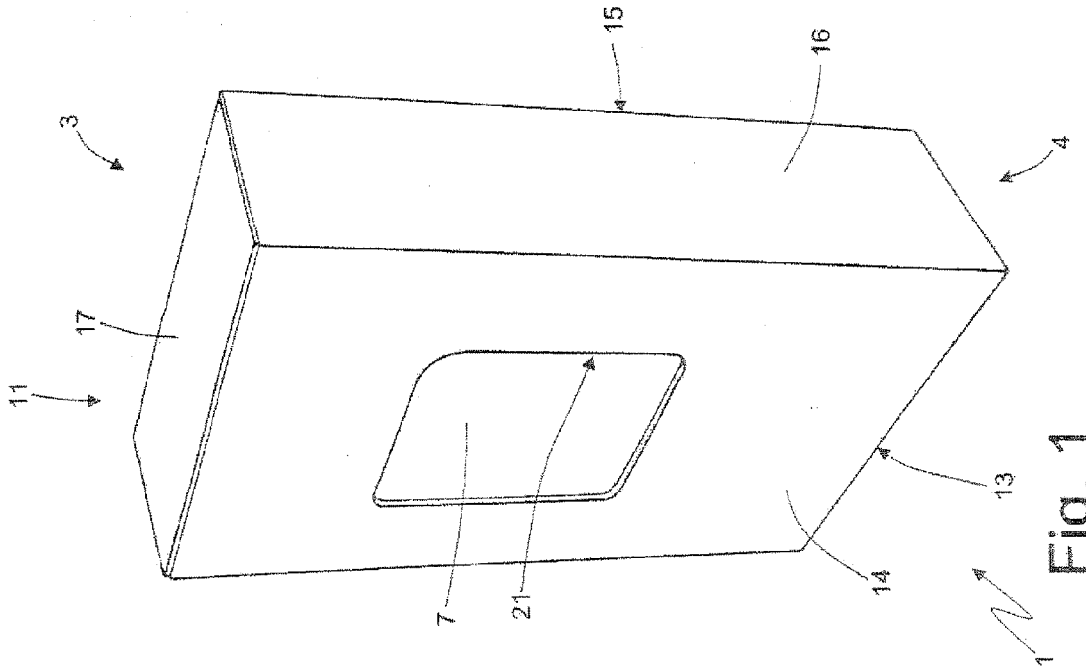


Fig. 1

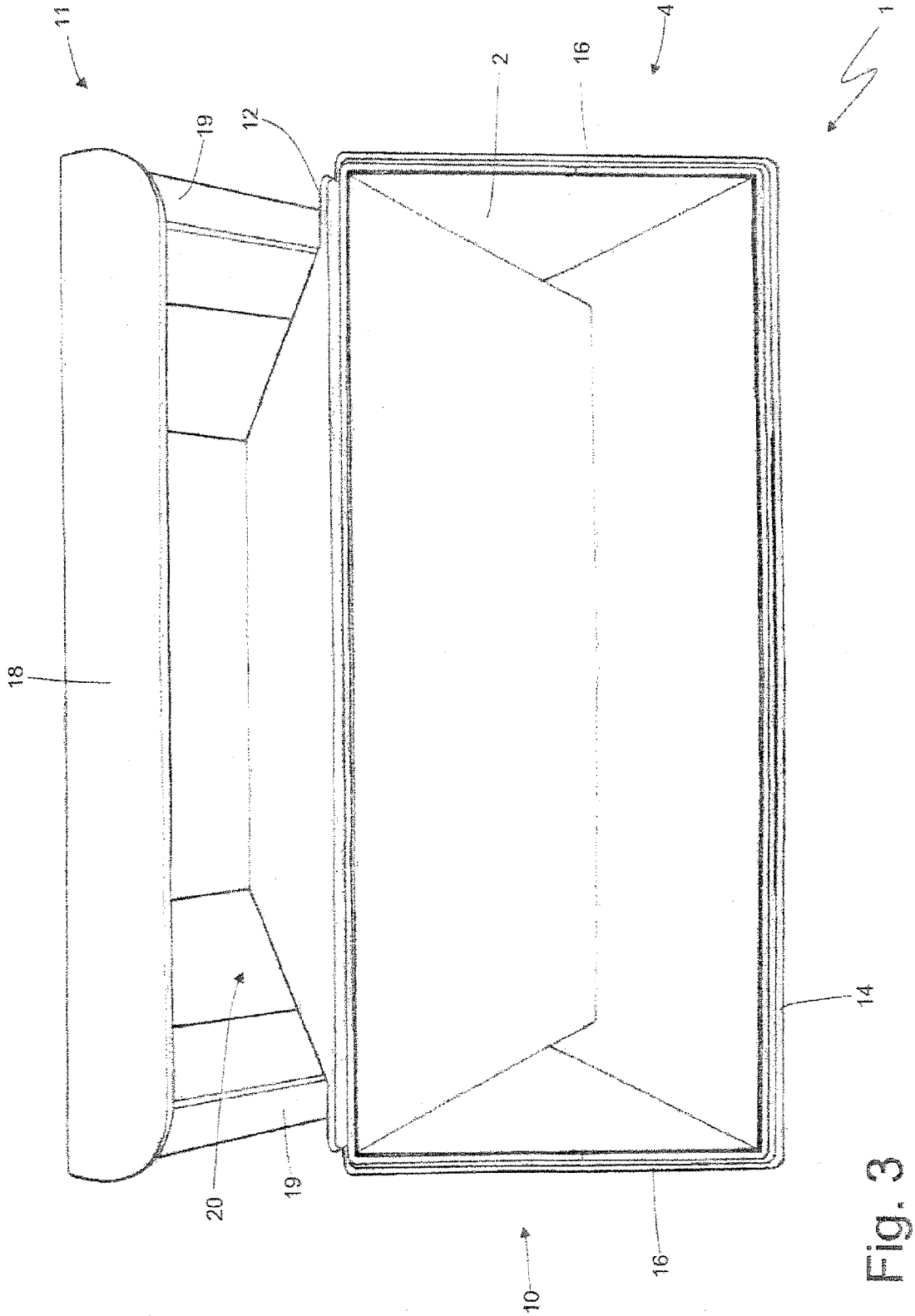


Fig. 3

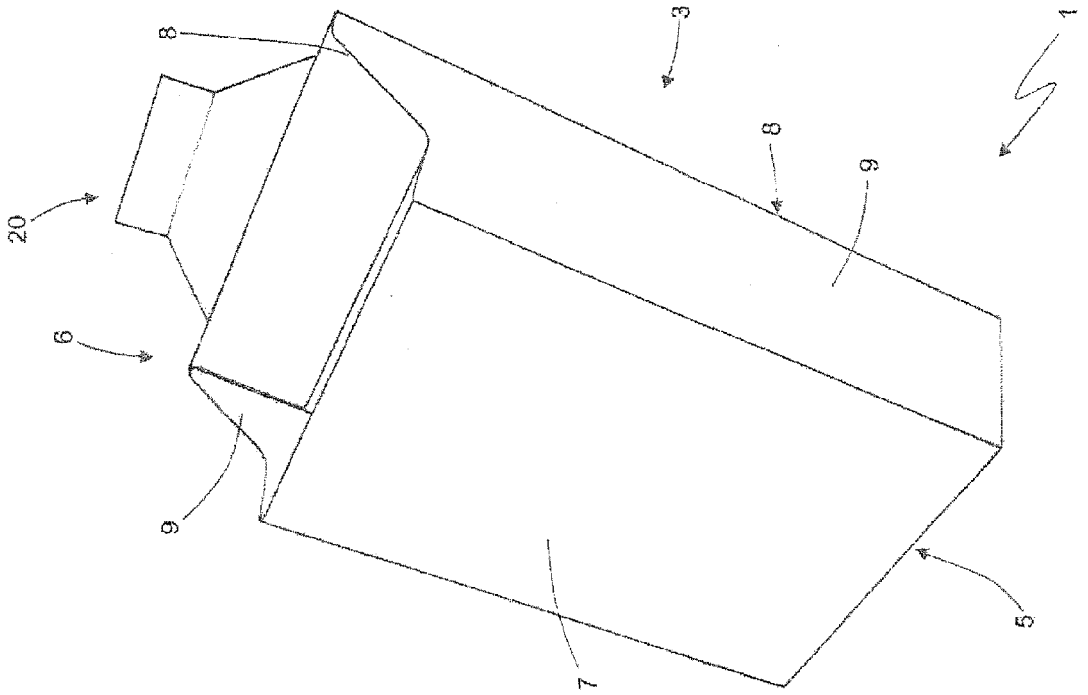
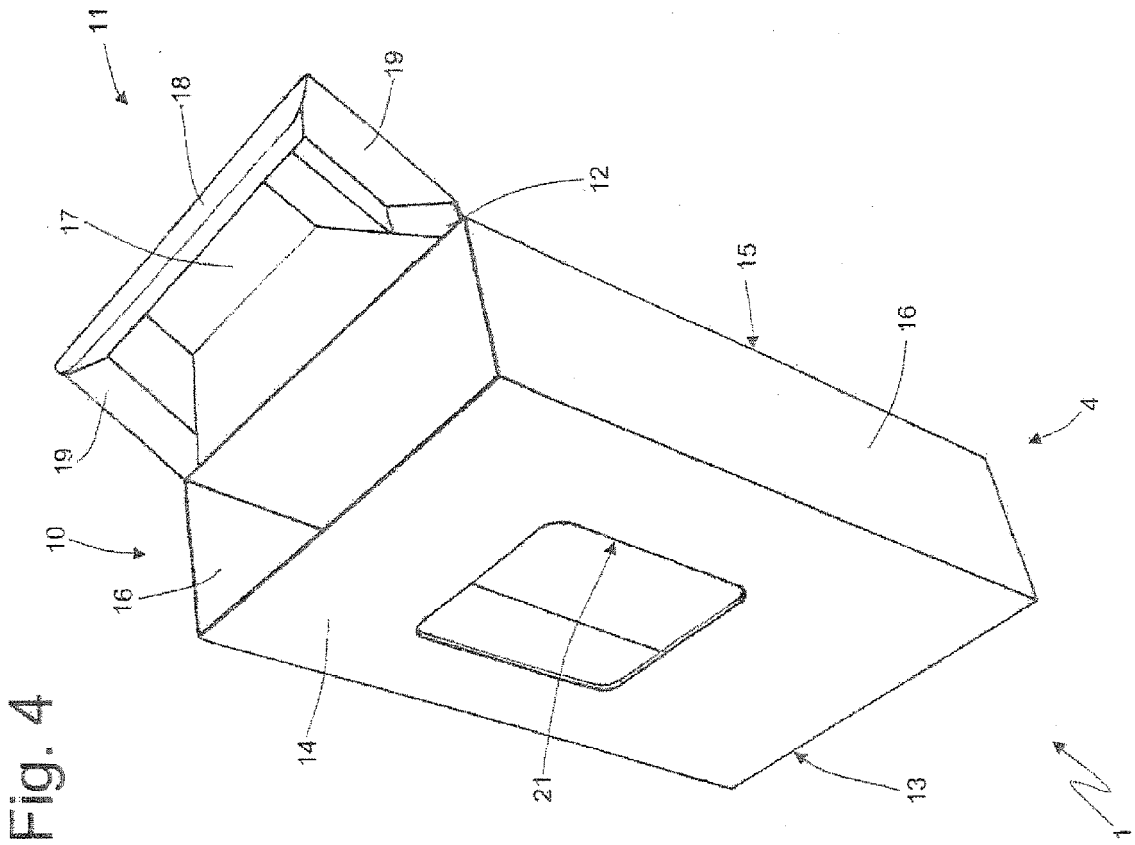


Fig. 5



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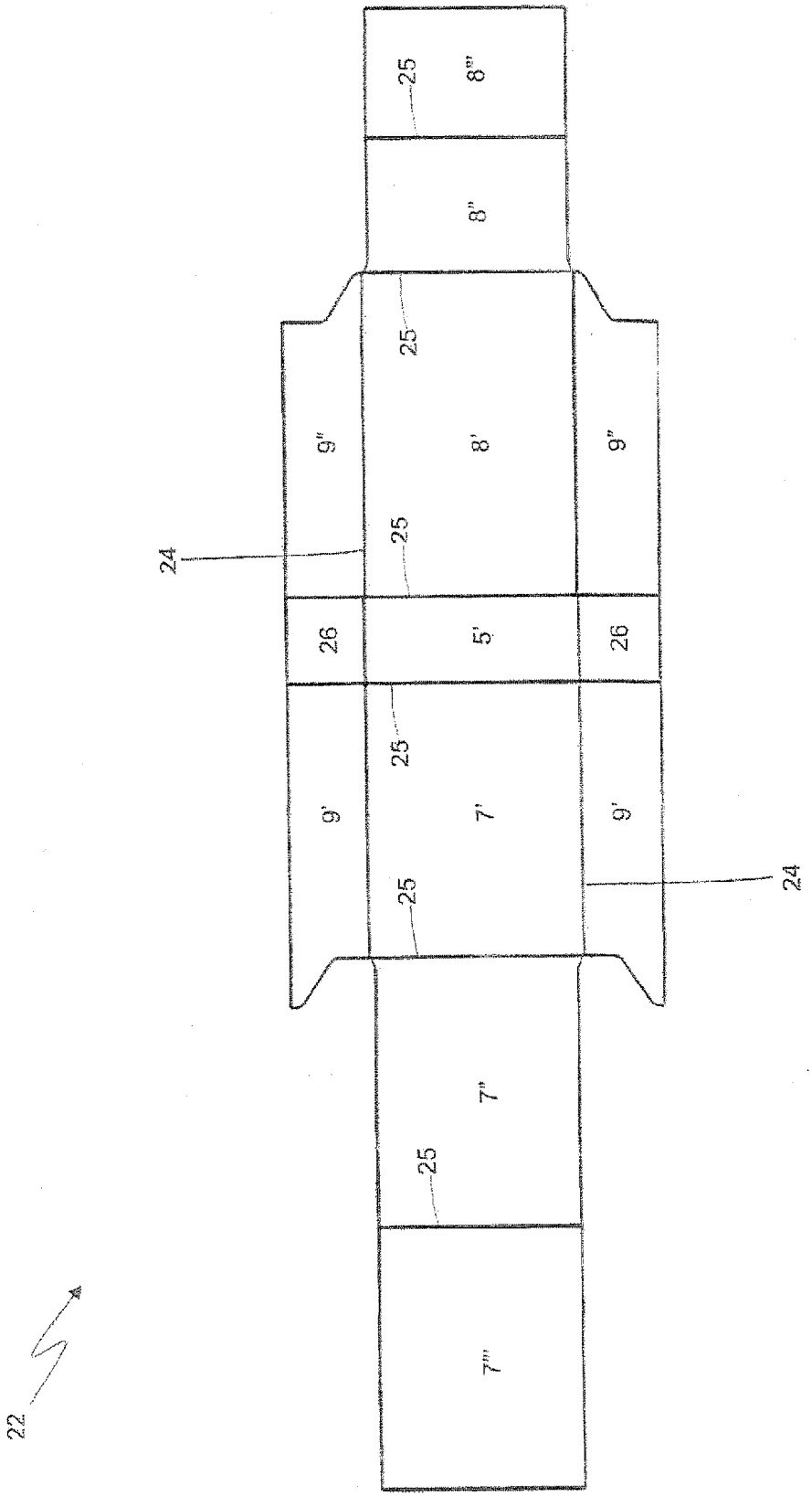

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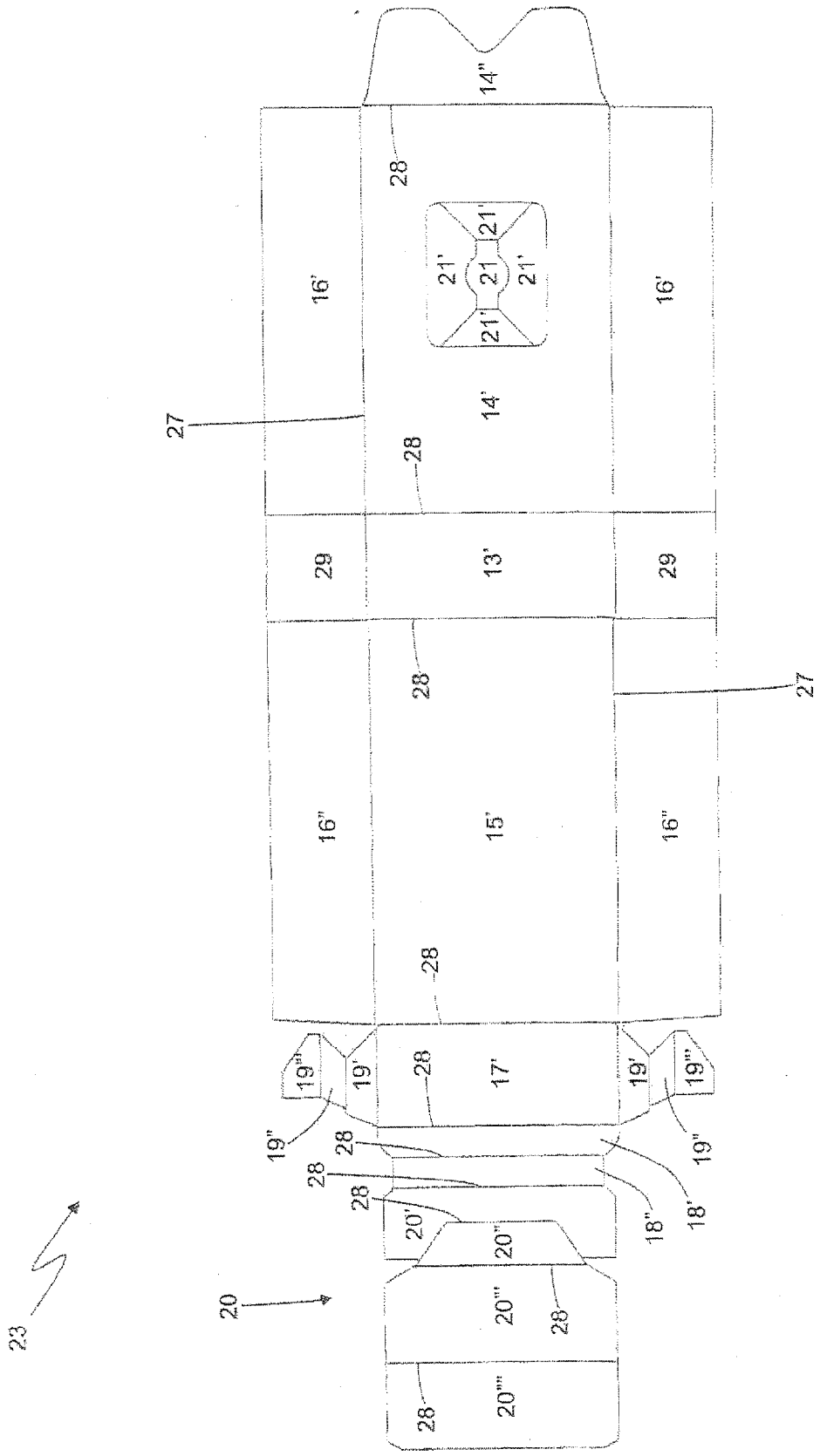
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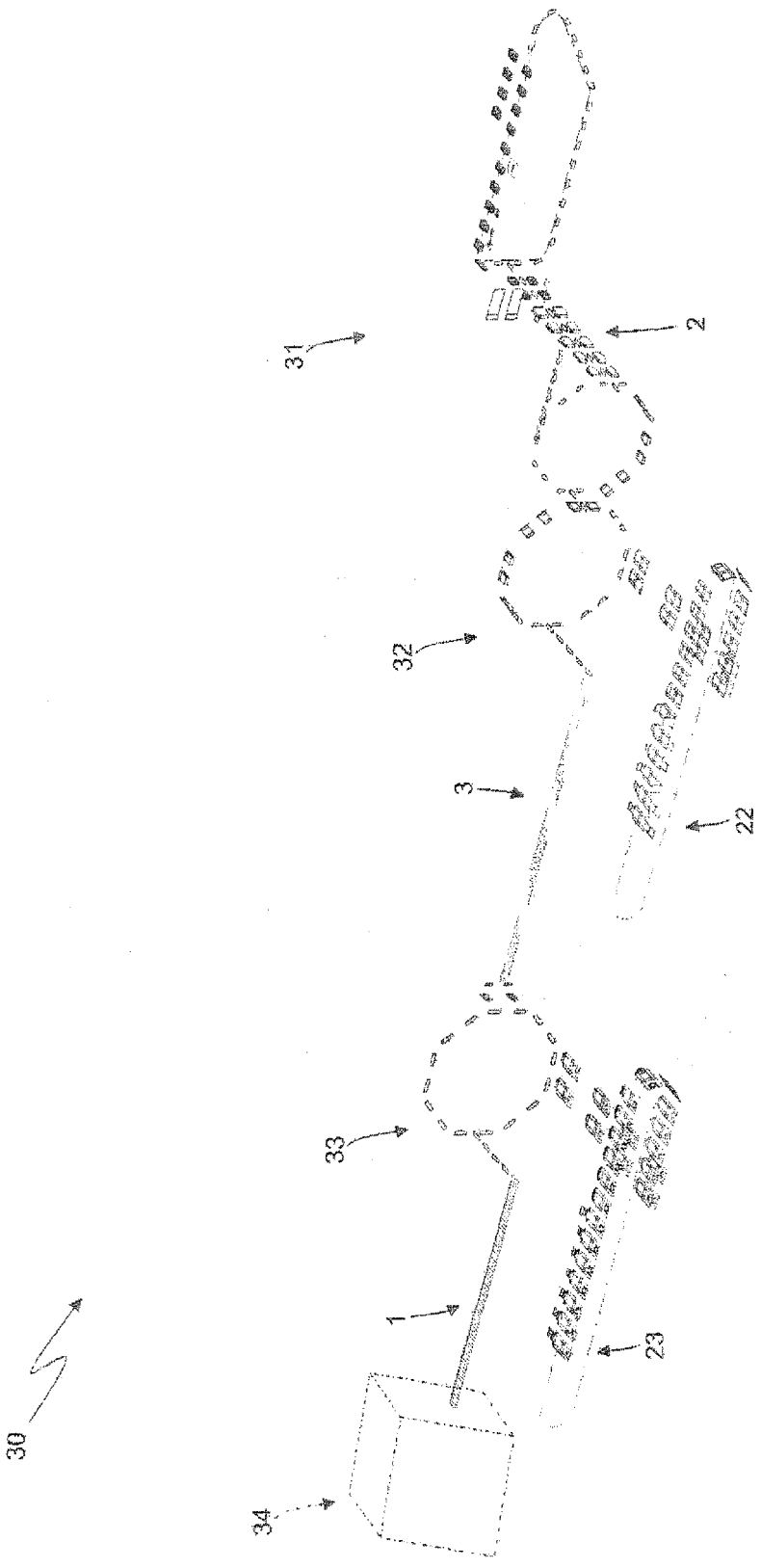
Fig. 7



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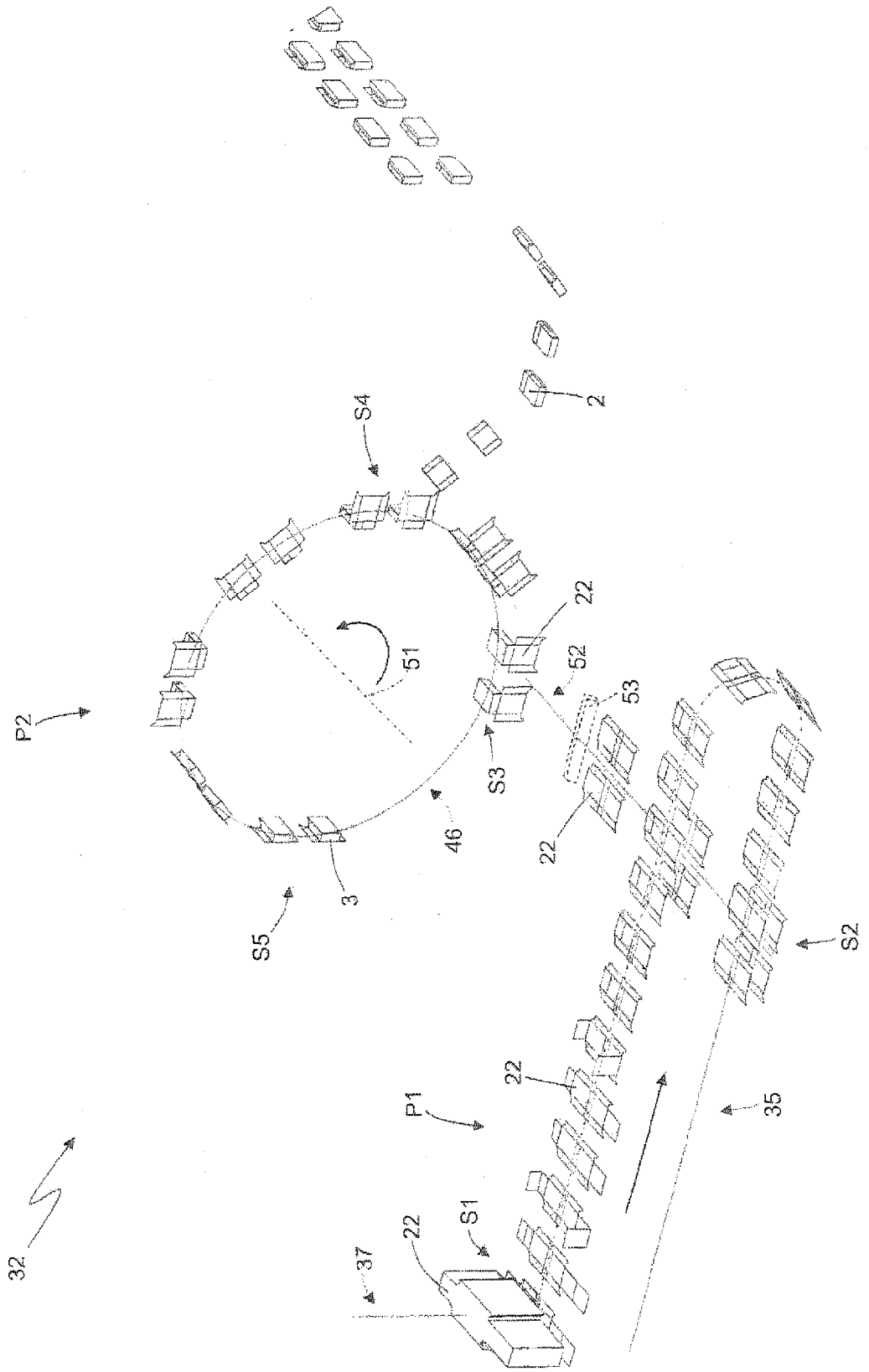

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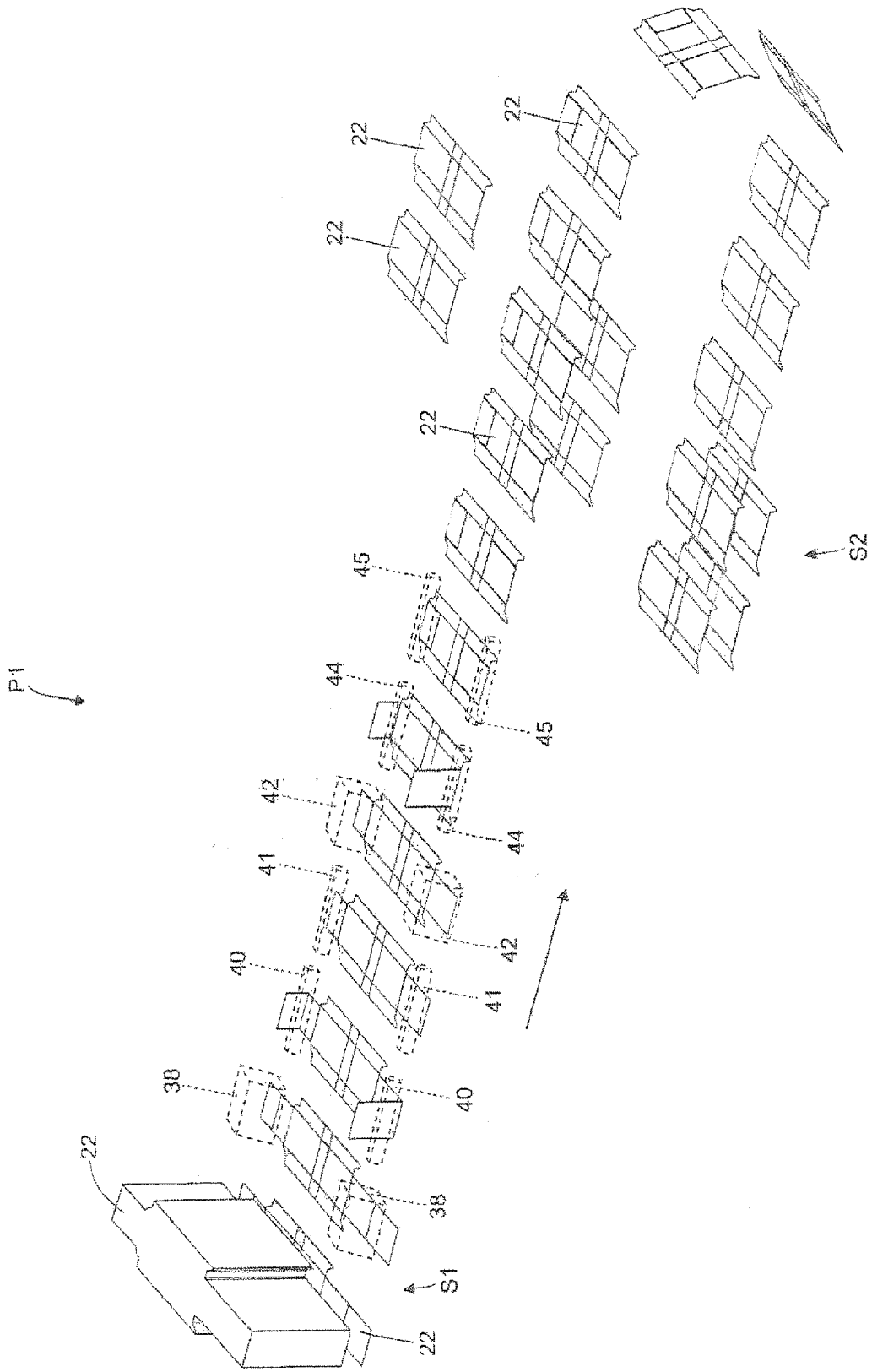

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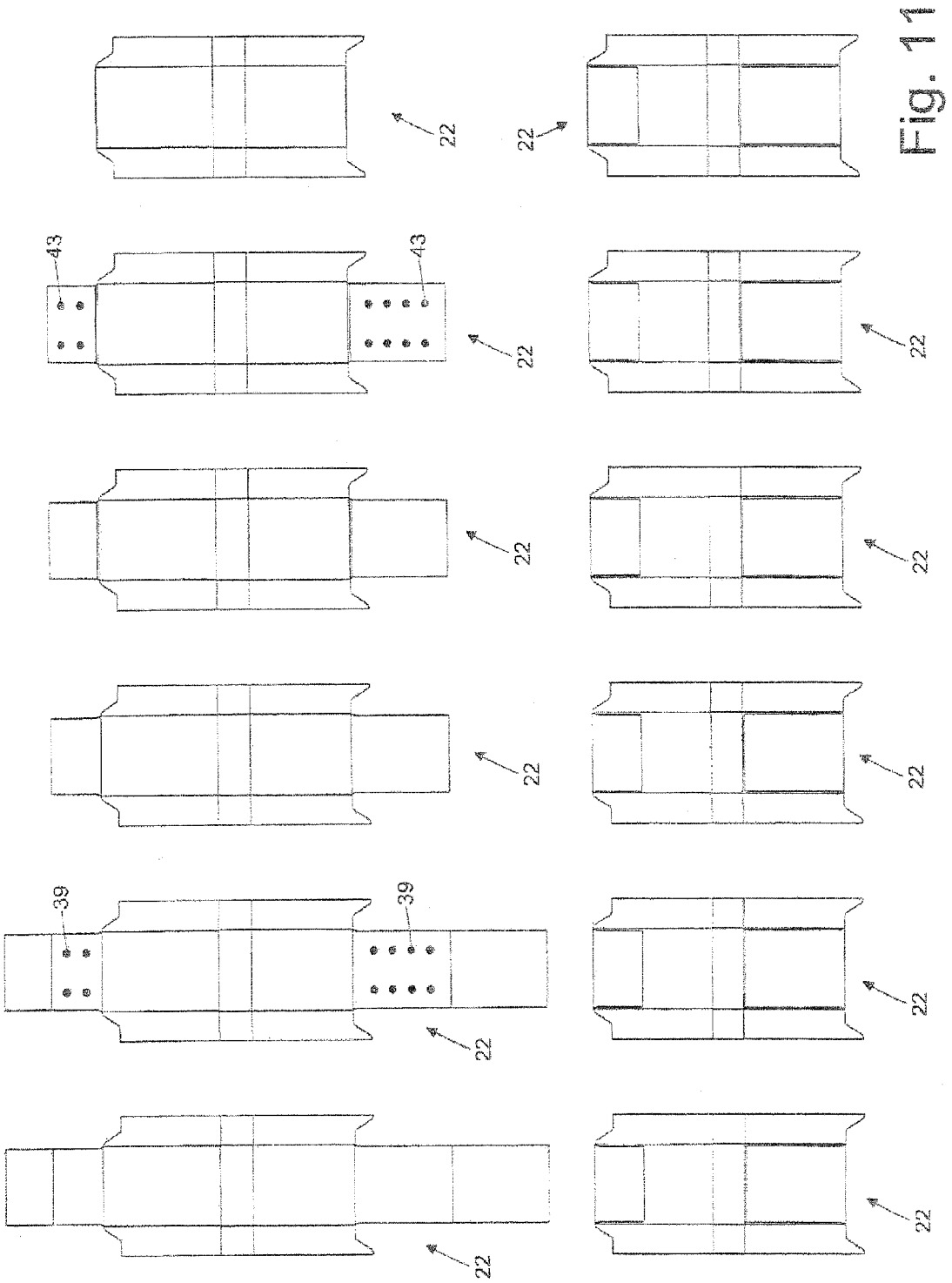

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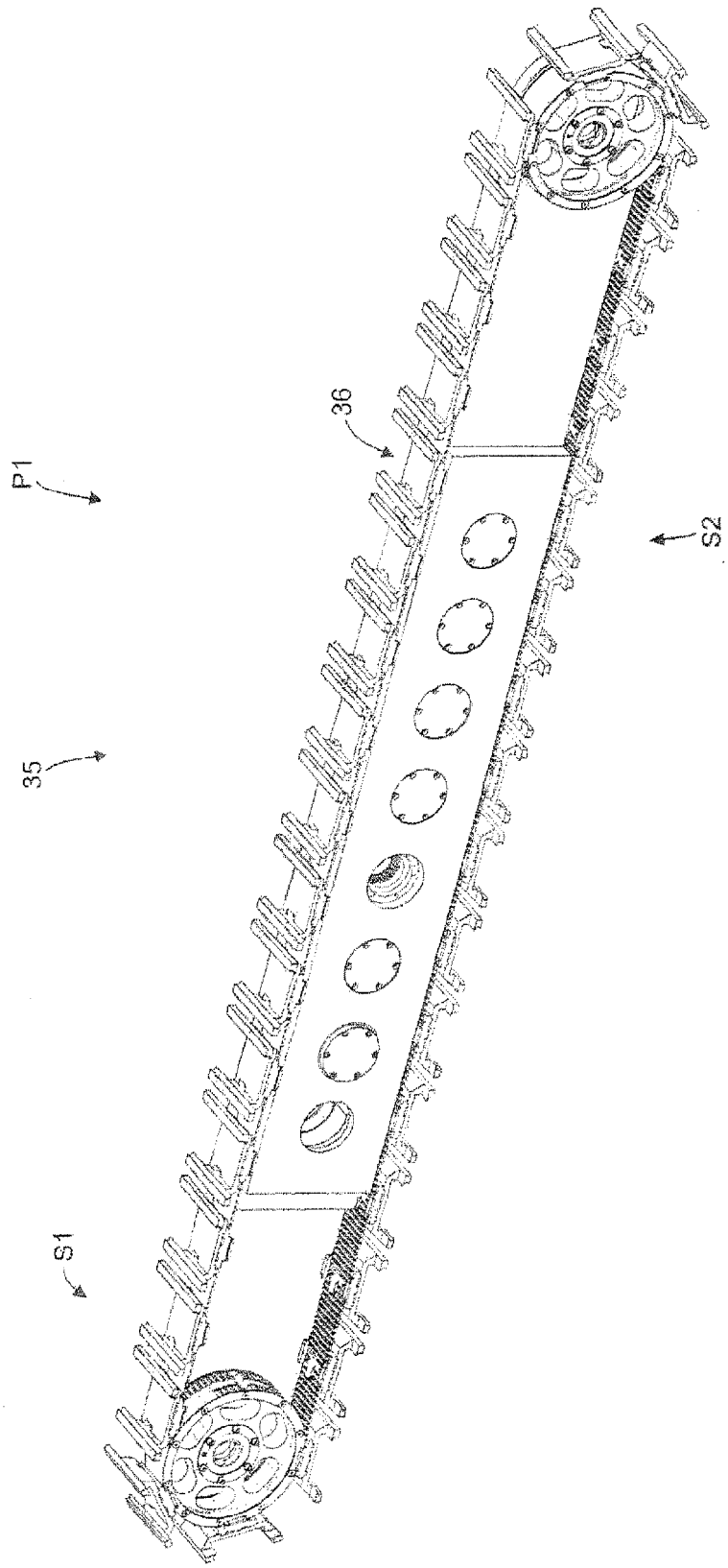

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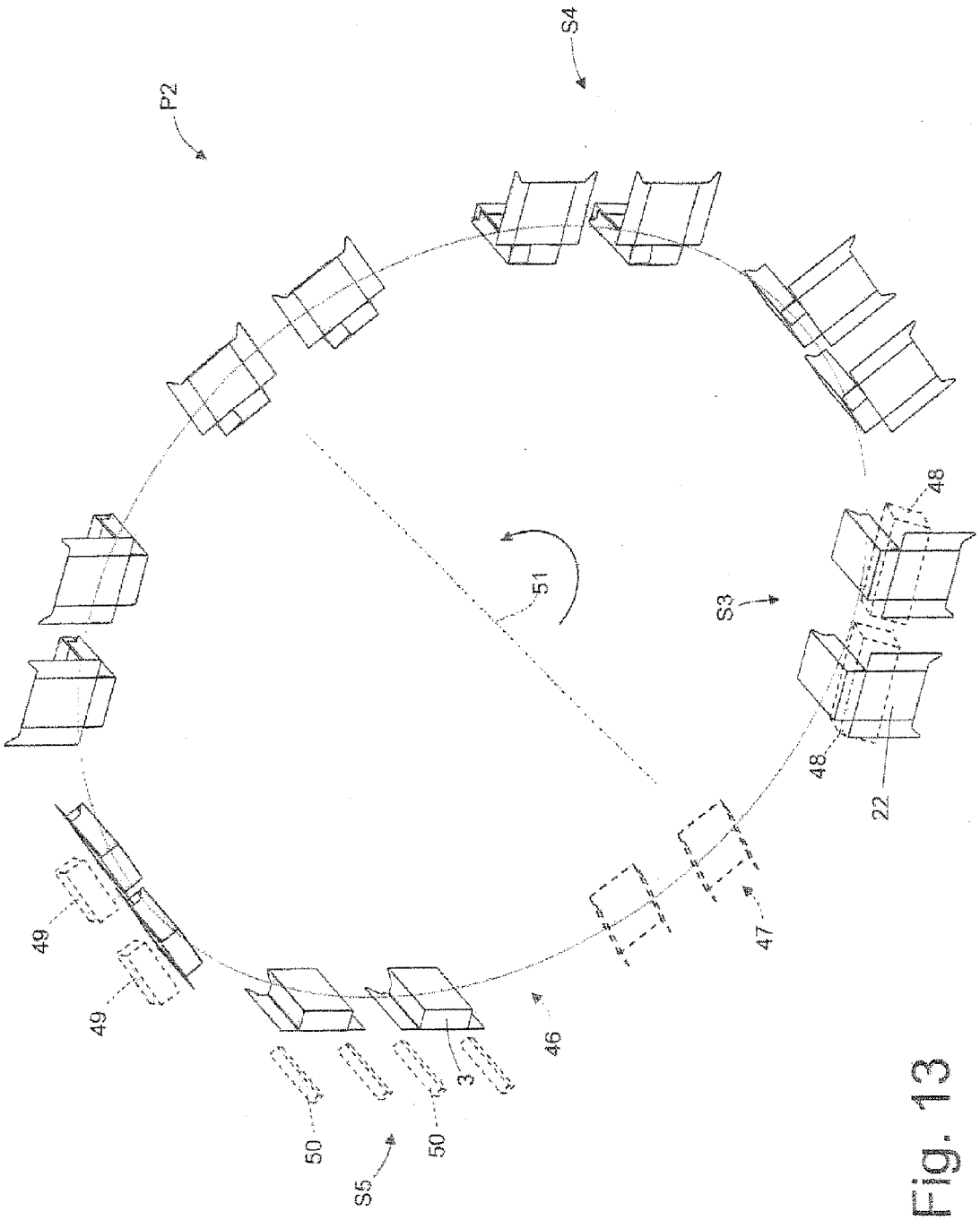

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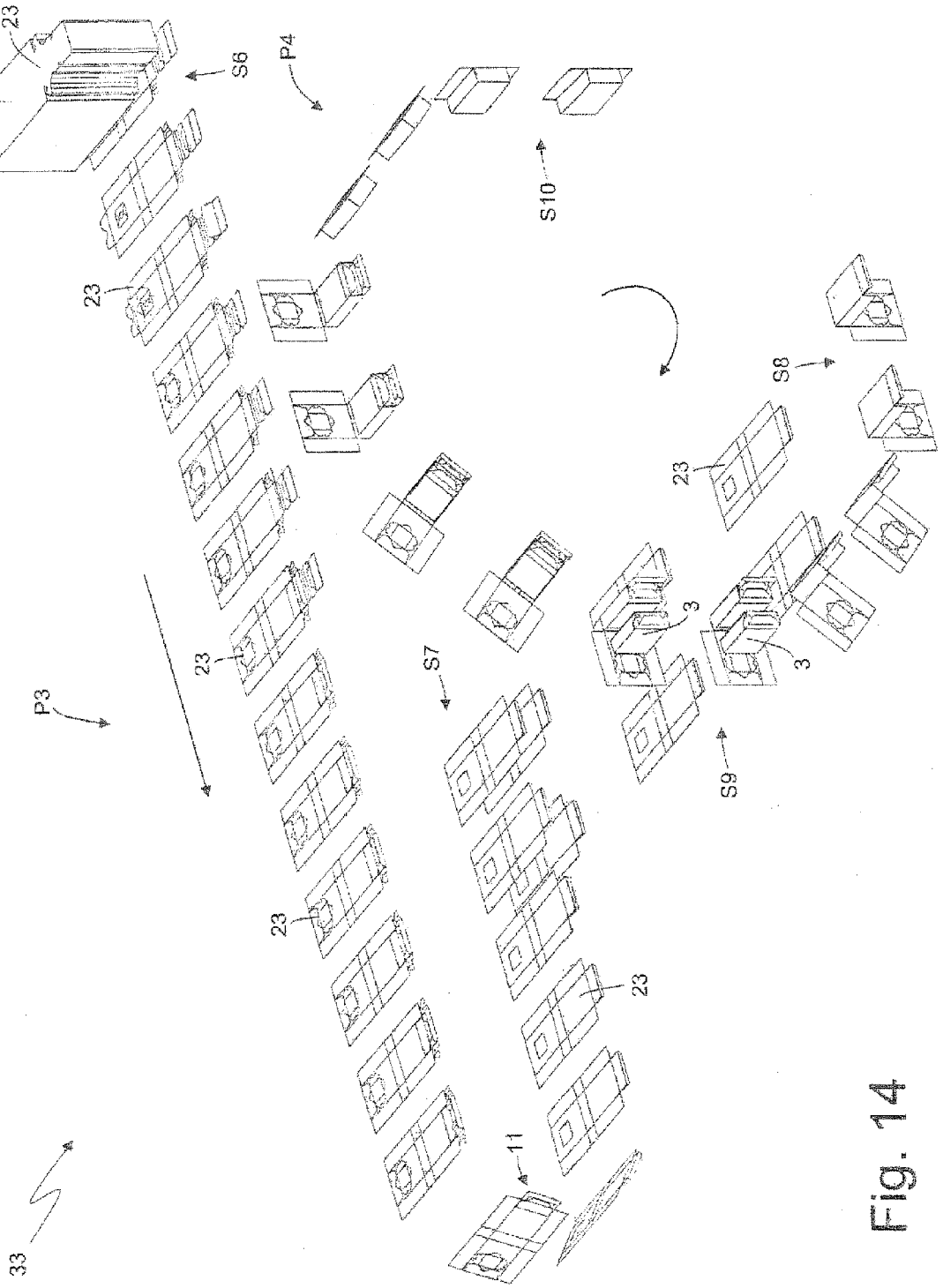

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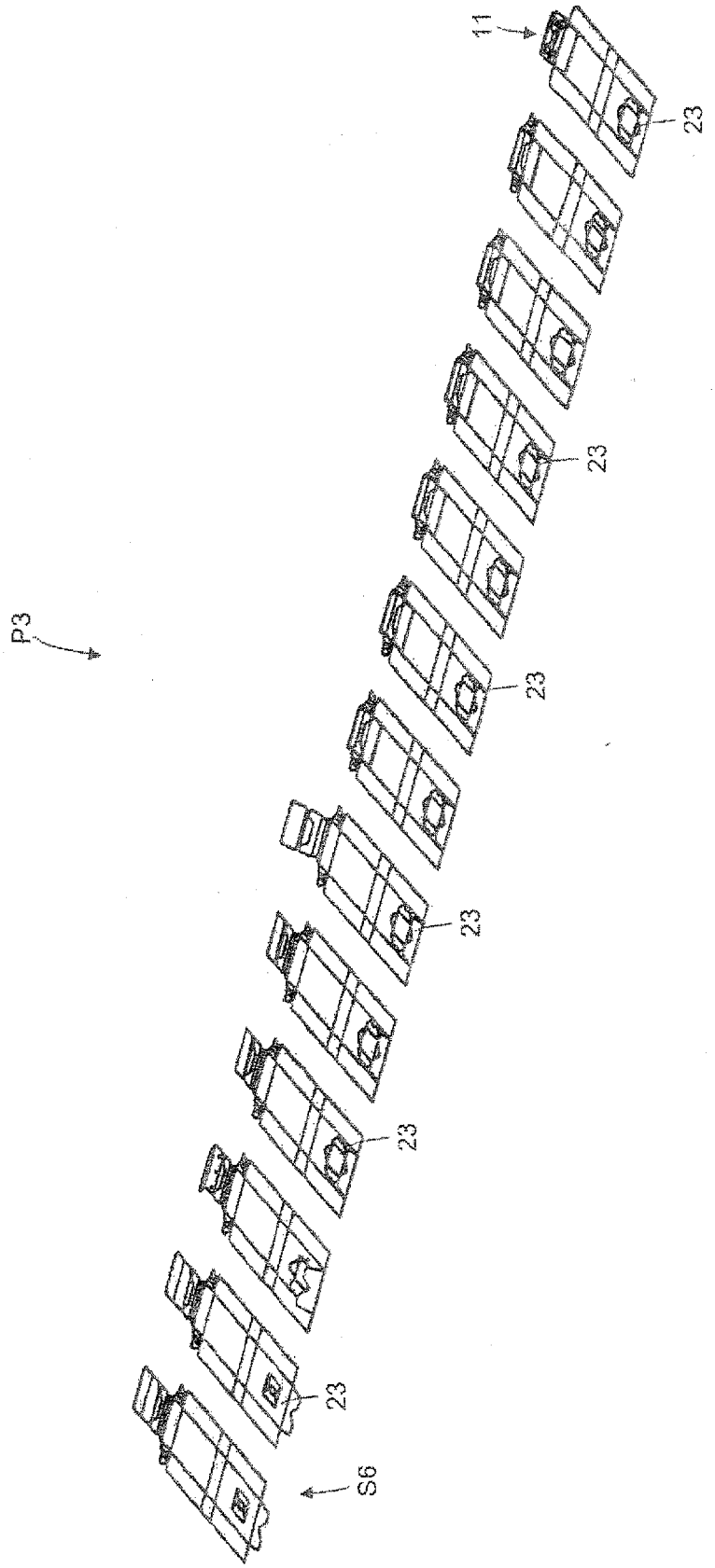

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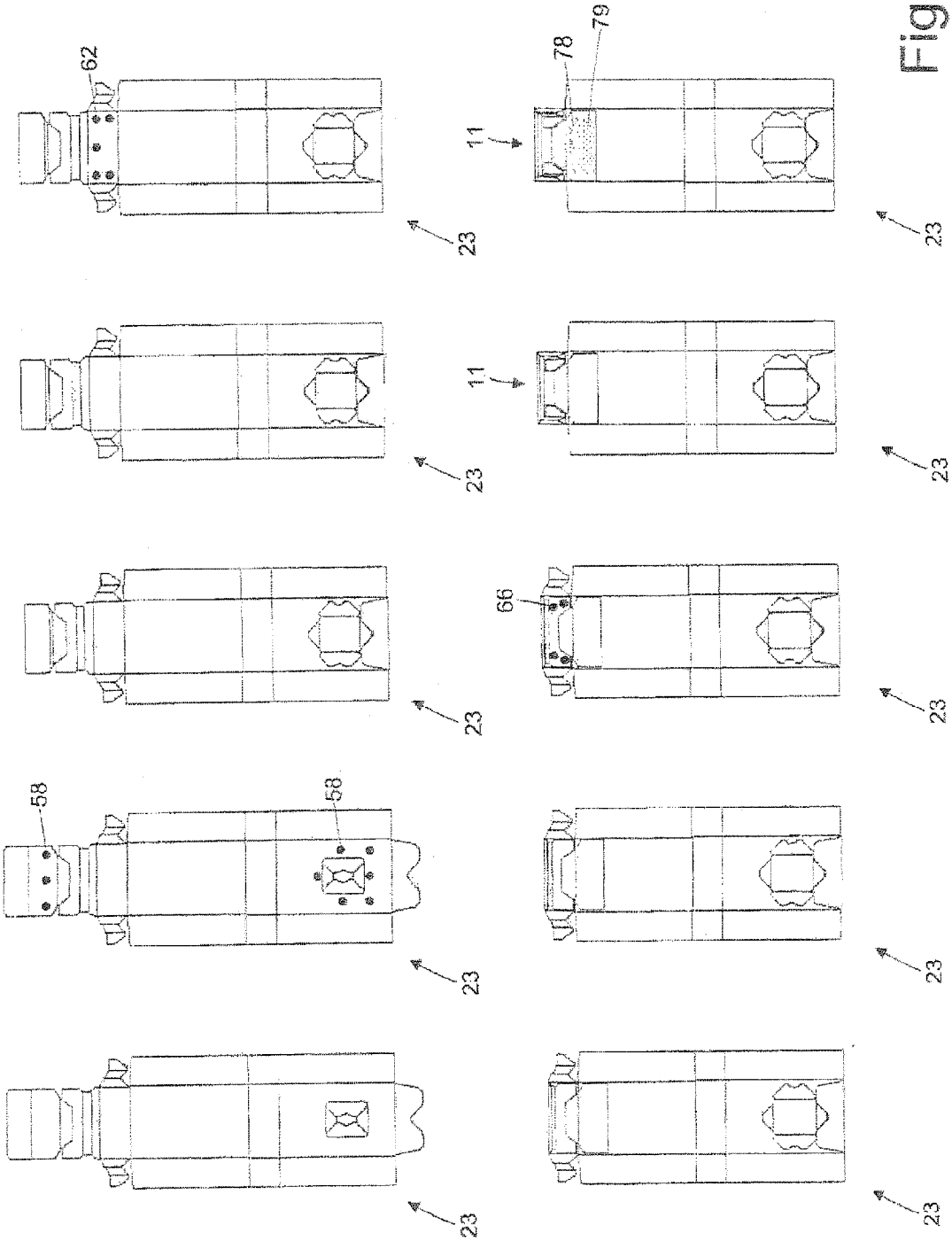

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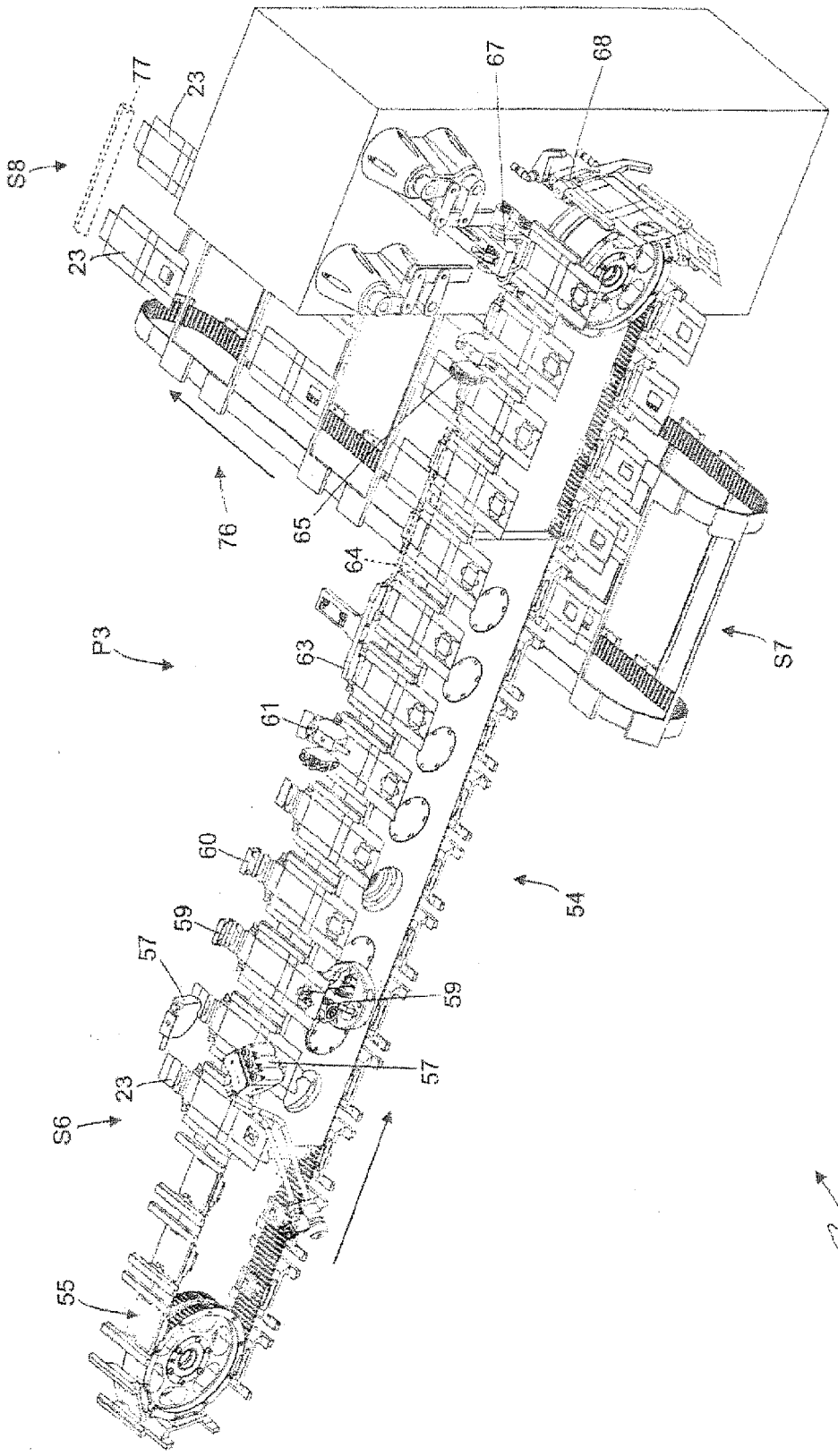
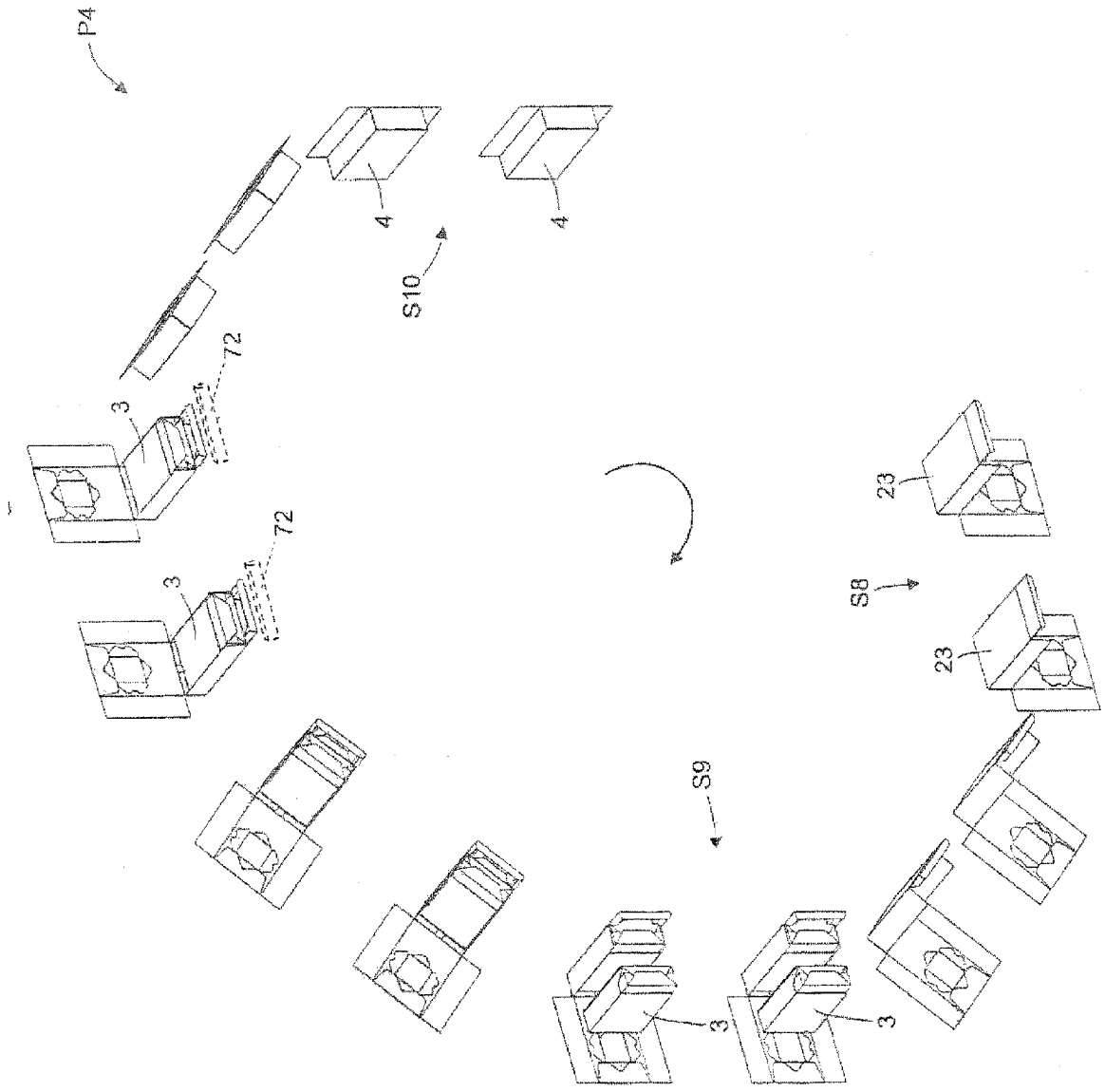


Fig. 17



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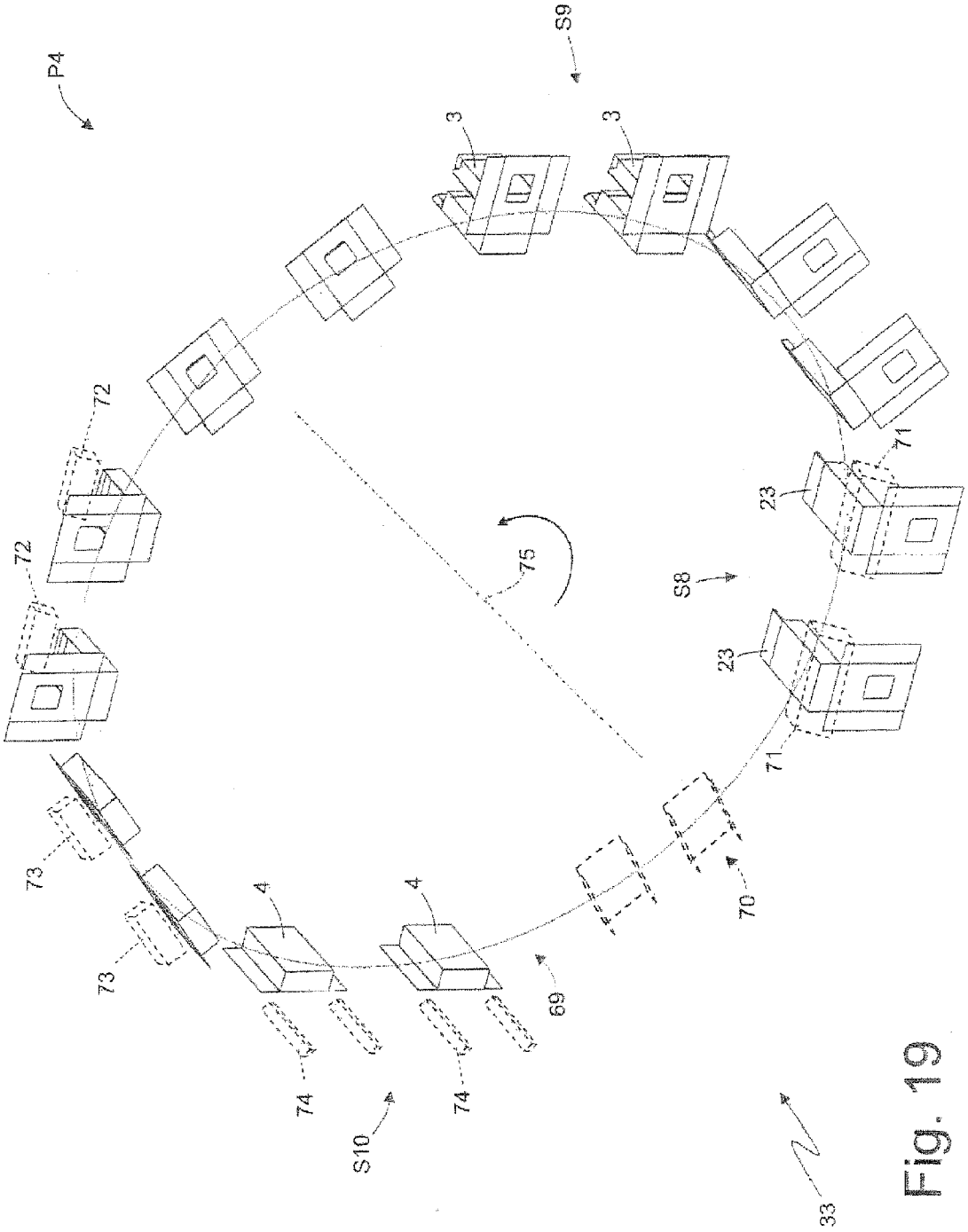

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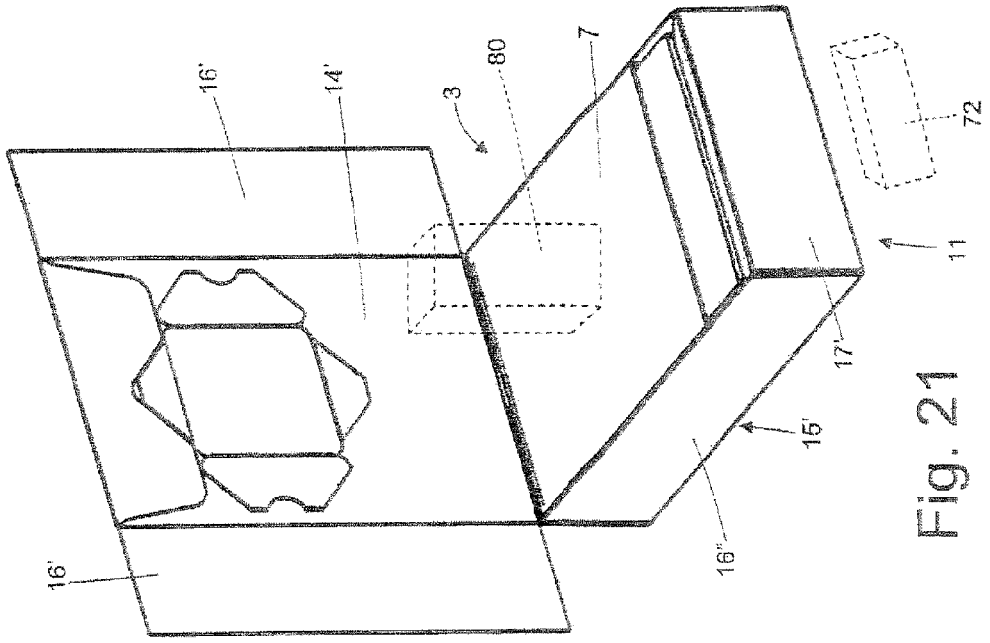
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Fig. 21

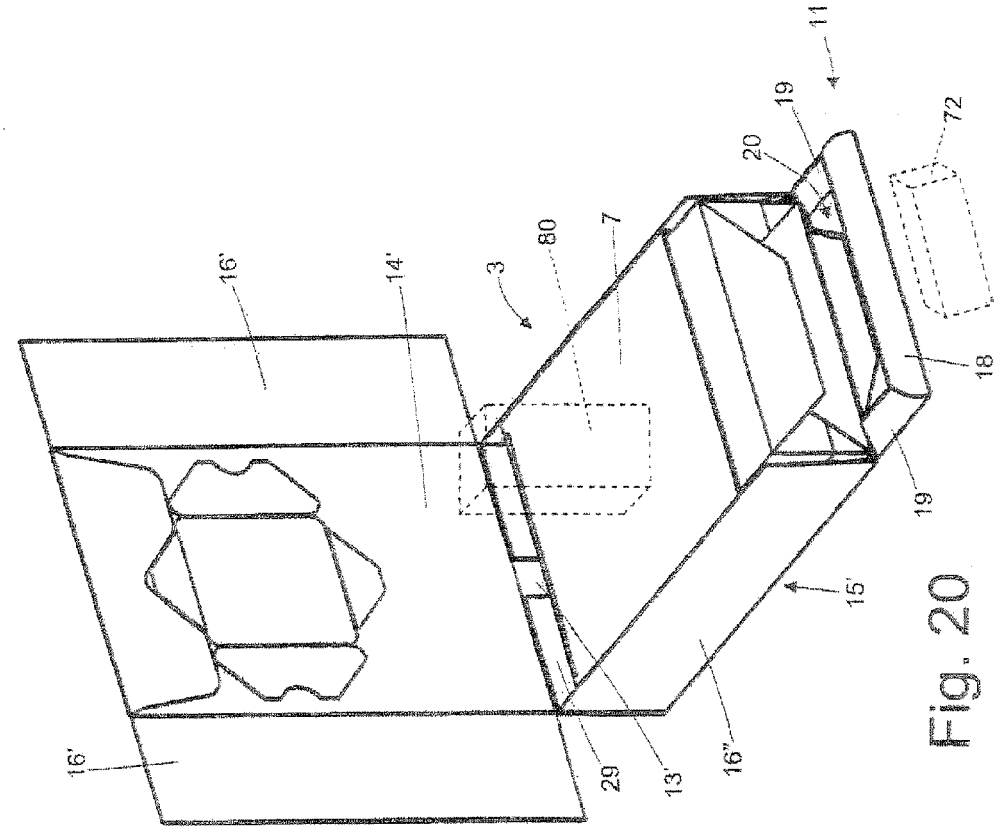
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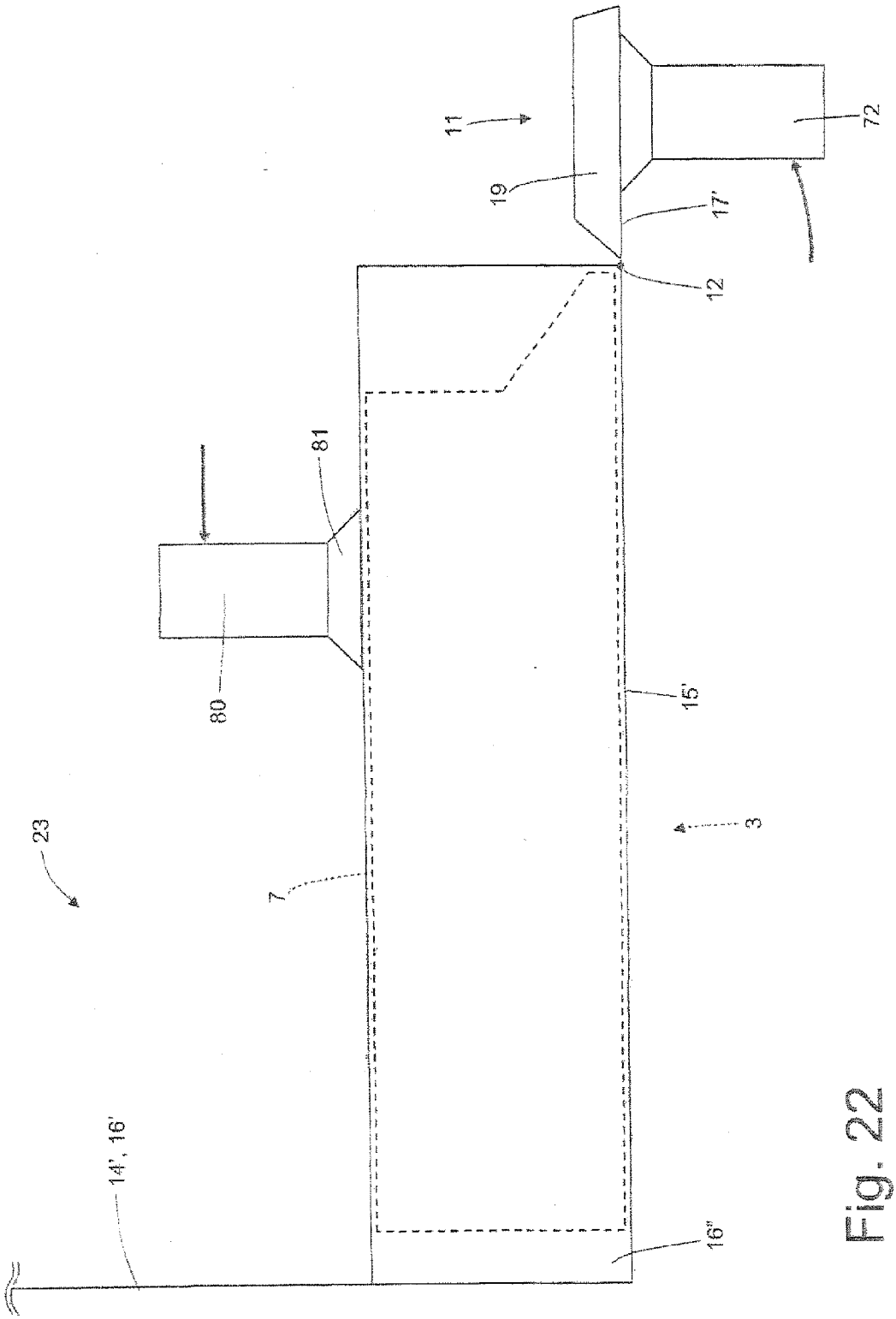
Fig. 20



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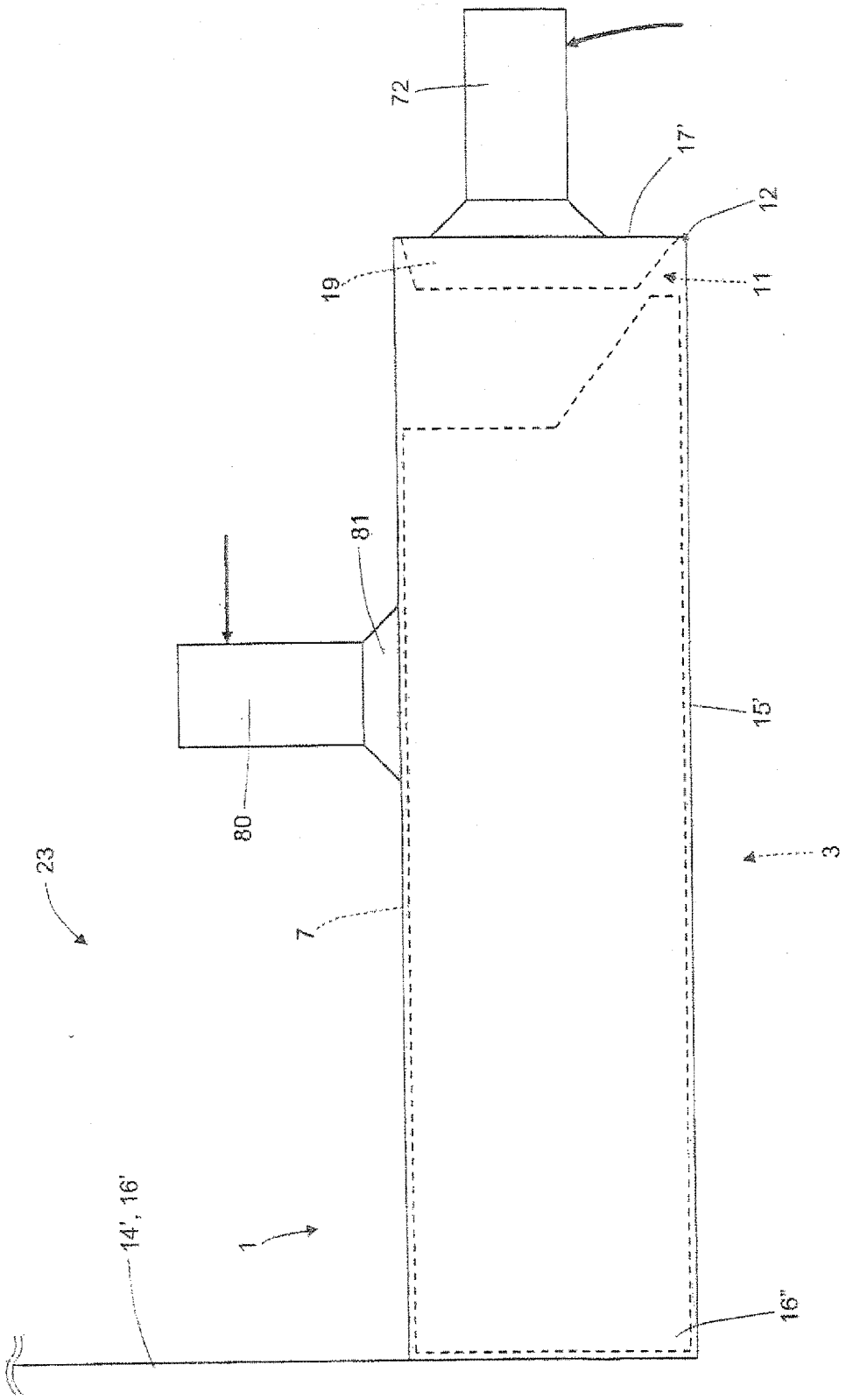

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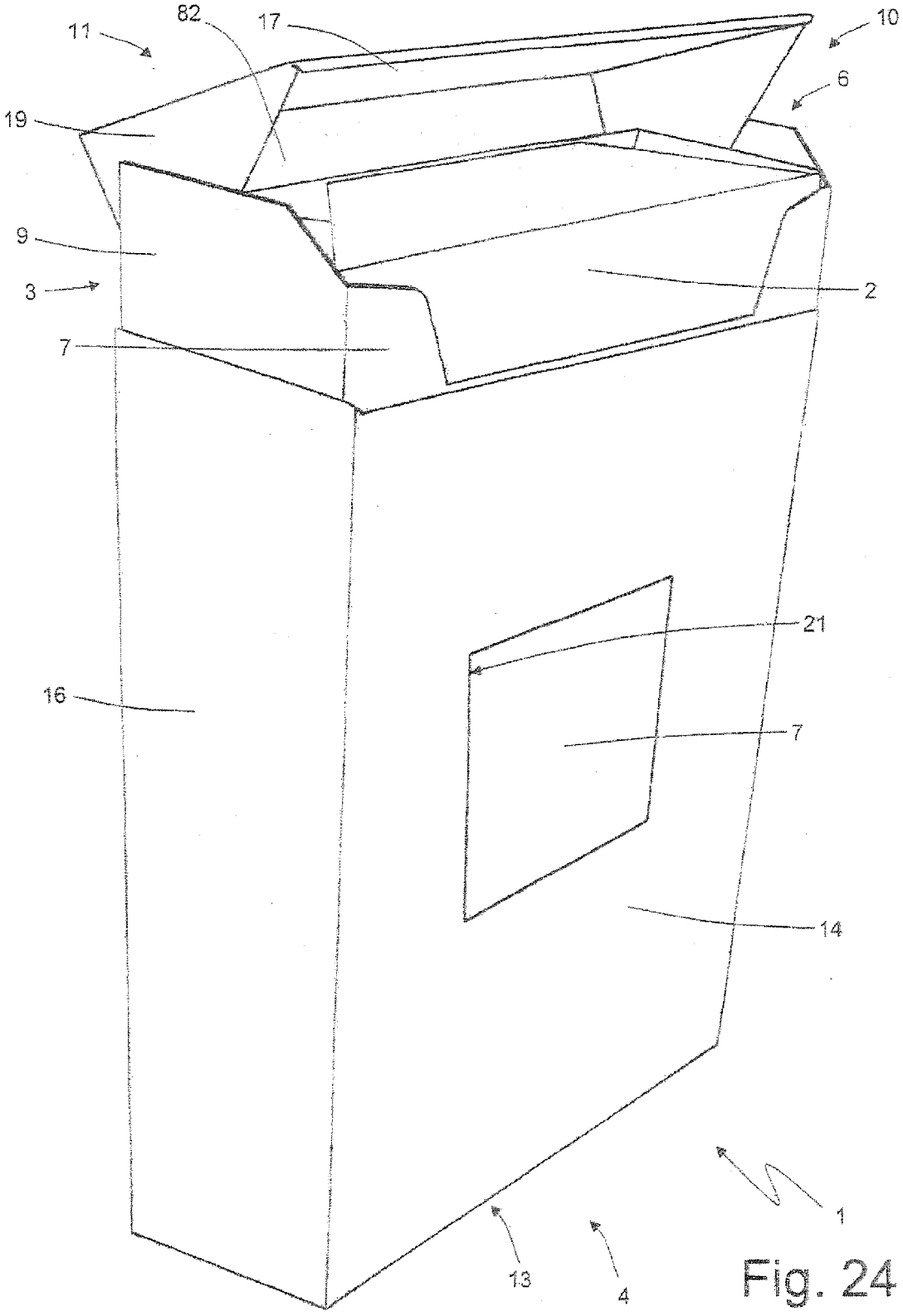
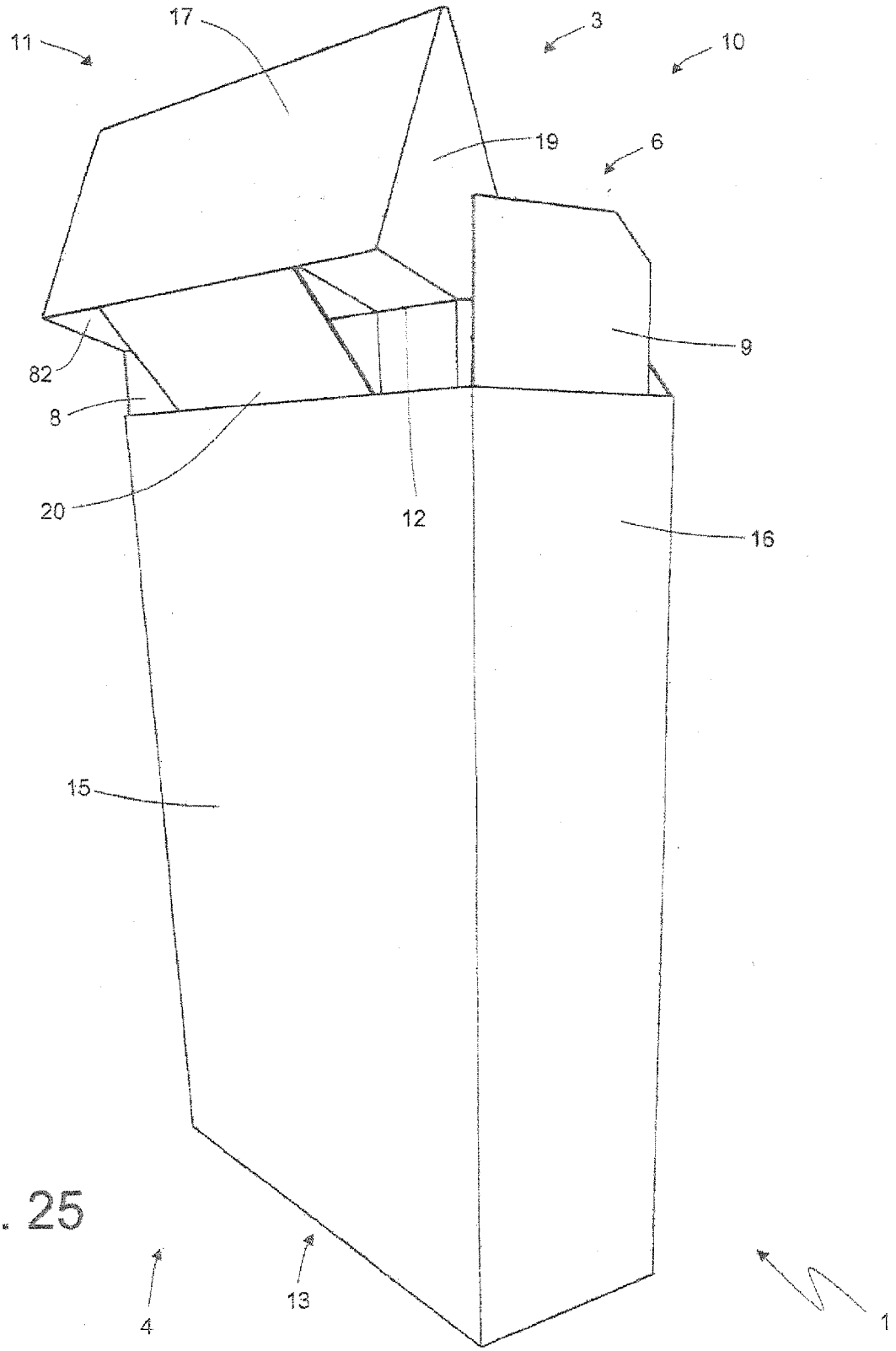


Fig. 24



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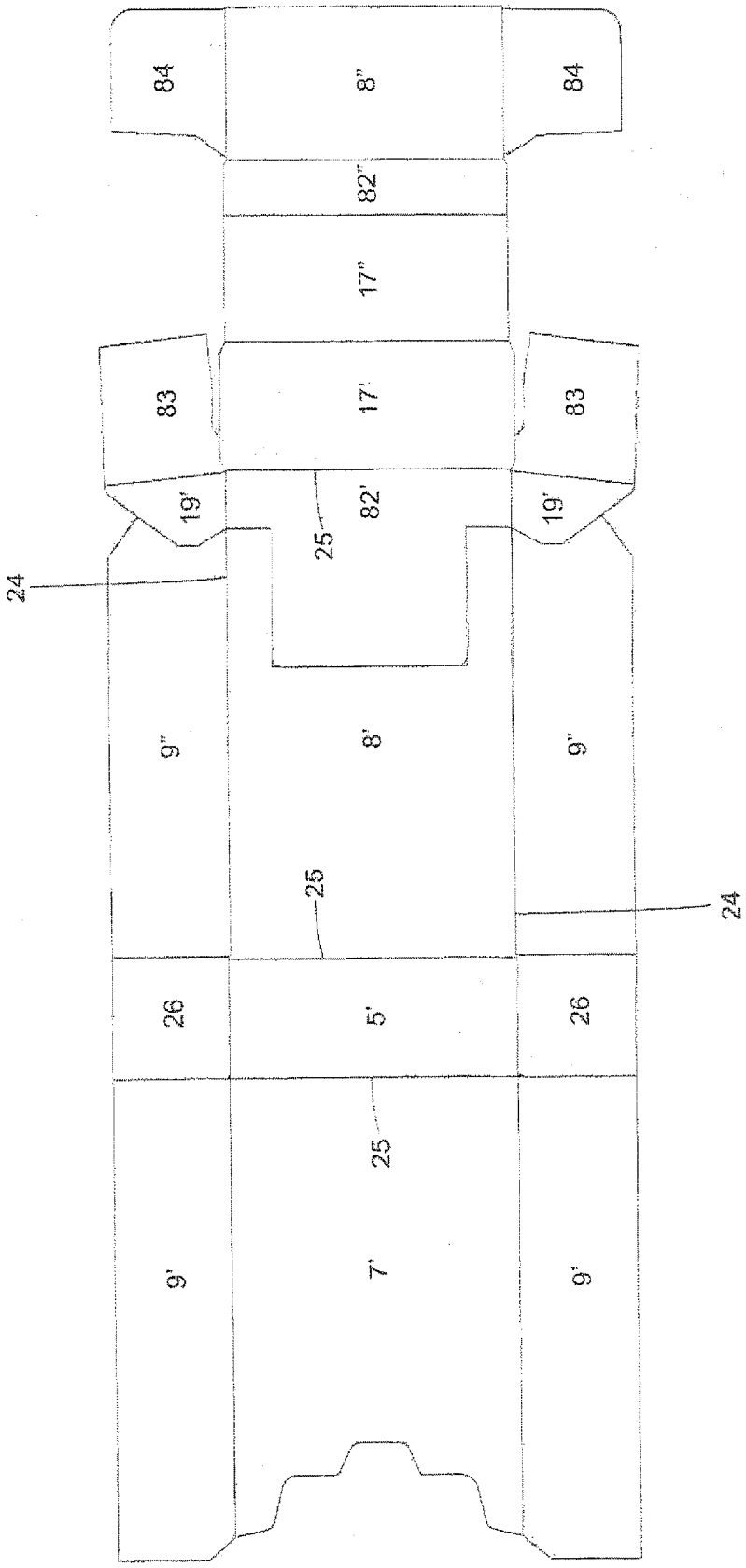
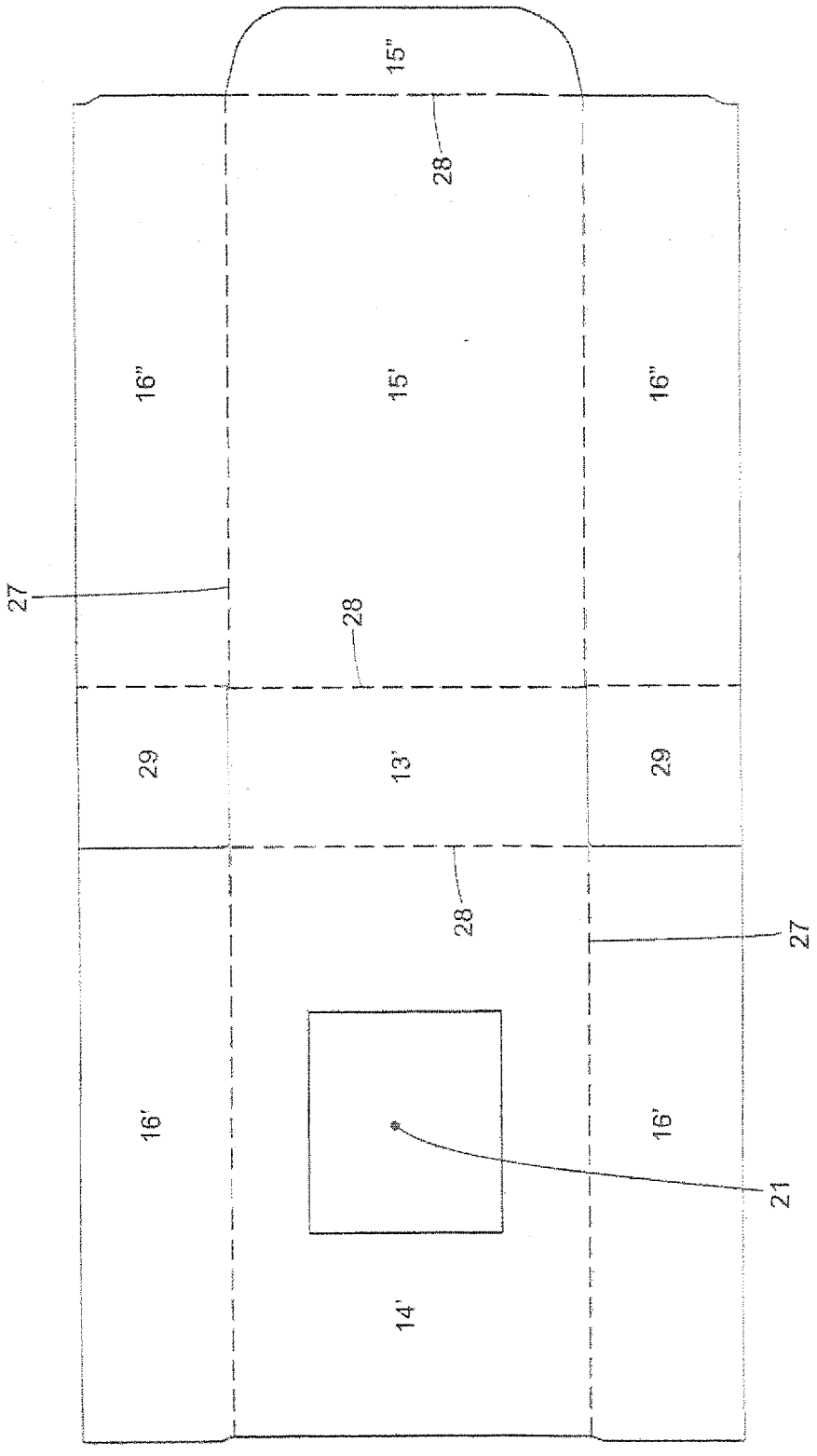


Fig. 26



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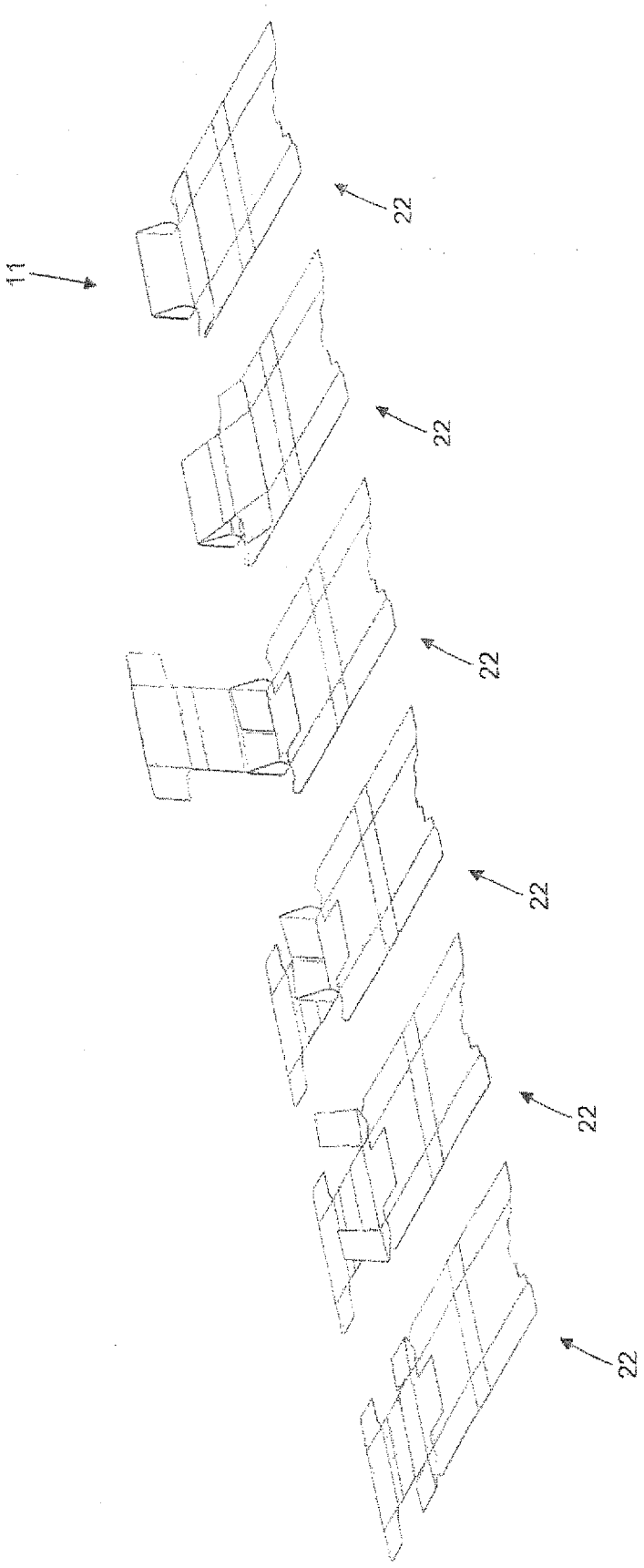
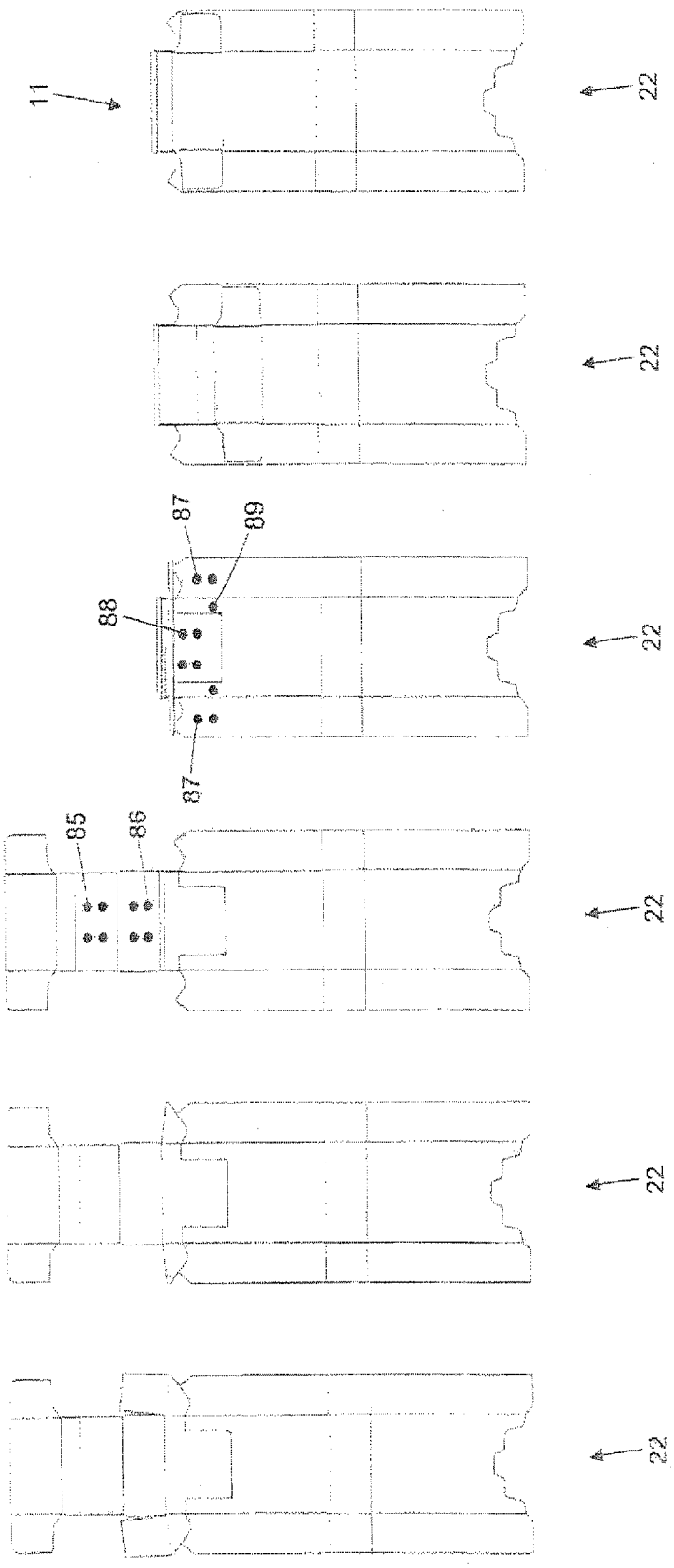


Fig. 28



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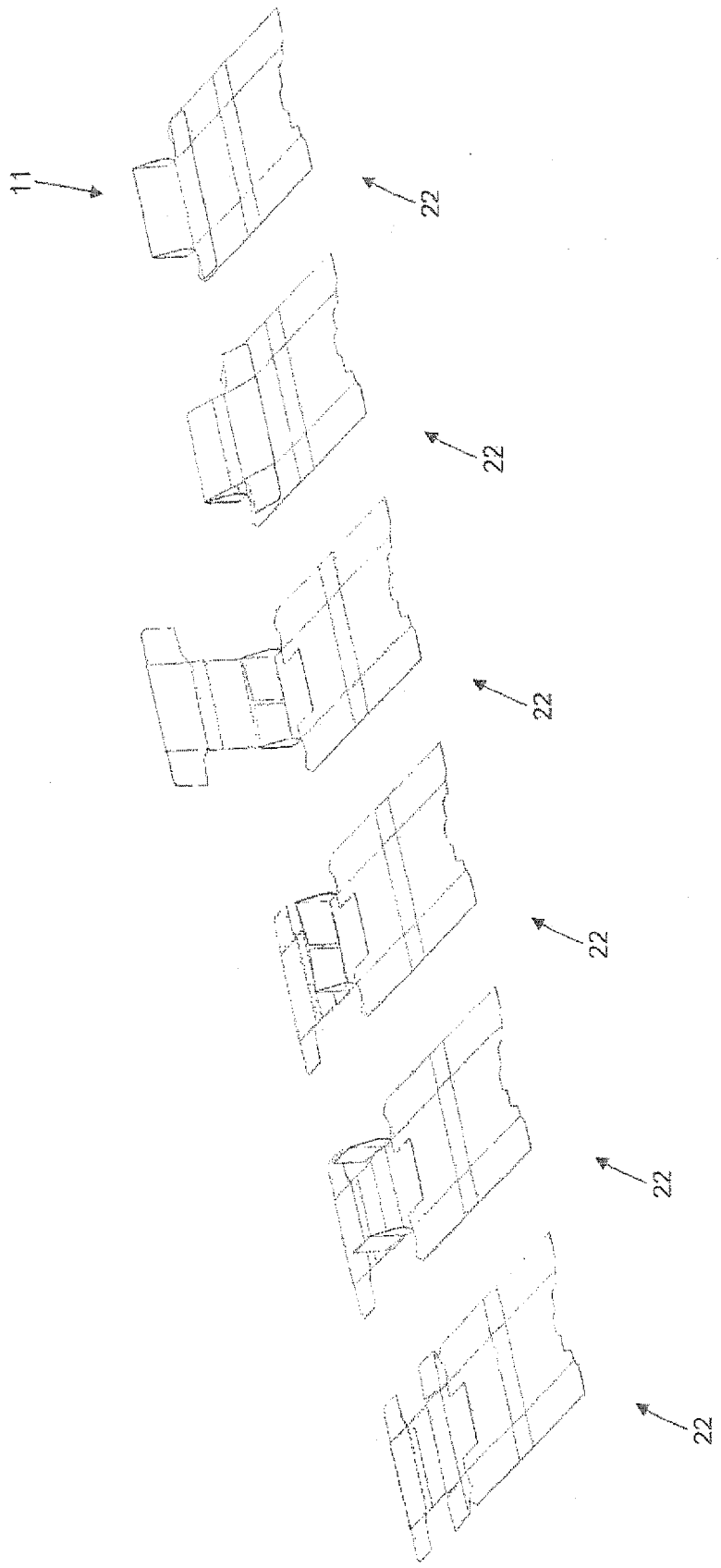

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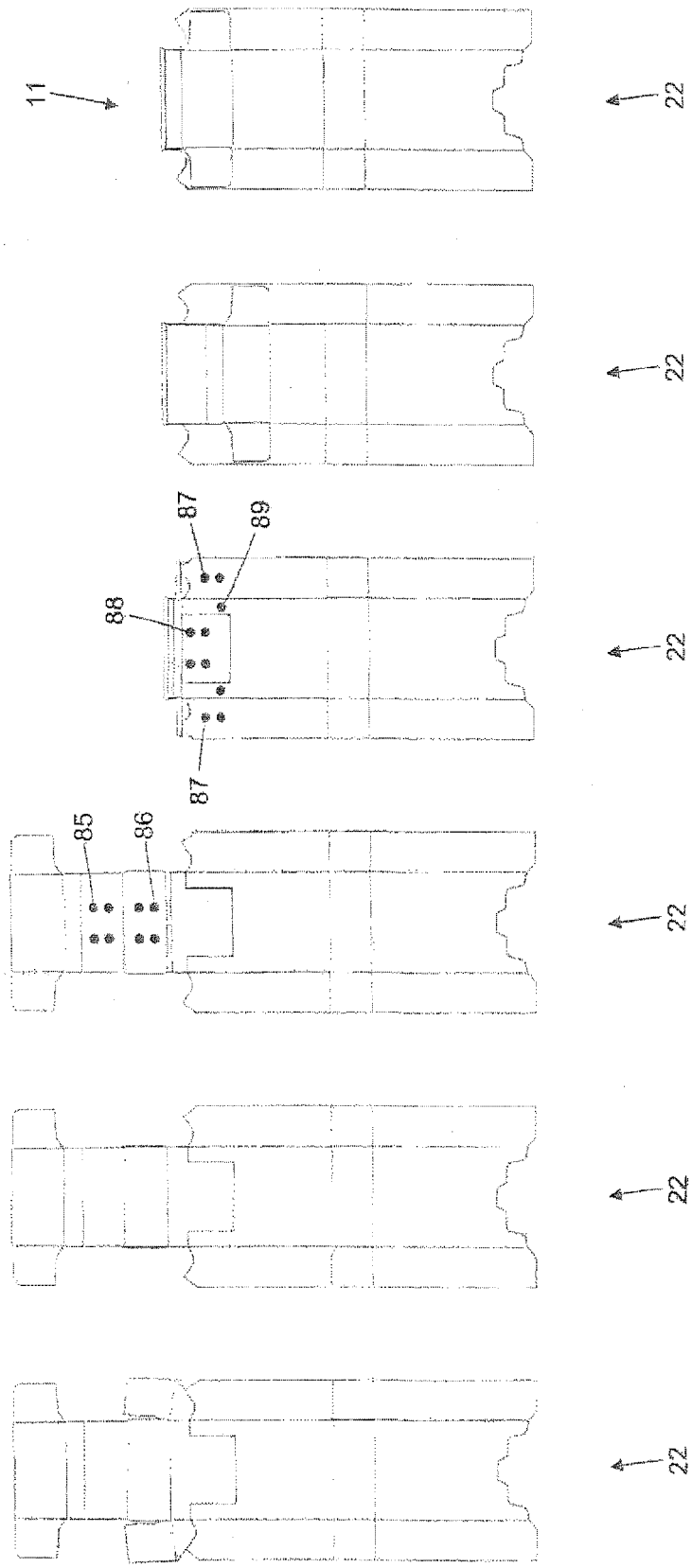

Fig. 31

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Application Number
EP 13 15 2956

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X	US 2011/041463 A1 (SQUARZONI MICHELE [IT] ET AL) 24 February 2011 (2011-02-24) * paragraph [0069] - paragraph [0072]; figures 8-13 *	1-12	INV. B65B19/20 B65B19/22 B65D5/66 B65D85/10
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A	EP 1 854 724 A2 (GD SPA [IT]) 14 November 2007 (2007-11-14) * abstract; figure 1 *	1,12	
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B65B
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 May 2013	Schelle, Joseph

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