

"PACKING METHOD AND UNIT FOR PRODUCING A SEALED INNER PACKAGE"TECHNICAL FIELD

The present invention relates to a packing method and unit for producing a sealed inner package.

The present invention is advantageously applied to a packet of cigarettes having a sealed inner package, to which the following description will make explicit reference without loss of generality.

PRIOR ART

A packet of cigarettes generally comprises an inner package, which is formed by a group of cigarettes wrapped in an inner sheet of packing material, and an outer shell, which encloses the inner package and can be made from an outer sheet of packing material folded about the cup-shaped inner package (soft type packet of cigarettes), or may be made from a rigid box with hinged lid formed by folding a rigid blank about the inner package (rigid type packet of cigarettes).

In a conventional packet of cigarettes, the group of cigarettes is internally wrapped in a rectangular inner sheet of packing material of metalized paper with no glue and is externally wrapped in a rectangular outer sheet of packing material stabilized by gluing.

The tobacco is very sensitive to the effects of the external environment, as contact with the atmosphere tends to change its organoleptic characteristics both for the effect of changes in humidity (tobacco can dry too much or can absorb too much moisture) and for the evaporation of volatile substances the tobacco has been impregnated with (especially in the case of flavoured cigarettes with particular aromas such as cloves). To preserve the integrity of the cigarette tobacco, the packets of cigarettes are cellophane-wrapped,

that is, are coated with an impermeable heat-sealed outer overwrapping of plastic material. However, the heat-sealed outer overwrapping may not be sufficient to completely preserve the organoleptic characteristics of the tobacco contained within a packet of cigarettes, particularly when the packet of cigarettes is consumed after a certain period of time from the production thereof. Moreover, at the first package opening the outer overwrapping is eliminated, and therefore the cigarette tobacco contained in the package is in contact with the external environment; if the cigarettes contained in the package are not consumed quickly after the first package opening, the organoleptic characteristics of the remaining cigarettes may become degraded.

In trying to obviate the above described disadvantage, in the patent US4300676A1 a rigid packet of cigarettes has been proposed, wherein the inner package is impermeable and is made from a sheet of impermeable and heat-sealable packing material having a cigarette extraction opening, which is closed by a reusable closing tag. However, the sealed inner package described in patent US4300676A1 has a modest sealing, i.e. does not ensure an adequate sealing degree that can effectively isolate the cigarette tobacco contained in the package from the outside environment.

To increase the tightness degree of a sealed inner package it is possible to use the so-called "fin-folds", in which two flaps of the inner sheet of packing material are folded towards each other so as to superimpose the two flaps and form a fin perpendicular to an underlying wall of the group of cigarettes. Some examples of cigarettes inner package presenting "fin-folds" are described in the following documents: EP2544958A1, EP2456685A1, EP1686060A1, US4789060A1, US2011084120A1, GB1471086A1, and US3948389A1.

However, performing "fin-folds" according to the packing

methods currently known requires the use of complex and therefore very expensive packing units.

DESCRIPTION OF THE INVENTION

The object of the present invention is to provide a packing method and unit for producing a sealed inner package, said method and unit are free of the drawbacks described above and, at the same time, are easy and inexpensive to produce.

According to the present invention, a packing method and unit for producing a sealed inner package, as defined in the appended claims are provided.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with reference to the accompanying drawings, which illustrate some examples of non-limiting embodiments, wherein:

- Figure 1 illustrates a front perspective view of a cigarette sealed inner package;
- Figure 2 illustrates a perspective view of a group of cigarettes enclosed in the sealed inner package of Figure 1;
- Figure 3 illustrates a perspective view of a stiffener which can be enclosed in the sealed inner package of Figure 1;
- Figure 4 illustrates a plan view of a blank used for producing the stiffener of Figure 3;
- Figure 5 illustrates a plan view of a sheet of packing material used for producing the sealed inner package of Figure 1;
- Figures 6, 7 and 8 are three side and schematic views of the folding of the sheet of packing material of Figure 5 about the group of cigarettes of Figure 2 to form the sealed inner package of Figure 1;
- Figures 9-12 are four perspective and schematic views of the folding of the sheet of packing material of Figure 5 about the group of cigarettes of Figure 2 to form the sealed inner package of Figure 1;

- Figure 13 is a schematic front view of a packing unit which produces the sealed inner package of Figure 1 and is produced according to the present invention;
- Figure 14 is a front, schematic and enlarged scale view of a first packing device of the packing unit of Figure 13;
- Figure 15 is a front, schematic and enlarged scale view, of a second packing device of the packing unit of Figure 13;
- Figure 16 is a front, schematic and enlarged scale view, of a third packing device of the packing unit of Figure 13;
- Figure 17 is a front, schematic and enlarged scale view, of an alternative of the second packing device of Figure 15;
- Figure 18 illustrates a front perspective view of a further sealed inner package produced according to the packing method of the present invention;
- Figure 19 illustrates a perspective view of a packet of cigarettes enclosed in the sealed inner package of Figure 18;
- Figure 20 illustrates a plan view of a sheet of packing material used for producing the sealed inner package in Figure 18;
- Figure 21 illustrates a front perspective view of an alternative of the sealed inner package of Figure 18;
- Figure 22 illustrates a plan view of a sheet of packing material used for producing the sealed inner package in Figure 21;
- Figure 23 illustrates a front perspective view of another alternative of the sealed inner package of Figure 18; and
- Figure 24 illustrates a plan view of a sheet of packing material used for producing the sealed inner package in Figure 23.

PREFERRED EMBODIMENTS OF THE INVENTION

In Figure 1, number 1 indicates as a whole a sealed cigarette inner package, for example of the type described in patent US4300676A1.

As shown in Figure 2, the sealed inner package (1) encloses a

group 2 of cigarettes having a parallelepiped shape and having a top wall 3 and a bottom wall 4 that are formed by the tips of the cigarettes and are parallel and opposite to each other, a front wall 5 and a rear wall 6 which are formed by the cylindrical lateral walls of the cigarettes and are parallel and opposite to each other, and two lateral walls 7 which are formed by the cylindrical lateral walls of the cigarettes and are parallel and opposite to each other. Between the front wall 5 and rear 6 wall and between the lateral walls 7 of the group 2 of cigarettes four longitudinal edges are defined (i.e. parallel to the symmetry axes of the cigarettes), between the front wall 5 and rear 6 wall and between the top wall 3 and bottom wall 4 of the group 2 of cigarettes four major transverse edges are defined (i.e. perpendicular to the symmetry axes of the cigarettes), and finally between the top wall 3 and bottom 4 wall and between the lateral walls 7 of group 2 of cigarettes four minor transverse edges are defined (i.e. perpendicular both to the symmetry axes of the cigarettes and to the major transverse edges).

As illustrated in Figure 1, the sealed inner package 1 has at the top and at the front a cigarette extraction opening 8 (visible in Figure 4), which is delimited by a pre-weakened tear line, is closed by a reusable closing tag 9 and engages a front wall portion of the sealed inner package 1 and a top wall portion of the sealed inner package 1. According to a preferred embodiment, the closing tag 9 has a graspable tab 10 is fixed to the sealed inner package 1 by a non drying re-stick adhesive, which is applied to the bottom surface of the closing tag 9 and is arranged around the extraction opening 8 to allow the closing tag 9 to be partially separated from the sealed inner package 1 and then fixed again to the sealed inner package 1 for several times.

According to a different embodiment not illustrated, the sealed inner package 1 has no extraction opening 8 nor the

relative closing tag 9 and has a removable top portion, which is separated from the rest of the sealed inner package 1 by a pre-weakened tear line to be eliminated at the first opening of the sealed inner package 1; in this embodiment, the sealed inner package 1 is preferably provided with a tear strip opening to facilitate the rupture of the sealed inner package 1 along the pre-weakened line.

The sealed inner package 1 is obtained by folding a sheet of packing material 11 (shown in Figure 5), which has a rectangular shape, comprises at least one layer of air-tight heat-sealable plastic material, and is folded directly about the group 2 of cigarettes so as to be in direct contact with the cigarettes themselves. Once the sheet 11 of packing material is folded about group 2 of cigarettes to form the sealed inner package 1, the shape of the sealed inner package 1 itself is stabilized by heat-sealing the superimposed portions of the sheet 11 of packing material. It is important to note that the sheet 11 of packing material may be a multilayer type, and therefore provide several different layers which are mutually overlapped (in this solution, the sheet 11 of packing material is generally opaque and may have externally a metallic uniform coloring) or, alternatively, it can be externally printed; the sheet 11 of packing material may be monolayer (i.e. formed by a single material) and in this solution, the sheet 11 of packing material is generally transparent.

Before folding the sheet 11 of packing material about the group 2 of cigarettes, the sheet 11 of packing material is pre-etched to define the extraction opening 8; thereafter, to the sheet 11 of packing material a closing tag 9 with rubberized bottom is applied, that is, provided with the re-stick adhesive at the bottom surface thereof which inside the extraction opening 8 determines the permanent gluing of the inner portion of the sheet 11 of packing material to the

closing tag 9 and outside the extraction opening 8 determines a re-stick gluing of the sheet 11 of packing material to the closing tag 9.

As illustrated in Figures 3 and 4, the sealed inner package 1 comprises a stiffener 12, which is made of cardboard or rigid paperboard, is U-shaped and is arranged inside the sealed inner package 1 contacting the group 2 of cigarettes. In particular, the stiffener 12 has a front wall 13 of rectangular shape arranged contacting the front wall 5 of the group 2 of cigarettes, two lateral walls 14, which are connected to opposite sides of the front wall 13 and are arranged contacting the lateral walls 7 of the group 2 of cigarettes, and a bottom wall 15 arranged contacting the bottom wall 4 of the group 2 of cigarettes. The front wall 13 has a window which is arranged at the top, is U-shaped, and facilitates the extraction of the cigarettes from the group 2 of cigarettes by leaving exposed a top area of the front wall of the group 2 of cigarettes at the extraction opening 8. Moreover, the stiffener 12 comprises two lateral stabilizing tabs 16 which are connected to the lateral walls 14 and are folded 90° onto an outer surface of the bottom wall 15.

When the sealed inner package 1 is complete, i.e. at the end of the formation of the sealed inner package 1, the function of the stiffener 12 is to give greater stiffness and greater shape stability to the sealed inner package 1 so as to prevent the sealed inner package 1 from collapsing on itself after removing part of the cigarettes enclosed in the sealed inner package 1 itself thus complicating the extraction of the remaining cigarettes and, in particular, making extremely complicated the opening and the subsequent reclosing of the closing tag 9. During the formation of the sealed inner package 1, the functions of the stiffener 12 are to provide adequate mechanical protection to the cigarettes and to simplify/improve the handling of the group 2 of cigarettes

(i.e. preventing the group 2 of cigarettes from coming apart). In other words, during the handling of the unit, constituted by the group 2 of cigarettes, and by the stiffener 12, it is possible to stabilize the stiffener 12 (i.e. preventing the stiffener 12 from abandoning the desired folded configuration) simply by mechanically preventing the opening of the lateral stabilizing tabs 16; in this way, the stiffener 12 acts as a containment box for the group 2 of cigarettes thus preventing the group 2 cigarettes from coming apart (obviously before the sheet 11 of packing material being folded partially about the group 2 of cigarettes coupled to the stiffener 12).

In Figures 6-11 the sequences of folding the sheet 11 of packing material about the group 2 of cigarettes for producing the sealed inner package 1 are illustrated.

As illustrated in Figure 6, initially the sheet 11 of packing material is folded into a "U" about the group 2 of cigarettes to form a first flap 17 which is coplanar to the front wall 5 of the group 2 of cigarettes and projects from the bottom wall 4 of the group 2 of cigarettes and a second bottom flap 18 which is coplanar with the rear wall 6 of the group 2 of cigarettes and projects from the bottom wall 4 of the group 2 of cigarettes. It is important to note that the two bottom flaps 17 and 18 do not have the same length, but the bottom flap 18 has a greater length (the difference in length between the two bottom flaps 17 and 18 is equal to the thickness of the bottom wall 4 of the group 2 of cigarettes).

Subsequently and as illustrated in Figures 7 and 9, the two bottom flaps 17 and 18 are folded 90° and in the same direction about respective transverse edges of the bottom wall 4 so as to superimpose the two bottom flaps 17 and 18 and form a transverse fin 19 which is parallel to the bottom wall 4 of the group 2 of cigarettes, has an inner edge 20 located at a transverse edge of the bottom wall 4 of the group 2 of

cigarettes, and has an outer edge 21 located outwards of and at a given distance from the group 2 of cigarettes. Subsequent to the formation of the transverse fin 19, the two superimposed bottom flaps 17 and 18 are heat sealed to each other to stabilize the transverse fin 19.

Finally, and as illustrated in Figures 8 and 10, the transverse fin 19 is folded 90° with respect to the transverse edge of the bottom wall 4 of the group 2 of cigarettes (i.e. about the inner edge 20 of the transverse fin 19) to rest the transverse fin 19 on the same front wall 5 of the group 2 of cigarettes (i.e. to rest the outer edge 21 of the transverse fin 19 on the front wall 5 of the group 2 of cigarettes).

In the embodiment illustrated in the attached figures, the transverse fin 19 is initially located close to the front wall 5 of the group 2 of cigarettes (as illustrated for example in Figure 7) and is subsequently folded onto the front wall 5 of the group 2 of cigarettes (as illustrated for example in Figure 8); according to one alternative and perfectly equivalent embodiment not shown, the transverse fin 19 is initially located close to the rear wall 6 of the group 2 of cigarettes and is then folded onto the rear wall 6 of the group 2 of cigarettes (in essence, the front wall 5 is inverted with the rear wall 6).

As illustrated in Figures 9 and 10, the formation of the transverse fin 19 gives the sheet 11 of packing material the conformation of a tubular wrapping, which encloses an inner group 2 of cigarettes and has two open ends 22 arranged at the lateral walls 7 of the group 2 of cigarettes itself (i.e. each open end 22 of the tubular wrapping leaves in view a corresponding lateral wall 7 of the group 2 of cigarettes). Each open end 22 has two lateral flaps 23 which face each other and project from the group 2 of cigarettes (in particular from the corresponding lateral wall 7 of the group

2 of cigarettes).

As illustrated in Figure 11 and once the formation and folding of the transverse fin 19 is finished, at each open end of the tubular wrapping the two corresponding lateral flaps 23 of the sheet 11 of packing material are folded towards each other so as to superimpose to each other the two lateral flaps 23 and form a longitudinal fin 24 perpendicular to an underlying lateral wall 7 of the group 2 of cigarettes. In particular, each longitudinal fin 24 has an inner edge 25 arranged centrally with respect to the lateral wall 7 of the group 2 of cigarettes (or arranged contacting the lateral wall 7 of the group 2 of cigarettes), and an outer edge 26 arranged outwards of and at a given distance from the group 2 of cigarettes. Subsequent to the formation of each longitudinal fin 24, the two superimposed lateral flaps 23 of the longitudinal fin 24 are heat sealed to each other to stabilize the longitudinal fin 24 itself.

Subsequently and as illustrated in Figure 12, each longitudinal fin 24 is folded 90° to rest the longitudinal fin 24 itself on the corresponding lateral wall 7 of the group 2 of cigarettes (i.e. to support the outer edge 26 of each longitudinal fin 24 at one longitudinal edge of the lateral wall 7 of the group 2 of cigarettes).

Each longitudinal fin 24 has two appendages 27 of substantially triangular shape, located on opposite sides of the corresponding lateral wall 7 of the group 2 of cigarettes and project (or protrude) from the lateral wall 7 itself.

Subsequently and as illustrated in Figure 1, the two appendages 27 of each longitudinal fin 24 are folded 180° onto the same longitudinal fin 24 and about respective transverse edges of the corresponding lateral wall 7.

Finally, each appendage 27 together with part of the underlying longitudinal fin 24 is heat sealed to the underlying portion of the sheet 11 of packing material to stabilize the folded position of the appendages 27 and 24 of the longitudinal fins.

In Figure 13, with number 28 is indicated as a whole a packing unit which is part of a packing machine and is suited to provide the sealed inner package 1 described above.

The packing unit 28 comprises a packing device 29 for folding each sheet 11 of heat-sealable packing material about a corresponding group 2 of cigarettes to form the tubular wrapping (shown in Figures 7-10) having two open ends 22 located at the lateral walls 7 of the group 2 of cigarettes, and each having two lateral flaps 23 which face each other and project from the group 2 of cigarettes. Furthermore, the device 29 performs the stabilization by heat sealing of each transverse fin 19 and then folds 90° the transverse fin 19 onto the front wall 5 of the corresponding group 2 of cigarettes.

The packing unit 28 comprises a packing device 30 for folding, at each open end 22 of the tubular wrapping, the two corresponding lateral flaps 23 of the sheet 11 of packing material towards each other to form the corresponding longitudinal fin 24 perpendicular to an underlying lateral wall 7 of the group 2 of cigarettes (as illustrated in Figure 11). Furthermore, the packing device 30 performs the stabilization by heat sealing of each longitudinal fin 24.

The packing unit 28 comprises a packing device 31 which performs the folding of the longitudinal fins 24 and of the corresponding appendages 27 onto the lateral walls 7 of the corresponding group 2 of cigarettes. In particular, the packing device 31 folds 90° each longitudinal fin 24 so that

the longitudinal fin 24 rests on the corresponding lateral wall 7 of the corresponding group 2 of cigarettes (as illustrated in Figure 12) and folds 180° the two appendages 27 of each longitudinal fin 24 onto the longitudinal fin 24 itself (as shown in Figure 1). Finally, the packing device 31 performs a heat sealing of the appendages 27 of each longitudinal fin 24 to stabilize the folded position of the appendages 27 and of the longitudinal fins 24.

As illustrated in Figure 14, the packing device 29 comprises a packing wheel 32 mounted to rotate about a horizontal axis of rotation (perpendicular to the plane of Figure 14) to turn in steps (i.e. with intermittent motion). The packing wheel 32 comprises a plurality of pockets 33, each of which is adapted to receive and contain a corresponding group 2 of cigarettes coupled to a stiffener 10 and to a sheet 11 of packing material.

The packing device 29 comprises a feed station 34, in which a group 2 of cigarettes coupled to a stiffener 10 and to a sheet 11 of packing material is fed inside a corresponding pocket 33; at the feed station 34 and consequentially at the inlet of the pocket 33, each sheet 11 of packing material is folded into a "U" about the group 2 of cigarettes (as shown in Figure 6) to form the two bottom flaps 17 and 18 (illustrated in Figure 6). The packing device 29 comprises a folding member 35 for folding 90° and in the same direction the two bottom flaps 17 and 18 to form the corresponding transverse fin 19 (as illustrated in Figure 7). The folding member 35 is located at a fixed position close to the periphery of the packing wheel 32 and directly downstream from the feed station 34 with respect to the rotation direction of the packing wheel 32 itself.

It is important to note that in the station 34, in which a group 2 of cigarettes, coupled to a stiffener 12 is inserted

together with a sheet 11 of packing material in a corresponding pocket 35 of the packing wheel 32, the group 2 of cigarettes does not come apart (i.e. does not lose its ordered configuration illustrated in Figure 2) thanks to the containment action of the stiffener 12. As previously mentioned, during handling of the whole constituted by the group 2 of cigarettes, and by the stiffener 12, it is possible to stabilize the stiffener 12 (i.e., prevent the stiffener 12 from abandoning the desired folded configuration) simply by mechanically preventing the opening of the lateral stabilizing tabs 16; in this way, the stiffener 12 acts as a containment box for the group 2 of cigarettes thus preventing the group 2 of cigarettes from coming apart (obviously before the sheet 11 of packing material is partially folded about the group 2 of cigarettes coupled to the stiffener 12).

The packing device 29 comprises two heat-seal members 36, each of which is located close to the periphery of the packing wheel 32 downstream from the feed station 34 with respect to the rotation direction of the packing wheel 32 itself and is suited to perform a heat sealing of the transverse fin 19. According to a preferred embodiment, each heat-seal member 36 is movable radially with respect to the packing wheel 32 to pinch a corresponding transverse fin 19 against an opposing surface of the packing wheel 32 located directly upstream from the pocket with respect to the rotation direction of the packing wheel 32 itself (as illustrated in Figure 14).

The packing device 29 comprises a folding member 37, which is arranged at a transfer station 38 in which each tubular wrapping (i.e. each group 2 of cigarettes is coupled to a stiffener 10 and wrapped in a sheet 14 of packing material) leaves the corresponding pocket of the packing wheel 29. The folding member 37 folds 90° each transverse fin 19 to rest the transverse fin 19 on the front wall 5 of the group 2 of cigarettes when the corresponding tubular wrapping comes out

from the pocket of the packing wheel 29. The folding member 37 is located at a fixed position close to the periphery of the packing wheel 29 located directly upstream from the pocket 33 stopped and waiting at the transfer station 38 with respect to the rotation direction of the packing wheel 29 itself.

The packing device 29 comprises a transfer wheel 39, which is arranged next to the packing wheel 32 mounted to rotate about a horizontal rotation axis (parallel to the axis of rotation of the packing wheel 32) to turn at steps (or with intermittent motion). The wheel 39 comprises a plurality of transfer pockets 40, each of which is suited to receive and contain a corresponding group 2 of cigarettes coupled to a stiffener 10. In an inlet station 41, each pocket 40 of the transfer wheel 39 receives a group 2 of cigarettes coupled to a stiffener 10; subsequently, in a further inlet station 42 arranged downstream from the inlet station 41 with respect to the rotation direction of the transfer wheel 39, on the periphery of the transfer wheel 39 a sheet 11 of packing material is deposited, which rests on the periphery of the transfer wheel 39 astride of a corresponding pocket 40 (i.e. the sheet 11 of packing material covers the inlet/outlet mouth of the pocket 40). In the feed station 34, a pusher 43 coupled to the transfer wheel 39 pushes a corresponding group 2 of cigarettes coupled to a stiffener 10 out of the pocket 40 of the transfer wheel 39 and inside a pocket 33 of the packing wheel 32; during this movement, the group 2 of cigarettes intercepts the sheet 11 of packing material that is arranged between the two pockets 40 and 33 bringing with it inside the pocket 33 of the packing wheel 32 the sheet 11 of packing material.

As shown in Figure 15, the device 30 comprises a straight packing conveyor 44 feeding each tubular wrapping (or each group 2 of cigarettes coupled to a stiffener 10 and wrapped in a sheet 14 of packing material) along a linear packing path.

Furthermore, the packing device 30 comprises two twin folding stations 45 arranged in series (i.e. one after the other) along the linear packing path; each folding station 45 comprises two heat-seal grippers 46, located on opposite sides of the straight packing conveyor 44 and are each suited to form and heat seal a corresponding longitudinal fin 24. Each heat-seal gripper 46 folds, at the open side 22 of each tubular wrapping, the two lateral flaps 23 of sheet 11 of packing material towards each other so as to superimpose the two lateral flaps 23 and form the longitudinal fin 24 (illustrated in Figure 11) and, at the same time, heat (for example by means of electrical thermo-resistances) the two superimposed lateral flaps 3 so to heat seal (stabilize) the longitudinal fin 24. The packing conveyor 44 operates intermittently cyclically alternating motion phases and stop phases, and the heat-seal grippers 46 of each folding station 45 pinch together the two lateral flaps 23 of each tubular wrapping during a stop phase (i.e. when the tubular wrapping is stopped and waiting in front of the heat-seal grippers 46).

The straight packing conveyor 44 comprises a static plane 47 (i.e. without movement) on which the tubular wrappings containing the groups 2 of cigarettes are fed (i.e. slid) under the thrust of a set of pushers 48 which have a reciprocating motion along the straight packing path. The pushers 48 are carried by a single support body 49, which is actuated by an arm 50 connected to an actuating member (not shown); the support body 49 cyclically performs a loop path having an active stroke (or discharge stroke) in which starting from an initial position the pushers 48 of the body 49 of the support push in the rear of the tubular wrappings to feed the tubular wrappings themselves along the straight packing path and a passive stroke (or reverse stroke) in which the pushers 48 of the support body 49 return to the initial position without touching the tubular wrappings (i.e. after disengaging from the tubular wrappings themselves).

At the end of the packing conveyor 44 a transfer station 50 is arranged, in which the sealed inner package 1 (not yet fully completed but already provided with the fins 19 and 24 as illustrated in Figure 11) are transferred from the packing conveyor 44 to the packing device 31.

As illustrated in Figure 16, the packing device 31 comprises a packing wheel 51 mounted to rotate about a horizontal axis of rotation (perpendicular to the plane of Figure 16 and parallel to the axis of rotation of the packing wheel 32) to turn at steps (i.e. with intermittent motion). The packing wheel 51 comprises a plurality of pockets 52, each adapted to receive and contain a corresponding sealed inner package 1 (i.e. a group 2 of cigarettes coupled to a stiffener 10 and wrapped by a sheet 11 of packing material as shown in Figure 11) fed by the packing conveyor 44 of the packing device 30 at the transfer station 50. The packing device 31 comprises two fixed folding members 53 (i.e. fixed folding helixes) located on opposite sides of the packing wheel 51 downstream from the transfer station 50 with respect to the rotation direction of the packing wheel 51 and folding 90° longitudinal fins 24 of each sealed inner package 1 (as shown in Figure 12). The packing device 31 comprises two fixed folding members 54 (i.e. fixed folding helixes) located on opposite sides of the packing wheel 51 downstream from the folding members 53 with respect to the rotation direction of the packing wheel 51, and folding 180° appendages 27 of the longitudinal fins 24 (as illustrated in Figure 1). Finally, the packing device 31 comprises two heat-seal members 55 located on opposite sides of the packing wheel 51 downstream from the folding members 54 with respect to the rotation direction of the packing wheel 51 and heat sealing each appendage 27 together with part of the underlying longitudinal fin 24 to the underlying portion of the sheet 11 of packing material to stabilize the folded position of the appendages 27 and of the longitudinal fins 24.

In the embodiment illustrated in Figure 17, the packing device 30 comprises a chamber 56, which houses part of the straight packing conveyor 44; in particular, the chamber 56 houses the folding stations 45 in which the sealing (i.e. airtight closure) of the sealed inner package 1 is completed. To the chamber 56 a feeding device is coupled feeding into the main chamber 56 itself a packing gas at above the atmospheric pressure to maintain the chamber 56 in overpressure with respect to atmospheric pressure. In this way, inside each sealed inner package 1 a modified atmosphere is provided consisting of gases (the packing gas) different (at least in whole or in part) from the normal terrestrial atmospheric gases. By way of example, the packing gas is essentially constituted by an inert gas (typically nitrogen) to which the sterilizing substances and/or aromatizing substances may be added. In particular, the aromatizing substances may comprise menthol flavour, tobacco flavour, coffee flavour, anise flavour. According to an alternative embodiment, to the chamber 56 a suction device is coupled that keeps the chamber 56 in low pressure with respect to atmospheric pressure. In this way, inside each sealed inner package 1 a more rarefied atmosphere compared with the normal earth atmosphere is provided. Further constructional details on the chamber 56 can be found for example in patent application B02013A000294.

In other words, inside each sealed inner package 1, a modified atmosphere is established consisting mainly or entirely of at least one inert gas, preferably nitrogen, preferably enriched with sterilizing substances and/or aromatizing substances, or a low enough pressure to establish a vacuum or substantially a vacuum within the sealed inner package 1.

In alternative to the use of the chamber 56, it is possible to use the so-called oxygen absorbers ("*oxygen scavengers*"), i.e. materials capable of spontaneously oxidizing and therefore

capture the molecular oxygen enclosed within the sealed inner package 1 (e.g. the oxygen absorbers most used in the food field are iron based). In other words, inside the sealed inner package 1 an oxygen absorbing material is inserted that after the sealing of the sealed inner package 1 and slowly (i.e. in a time lapse of the order of several minutes) consumes at least part of the molecular oxygen inside the sealed inner package itself. The oxygen absorbing material may be enclosed in an especially provided insert which is introduced inside the sealed inner package 1, or it can be carried by the stiffener 12 and/or by the inner surface of the sheet 11 of packing material (in this case the oxygen absorber material is applied by way of surface treatment, even nano-technological, of the stiffener 12 and/or of the inner surface of the sheet 11 of packing material).

In the embodiment illustrated in Figures 1-17, the sealed inner package 1 encloses a group 2 of cigarettes which is arranged in direct contact with the sealed inner package 1 itself. In the embodiment illustrated in Figures 18-24, the sealed inner package 1 encloses a packet 57 of cigarettes of rigid type (as shown in Figure 19) or of soft type; in particular, the packet 57 of cigarettes comprises an inner package (not shown) which encloses a group 2 of cigarettes and an outer package enclosing the inner package. In this embodiment, the sealed inner package 1 is the overwrapping that wraps the packet 57 of cigarettes to protect the packet 57 of cigarettes. Preferably (but not necessarily), the sheet 11 of packing material used to produce the sealed inner package 1 is made of air-tight, heat-sealable and transparent plastic material (e.g. polyethylene or polypropylene).

As illustrated in Figures 18 and 20, the sheet 11 of packing material, and then the sealed inner package 1 are provided with a tear strip 58 which is used to open and remove the sealed inner package (1) at the time of first opening of the

packet 57 of cigarettes; i.e. the tear strip 58 is adapted to generate a laceration of the sheet 11 of packing material (i.e. of the sealed inner package 1 formed by the folded sheet 11 of packing material) to allow subsequent removal of at least part of the sealed inner package 1 itself. The tear strip 58 is applied (typically heat sealed, but also possibly glued) to the sheet 11 of packing material so as to adhere to the sheet 11 of packing material; by pulling one end 59 of the initial tear strip 58, the sheet 11 of packing material (i.e. the sealed inner package 1 formed by the folded sheet 11 of packing material) tears along the tear strip 58 (which is mechanically stronger and more resistant than the sheet 11 of packing material) allowing to easily and quickly generate a controlled breakage of the sheet 11 of packing material.

According to a preferred embodiment illustrated in Figures 18 and 20, the leading end 59 of the tear strip 58 projects cantilevered from one edge of the sheet 11 of packing material and a trailing end 60 of the tear strip 58 is arranged at a certain distance from the opposite edge of the sheet 11 of packing material. Consequently, the leading end 59 of the tear strip 58 is located at the outer edge 21 of the fin 19 and projects cantilevered from the outer edge 21 of the transverse fin 19. In use the user grips the leading end 59 of the tear strip 58 of the outer edge 21 of the transverse fin 19 and then starts to pull the tear strip 58 off the sheet 11 of packing material (i.e., the sealed inner package 1 formed by the folded sheet 11 of packing material).

According to a preferred embodiment illustrated in Figures 18 and 20, at the leading end 59 of the tear strip 58 and in alignment with the leading end 59 of the tear strip 58 in the sheet 11 of packing material two through incisions 61 are formed, which cut from one side to the other the sheet of sealed inner package 11 and serve to facilitate the initial tearing of the sheet 11 of packing material in the vicinity of

the leading end 59 of the tear strip 58. According to a different and perfectly equivalent embodiment, the through incisions 61 are not formed beforehand in the sheet 11 of packing material, but are formed at the time of the sealing of the transverse fin 19 (i.e. at least one of the heat-seal members 36 heat sealing the transverse fin 19 has small blades producing through incisions 61 at the outer edge 21 of the transverse fin 19).

In the embodiment illustrated in Figures 18 and 20, the tear strip 58 is arranged longitudinally (therefore, the tear strip 58 perpendicularly crosses the transverse fin 19); in the alternative shown in Figures 21 and 22, the tear strip 58 is arranged transversely (accordingly, the tear strip 58 perpendicularly crosses the longitudinal fins 24) and the sheet 11 of packing material (shown in Figure 22) is formed by two distinct portions that are initially separate and are superposed during folding of the sheet 11 of packing material.

Also in the alternative shown in Figures 23 and 24, the tear strip 58 is arranged transversely, but the folding mode of the sheet 11 of packing material (which consequently has a different shape) is reversed so that the two longitudinal fins 24 are arranged at the top wall and at the bottom wall of the packet 57 of cigarettes.

It is important to note that the packing machine may comprise only the packing unit 28 (in this case each sealed inner package 1 described above is a finished product and directly marketable); alternatively, the packing machine may further comprise a packing unit of known type to wrap about each sealed inner package 1 a respective outer shell, which encloses the sealed inner package 1 and can be formed by a sheet of packing material folded about the cup-shaped sealed inner package 1 (soft type packet of cigarettes), or may be obtained from a rigid box with hinged lid formed by folding a

rigid blank about the sealed inner package 1 (rigid type packet of cigarettes).

The sealed inner package 1 and the packing unit 28 for producing the sealed inner package 1 described above have numerous advantages.

First, the sealed inner package 1 described above has greater tightness, i.e. it guarantees an optimum seal with respect to the external environment; said result is obtained thanks to the fact that the closure of the sealed inner package 1 is guaranteed by three fins 19 or 24 ensuring maximum possible tightness. In particular, during heat sealing, each fin 19 or 24 allows to apply a very high mechanical pressure to press together the superimposed edges of the sheet 11 of packing material forming the fin 19 or 24 itself as said mechanical pressure does not relieve in any way onto the group 2 of cigarettes or onto the packet 57 of cigarettes. Furthermore, in each fin 19 or 24 the superimposing of the portions of the sheet 11 of packing material always takes place by bringing in contact with each other only parts of the inner surface of the sheet 11 of packing material (i.e. without engaging the outer surface of the sheet 11 of packing material) making the heat sealing stronger and stable.

The sealed inner package 1 described above is also easily obtainable in a packing machine of simple construction; consequently, the sealed inner package 1 described above can be produced quickly while maintaining a high production quality.

Moreover, the packing unit 28 described above for the production of the sealed inner package 1 on one end is of simple and inexpensive construction, and on the other end allows to obtain both a high production quality, and to achieve high productivity.

CLAIMS

1. A packing method for producing a sealed inner package (1), which encloses a product (2; 57), preferably containing tobacco articles, and having a front wall (5), a back wall (6), two lateral walls (7), a bottom wall (4) and a top wall (3); the packing method comprising the steps of:
folding a sheet (11) of heat-sealable packing material about the product (2; 57) to form a tubular wrapping having two open ends (22), located at the lateral walls (7) and each having two facing lateral flaps (23) projecting from the product (2; 57);
folding the two lateral flaps (23) of the sheet (11) of packing material at each open end (22) of the tubular wrapping towards each other, so as to superimpose the two lateral flaps (23) and form a longitudinal fin (24) perpendicular to an underlying lateral wall (7); and
heat sealing the two superimposed lateral flaps (23) of each longitudinal fin (24) to each other to stabilize the longitudinal fin (24);
wherein the step of folding the sheet (11) of packing material to form the tubular wrapping comprises the further steps of:
folding the sheet (11) of packing material into a "U" about the product (2; 57) to form a first bottom flap (17) coplanar with the front wall (5) and projecting from the bottom wall (4) and a second bottom flap (18) which is coplanar with the rear wall (6) and projecting from the bottom wall (4);
folding the two bottom flaps (17, 18) 90° and in the same direction about respective transverse edges of the bottom wall (4) so as to superimpose the two bottom flaps (17, 18) and to form a transverse fin (19) which is parallel to the bottom wall (4), has an inner edge (20) located at a transverse edge of the bottom wall (4), and has an outer edge (21) located outwards of and at a given distance from the product (2; 57);
and
heat sealing the two superimposed bottom flaps (17, 18) to

each other to stabilize the transverse fin (19);
the packing method is **characterized by** comprising the further steps of:
folding each longitudinal fin (24) 90° onto the corresponding lateral wall (7); and
folding two appendages (27) of each longitudinal fin (24) 180° onto the longitudinal fin (24) and about respective transverse edges of the corresponding lateral wall (7);
wherein the step of folding the sheet (11) of packing material to form the tubular wrapping is performed as the product (2; 57) is conveyed by a pocket (33) on a first packing wheel (32) mounted to rotate about a first axis of rotation;
wherein the step of folding the lateral flaps (23) of the sheet (11) of packing material to form the longitudinal fins (24) and the step of heat sealing the superimposed lateral flaps (23) of each longitudinal fin (24) to each other, are performed as the product (2; 57) is conveyed by a straight packing conveyor (44) located directly downstream from the first packing wheel (32); and
wherein the step of folding each longitudinal fin (24) 90°, and the step of folding the two appendages (27) of each longitudinal fin (24) 180°, are performed as the product (2; 57) is conveyed by a pocket (52) of a second packing wheel (51) mounted to rotate about a second axis of rotation and located directly downstream from the straight packing conveyor (44).

2. The packing method according to Claim 1 and further comprising the step of folding the transverse fin (19) 90° with respect to the transverse edge of the bottom wall (4) onto the front wall (5) or the back wall (6).

3. The packing method according to claim 1 or 2, wherein, inside each sealed inner package (1), a modified atmosphere is established consisting mainly or entirely of at least one inert gas, preferably nitrogen, preferably enriched with

sterilizing and/or aromatizing substances, or a low pressure is established to form a vacuum- or substantially vacuum-sealed inner package (1).

4. A packing unit (28) for producing a sealed inner package (1), which encloses a product (2; 57), preferably containing tobacco articles, and having a front wall (5), a rear wall (6), two lateral walls (7), a bottom wall (4) and a top wall (3); the packing unit (28) comprising:

a first packing device (29) for folding a sheet (11) of heat-sealable packing material about the product (2; 57) to form a tubular wrapping having two open ends (22) located at the lateral walls, (7) and each having two facing lateral flaps (23) projecting from the product (2; 57);

a second packing device (30) for folding the two lateral flaps (23) of the sheet (11) of packing material at each open end (22) of the tubular wrapping towards each other, so as to superimpose the two lateral flaps (23) and form a longitudinal fin (24) perpendicular to the underlying lateral wall (7); and a first heat-seal member for heat sealing the two superimposed lateral flaps (23) of each longitudinal fin (24) to each other to stabilize the longitudinal fin (24) itself;

wherein the first packing device (29) comprises:

a feed station (34) where the sheet (11) of packing material is folded into a "U" about the product (2; 57) to form a first bottom flap (17) which is coplanar with the front wall (5), and projecting from the bottom wall (4); and a second bottom flap (18) which is coplanar with the rear wall (6) and projecting from the bottom wall (4);

a first folding member (35) for folding the two bottom flaps (17, 18) 90° and in the same direction about respective transverse edges of the bottom wall (4), so as to superimpose the two bottom flaps (17, 18) and form a transverse fin (19), which is parallel to the bottom wall (4), has an inner edge (20) located at a transverse edge of the bottom wall (4), and has an outer edge (21) located outwards of and at a given

distance from the product (2; 57); and
a second heat-seal member (36) for heat sealing the two superimposed bottom flaps (17, 18) to each other to stabilize the transverse fin (19);

the packing unit (28) is **characterized in that:**

the first packing device (29) comprises a first packing wheel (32), mounted to rotate about a first axis of rotation, and supporting at least one pocket (33) for receiving the product (2; 57), with the sheet (11) of packing material applied, at the feed station (34);

the second packing device (30) comprises a straight packing conveyor (44) for conveying the product (2; 57) wrapped in the tubular wrapping along a straight packing path; and at least two heat-seal grippers (46) located on opposite sides of the straight packing conveyor (44) and each designed to form and heat seal a corresponding longitudinal fin (24);

a third packing device (31) for folding each longitudinal fin (24) 90° onto the corresponding lateral wall (7), and for folding two appendages (27) of each longitudinal fin (24) 180° onto the longitudinal fin (24) is provided; and

the third packing device (31) comprises a second packing wheel (51) mounted to rotate about a second axis of rotation, and supporting at least one pocket (52) for receiving the product (2; 57) from the second packing device (30).

5. The packing unit (28) according to Claim 4, wherein the first packing device (29) comprises a second folding member (37) for folding the transverse fin (19) 90° with respect to the transverse edge of the bottom wall (4) and onto the front wall (5) or the rear wall (6).

6. The packing unit (28) according to Claim 4 or 5, wherein the first folding member (35) is located at a fixed position close to the periphery of the first packing wheel (32) and directly downstream from the feed station (34) with respect to the rotation direction of the first packing wheel (32).

7. The packing unit (28) according to Claim 4, 5 or 6, wherein the second heat-seal member (36) is located close to the periphery of the first packing wheel (32) and is movable radially with respect to the first packing wheel (32) to pinch the transverse fin (19) against an opposing surface of the first packing wheel (32) located directly upstream from the pocket (33) with respect to the rotation direction of the first packing wheel (32).

8. The packing unit (28) according to one of Claims 4 to 7, wherein the third packing device (31) comprises:
two third folding members (53) located on opposite sides of the second packing wheel (51) to fold the longitudinal fins (24) 90°;
two fourth folding members (54) located on opposite sides of the second packing wheel (51) downstream from the third folding members (53) with respect to the rotation direction of the second packing wheel (51), to fold the appendages (27) of the longitudinal fins (24) 180°; and
two third heat-seal members (55) located on opposite sides of the second packing wheel (51), downstream from the fourth folding members (54) with respect to the rotation direction of the second packing wheel (51), to heat seal the appendages (27) of the longitudinal fins (24) onto the respective longitudinal fins (24).

9. The packing unit (28) according to one of Claims 4 to 8, characterized by comprising a chamber (56) in which sealing of the sealed inner package (1) is terminated; said chamber (56) being connected to a feed device which feeds packing gas into the chamber (56) at higher than atmospheric pressure, to keep the chamber (56) at above atmospheric pressure, or to a suction device for keeping the chamber (56) at below atmospheric pressure.

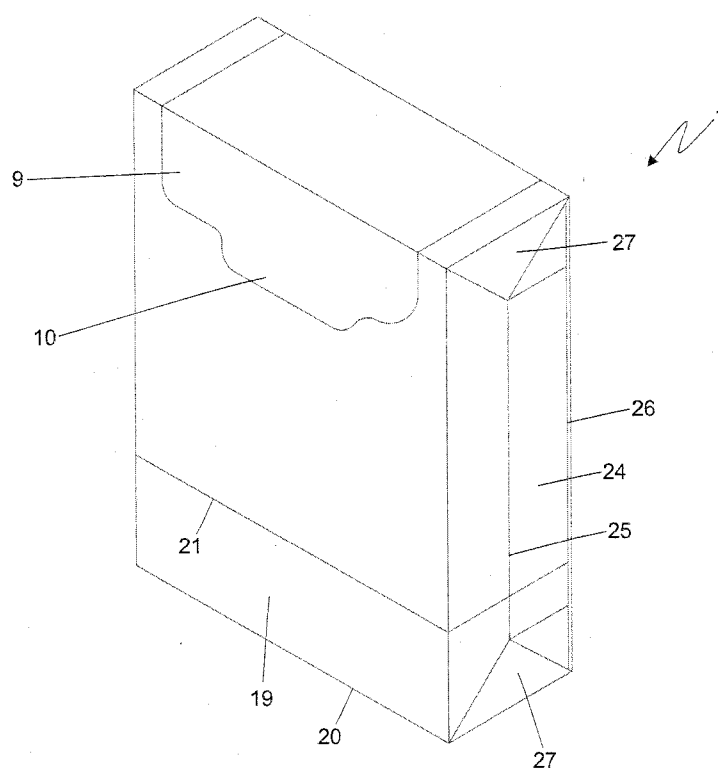
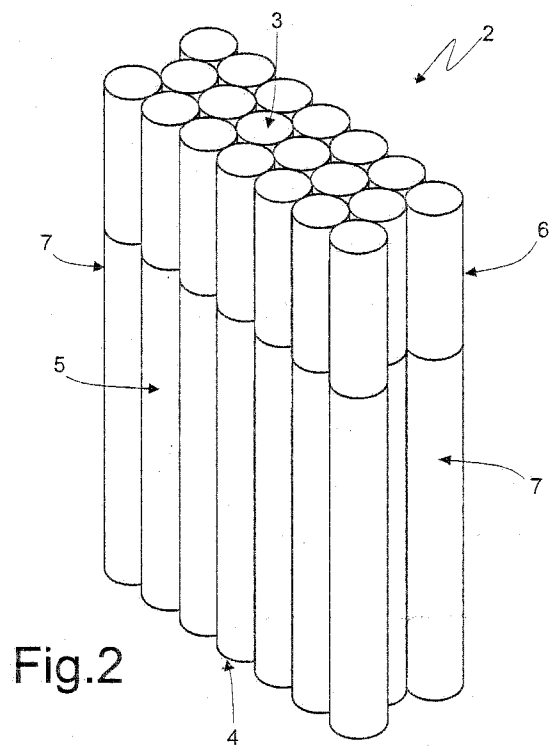
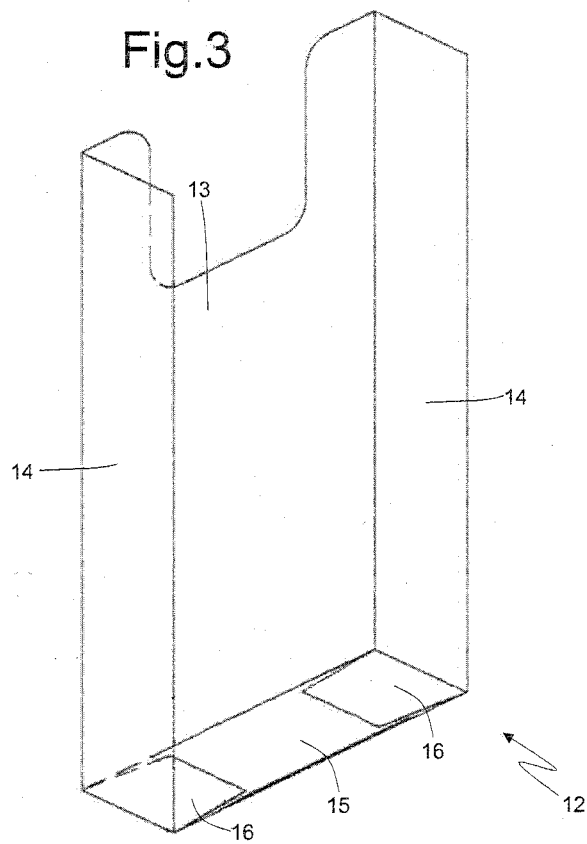
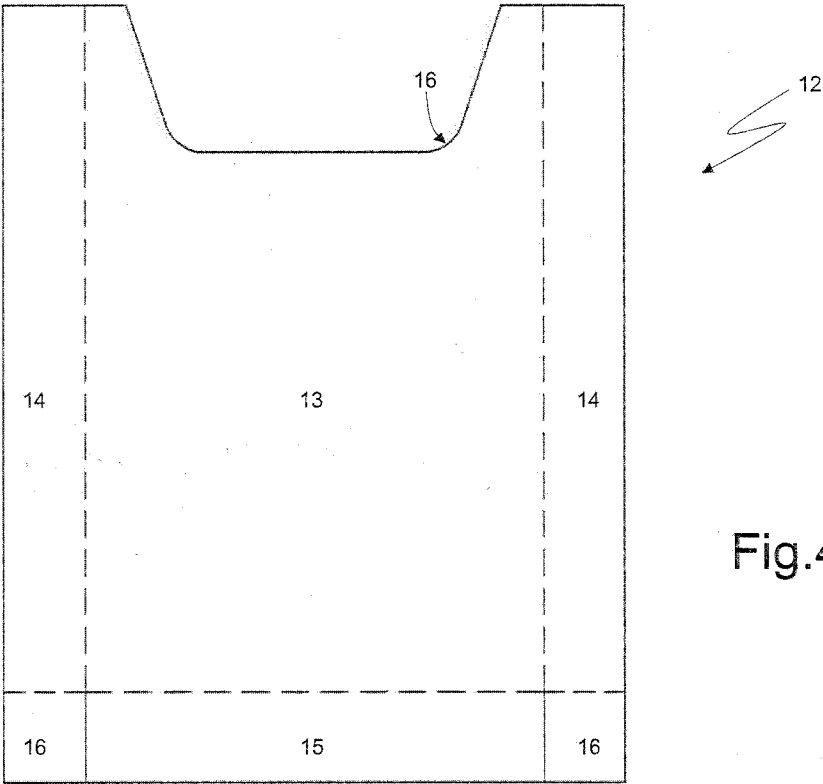


Fig.1





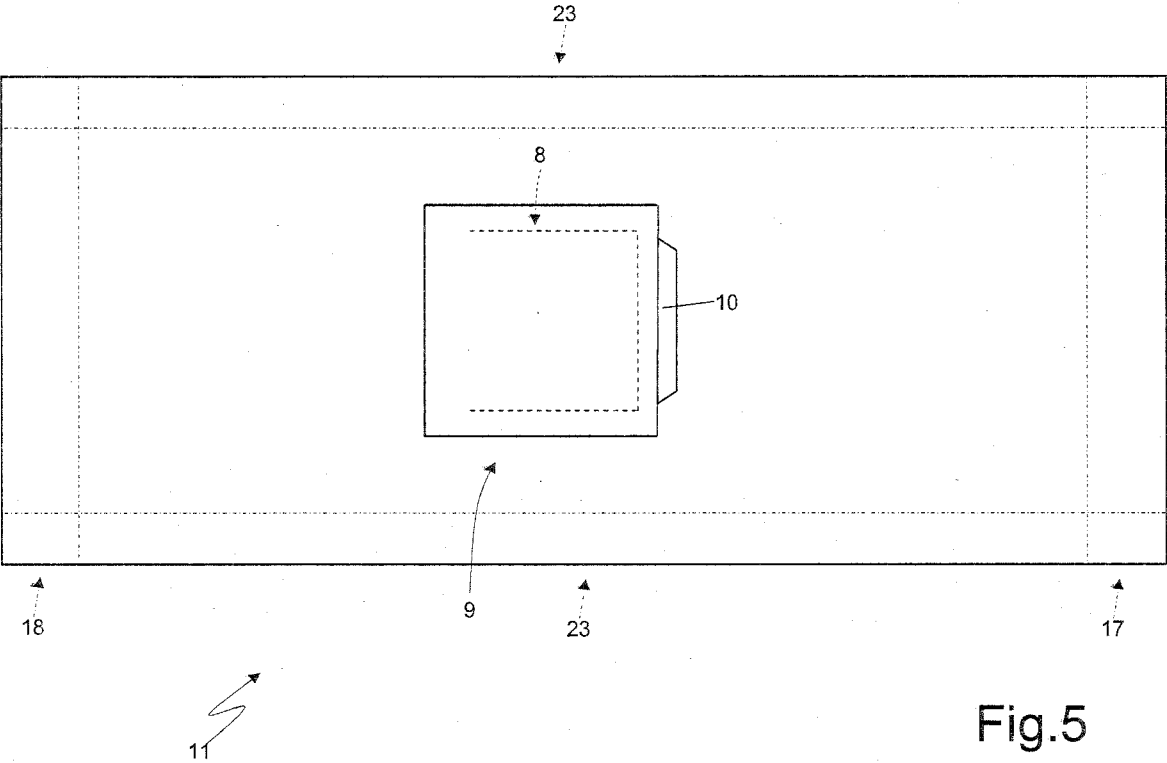
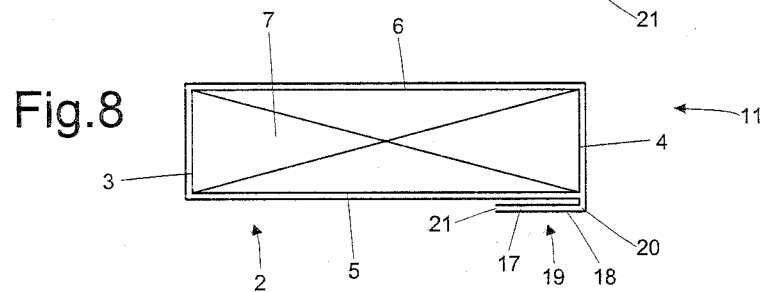
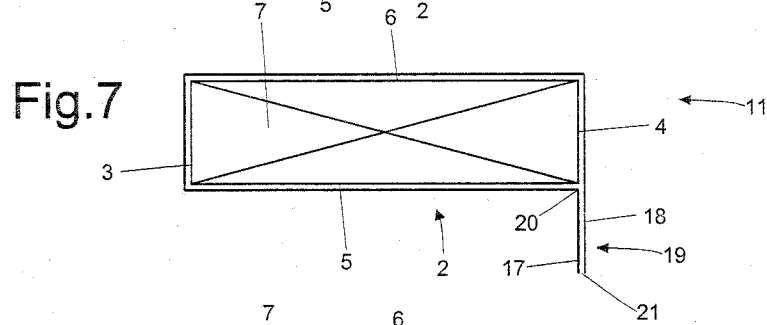
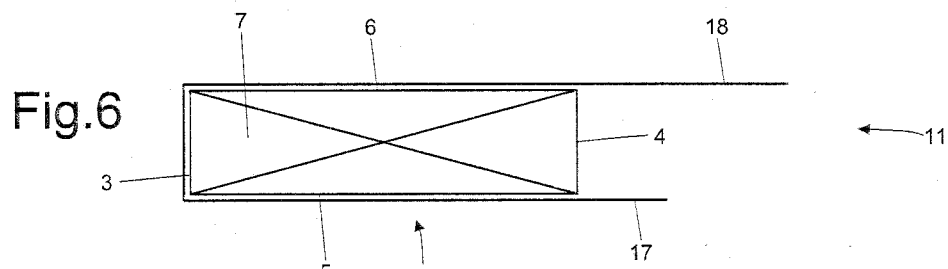


Fig.5



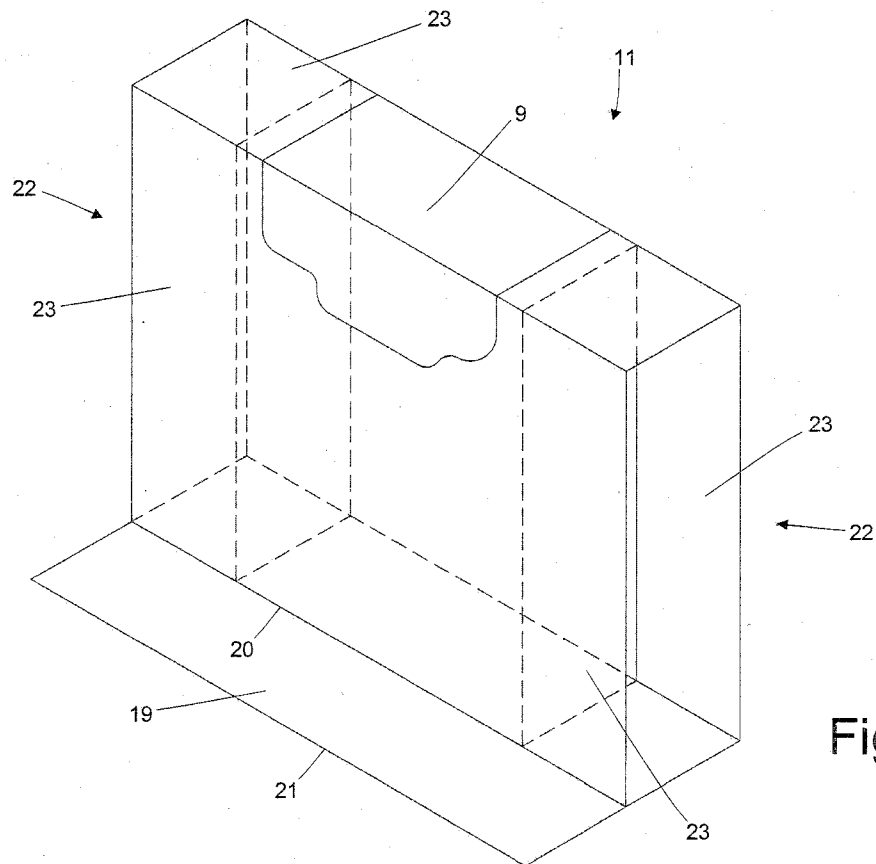


Fig.9

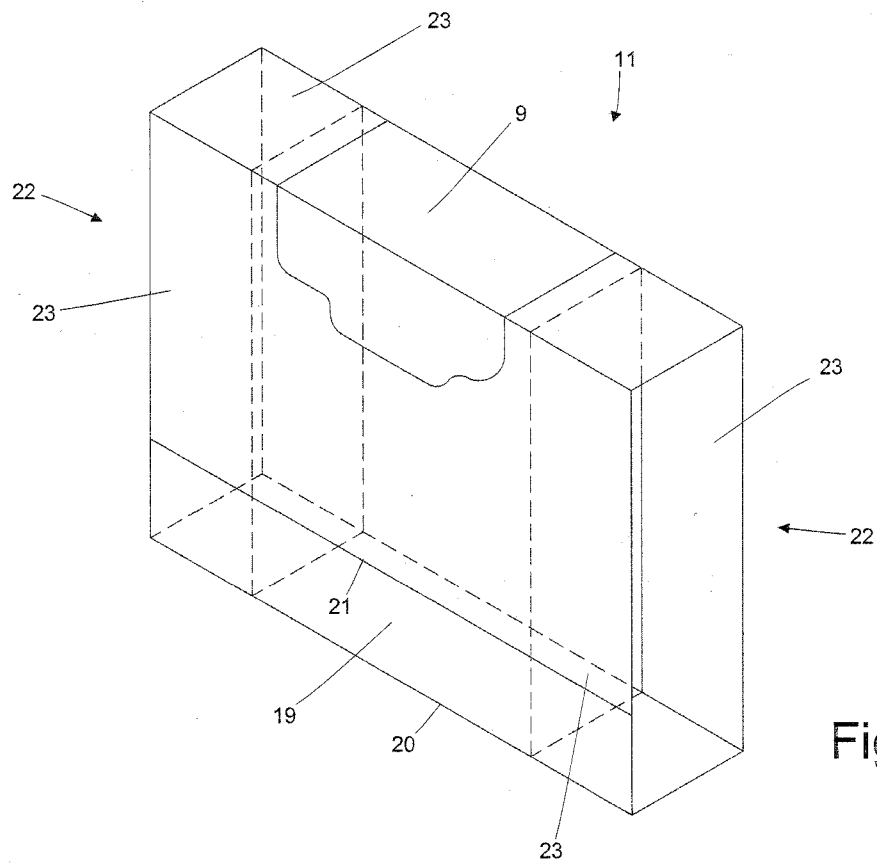


Fig.10

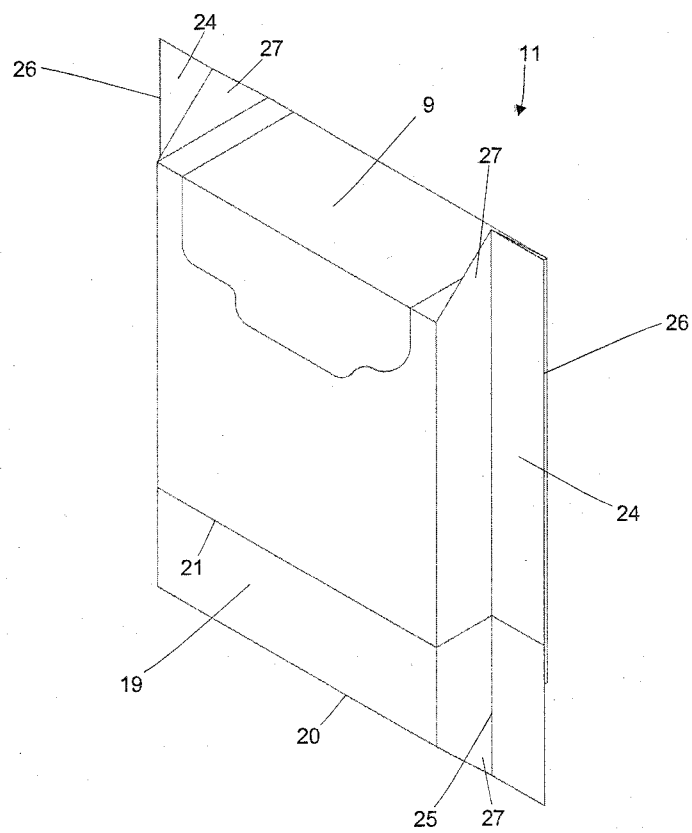


Fig.11

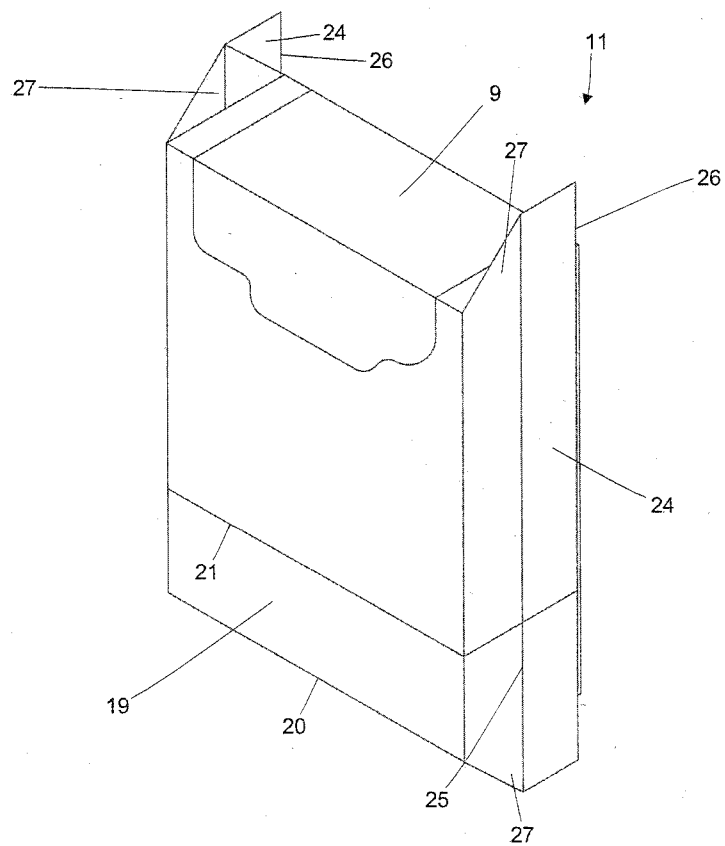


Fig.12

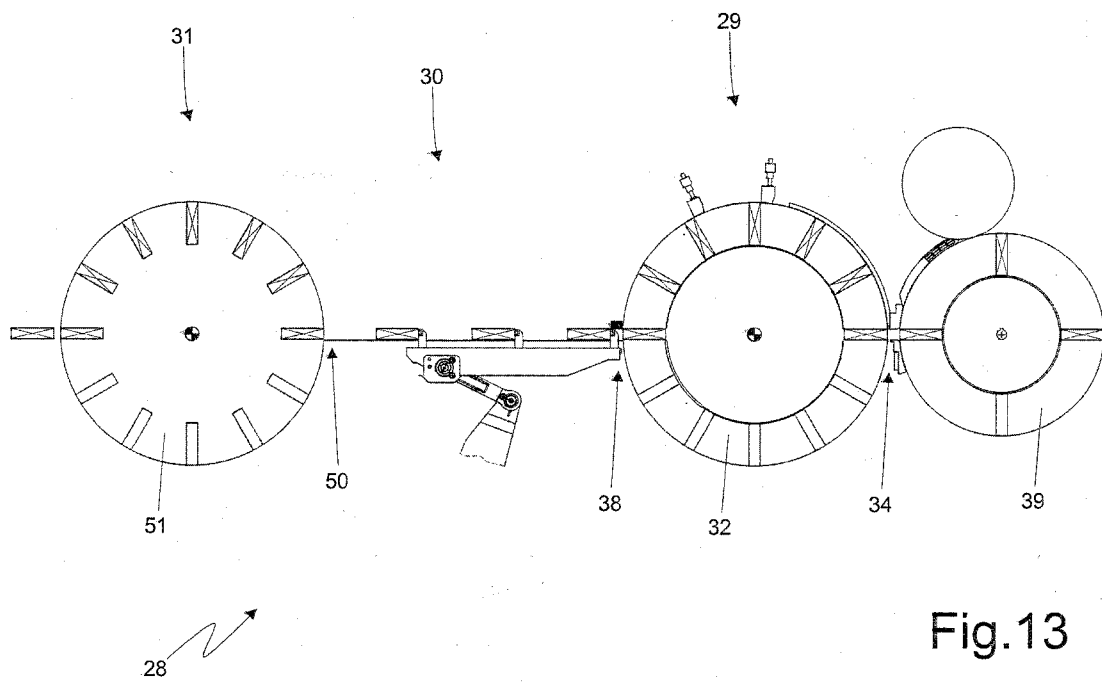


Fig.13

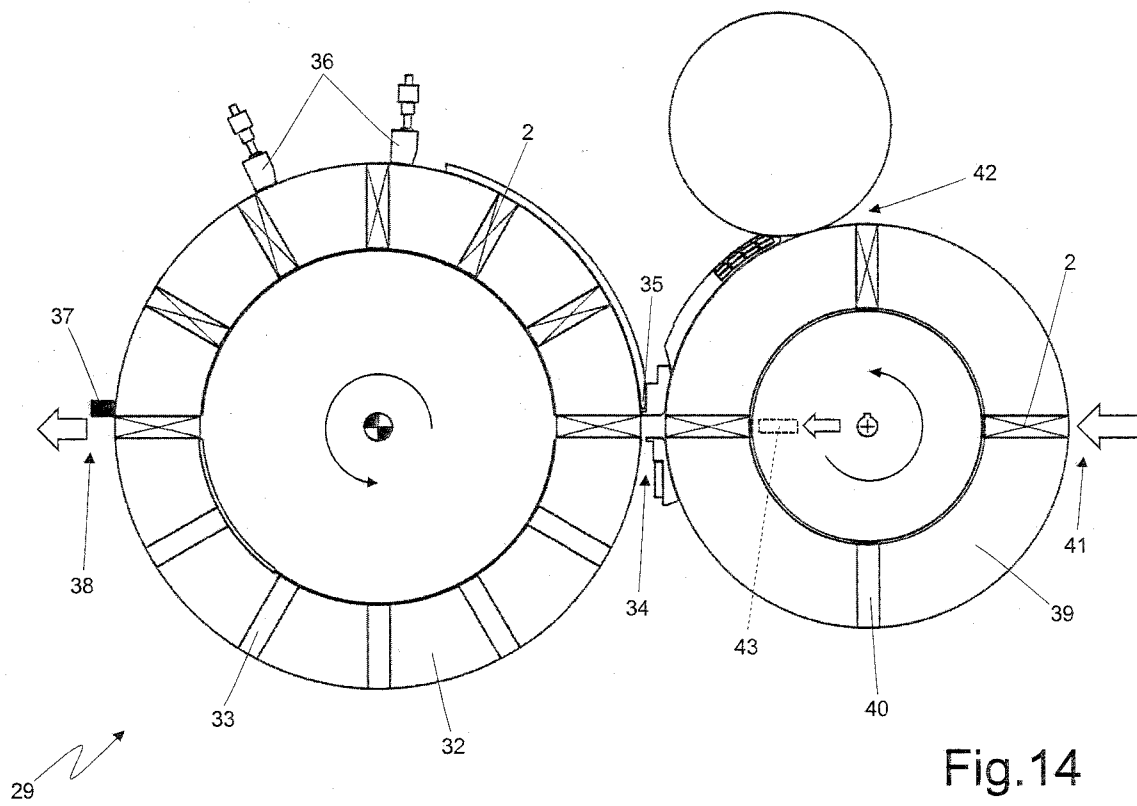


Fig.14

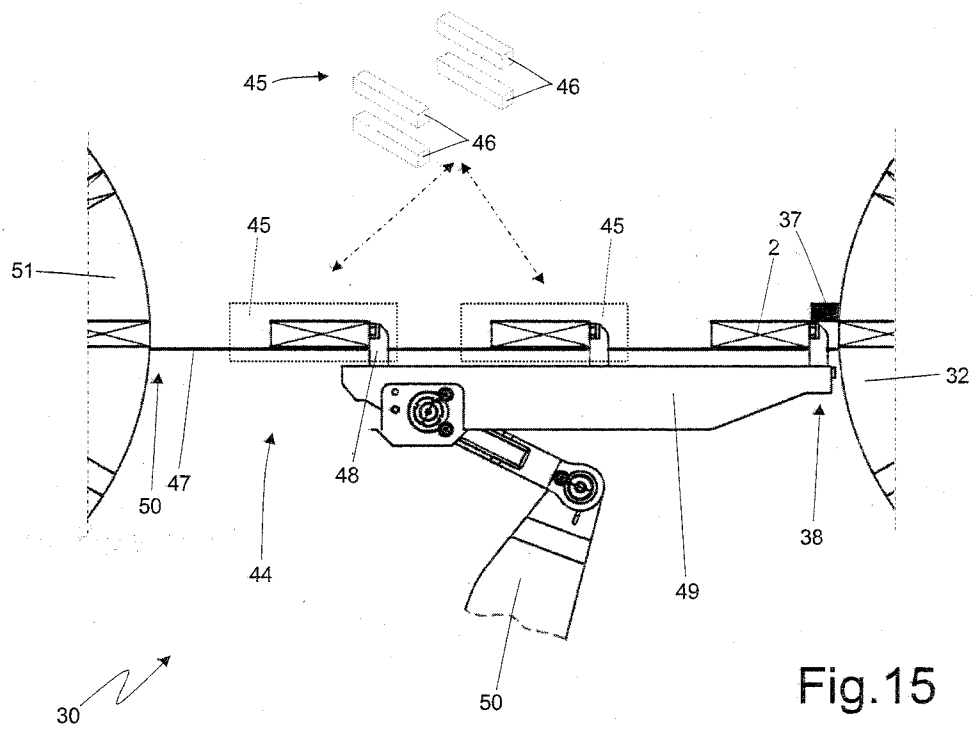


Fig.15

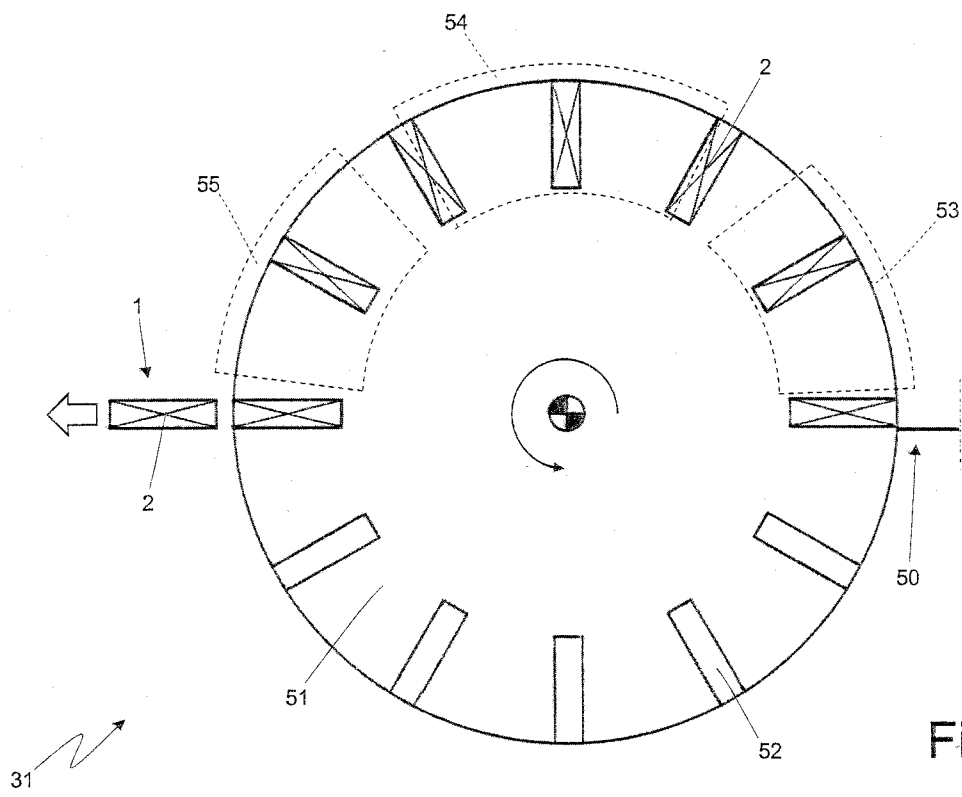
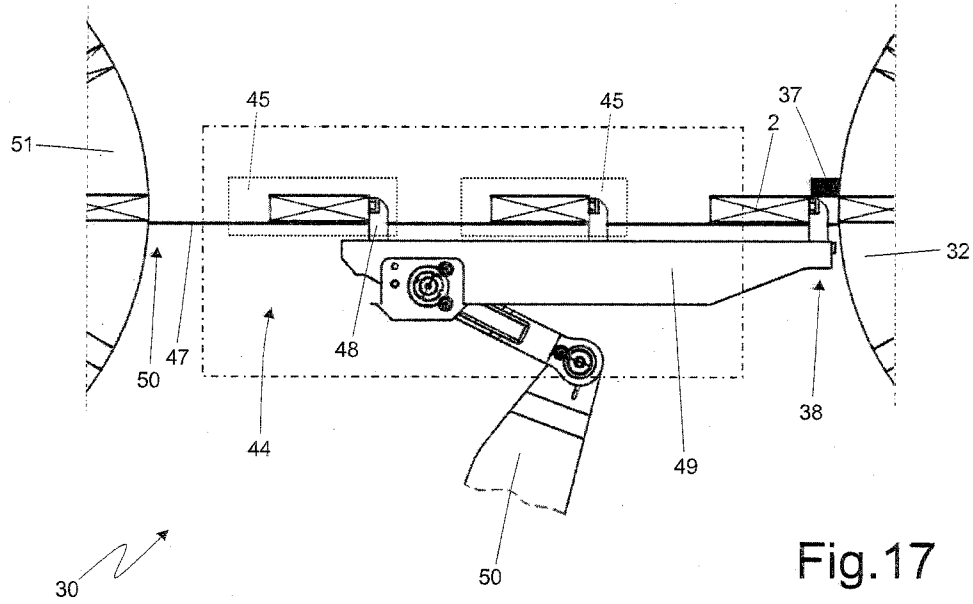


Fig.16



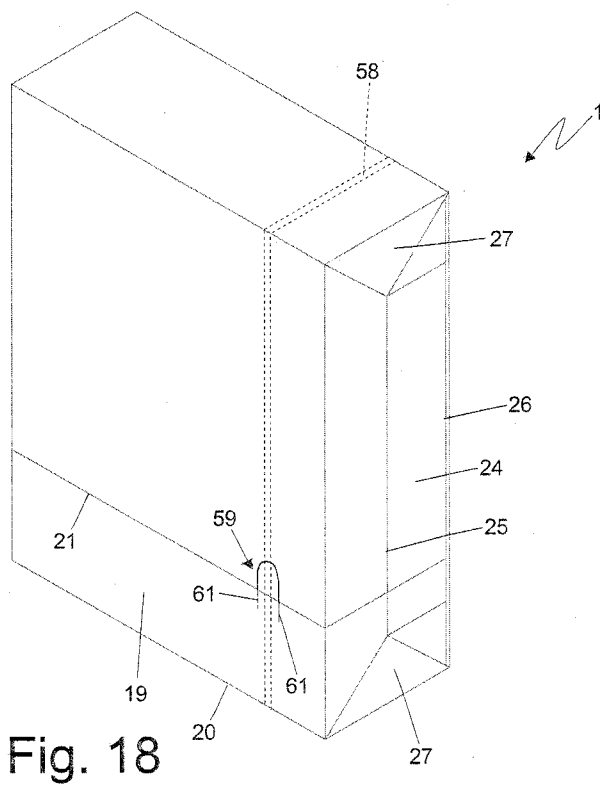


Fig. 18

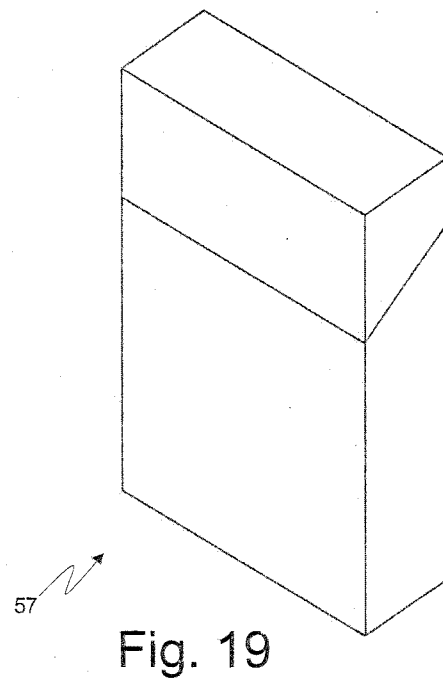


Fig. 19

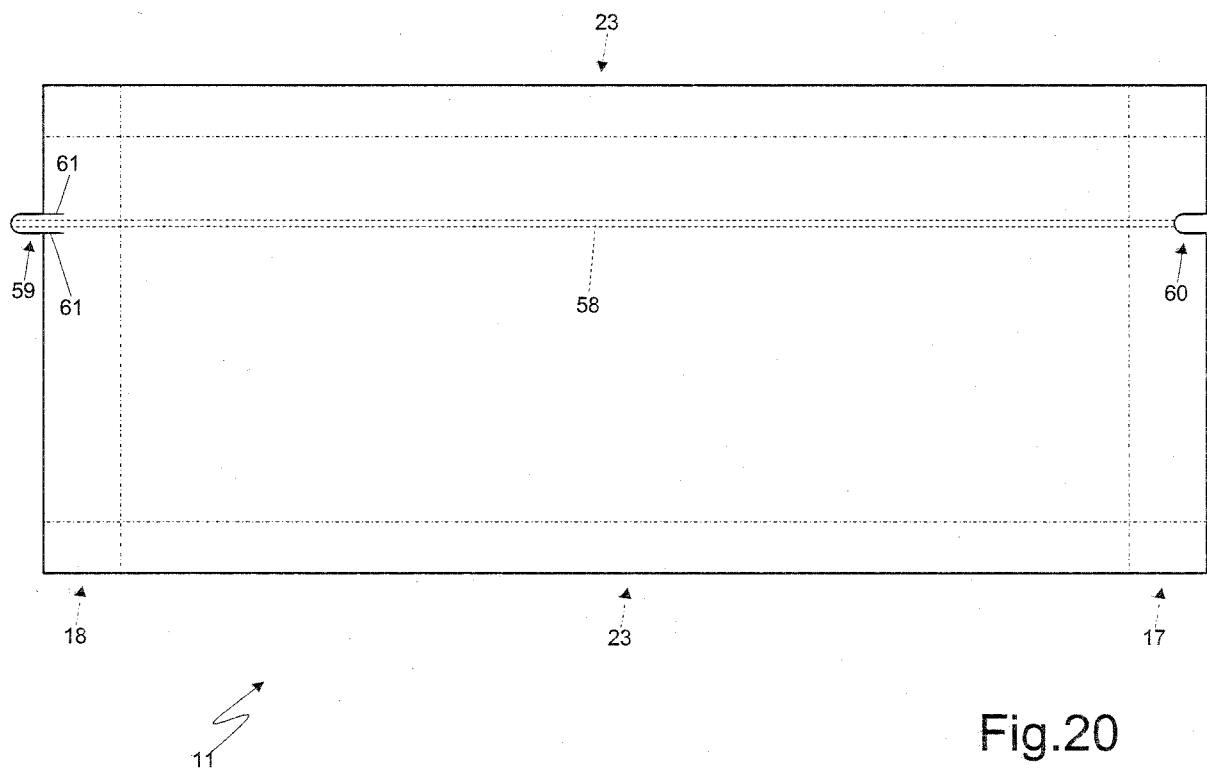
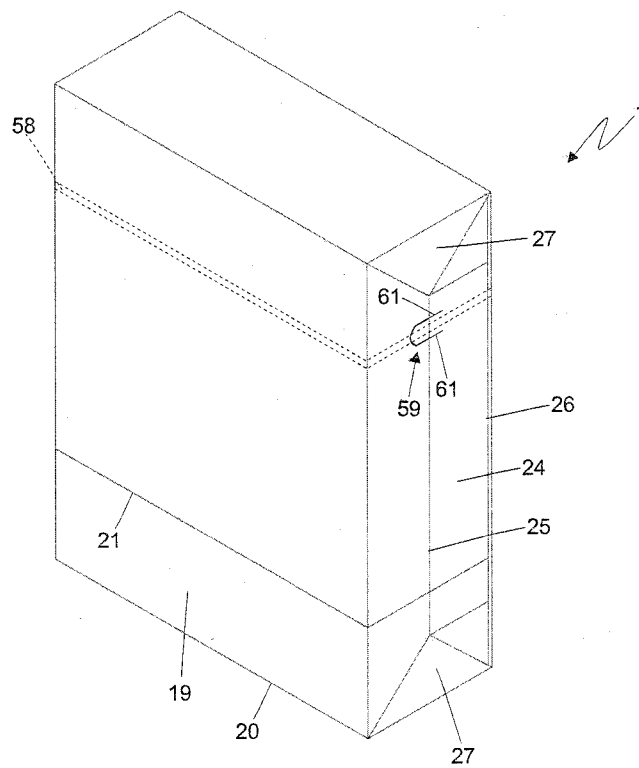


Fig.20

Fig. 21



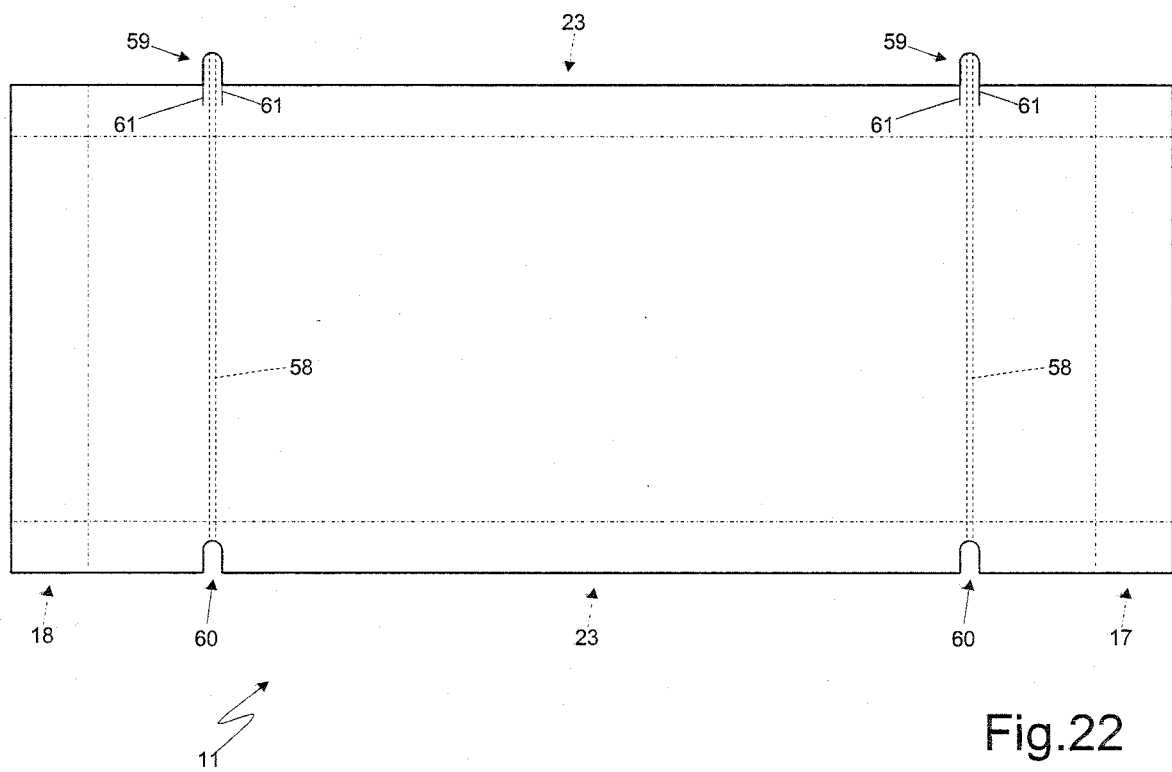


Fig.22

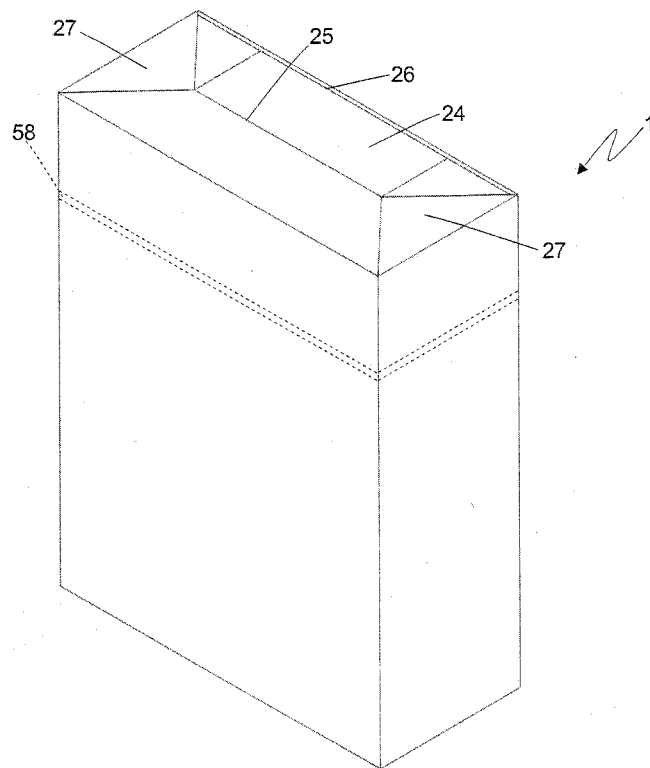


Fig.23

