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(54) **METHOD AND PACKING MACHINE FOR PRODUCING PACKETS OF CIGARETTES**

(57) A method and packing machine (1) for producing packets (2) of cigarettes, whereby a group (4) of cigarettes is fed by a packing conveyor (25) along a packing path (P1) and through a feed station (24b) for feeding sheets (5) of inner packing material, each of which is rectangular with two long sides and two short sides; a feed conveyor (26) feeds each sheet (5) of inner packing material through the feed station (24b) and along a feed

path (P2), perpendicular to the packing path (P1), so that a respective group (4) of cigarettes intercepts the sheet (5) of inner packing material, thus folding the sheet (5) of inner packing material into a U about the group (4) of cigarettes; and each sheet (5) of inner packing material is fed through the feed station (24b) and along the feed path (P2) with its long sides perpendicular to the feed path (P2), and its short sides parallel to the feed path (P2).

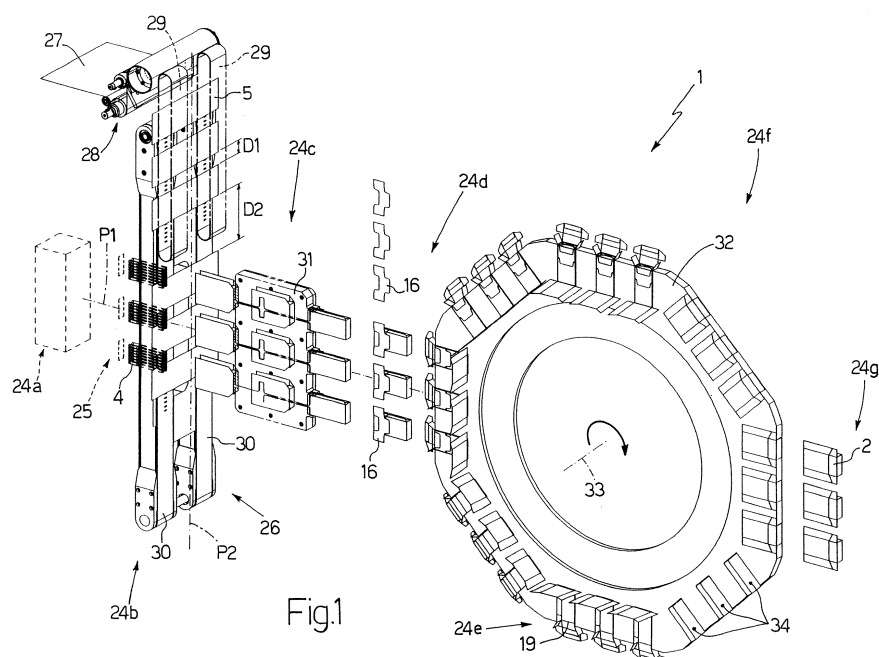


Fig.1

Description

TECHNICAL FIELD

[0001] The present invention relates to a method and packing machine for producing packets of cigarettes.

[0002] The present invention may be used to advantage in a packing machine for producing rigid, hinged-lid packets of cigarettes, to which the following description refers purely by way of example.

BACKGROUND ART

[0003] A rigid, hinged-lid packet of cigarettes comprises a group of cigarettes wrapped in a sheet of foil inner packing material; and a rigid outer package containing the group of cigarettes. The outer package comprises a cup-shaped container housing the group of cigarettes and having an open top end, and a cup-shaped lid hinged to the container along a hinge to rotate, with respect to the container, between an open position and a closed position opening and closing the open end respectively. A collar is normally provided, which is folded and connected to the inside of the container, and projects partly out of the open end to engage a corresponding inner surface of the lid when the lid is in the closed position.

[0004] A packing machine for producing rigid, hinged-lid packets of cigarettes comprises a station for forming groups of cigarettes; a station for feeding and folding sheets of inner packing material about the groups of cigarettes; a station for feeding and folding collars; and a station for feeding and folding blanks about the groups of cigarettes and on top of the folded sheets of inner packing material to form the outer packages. At the station for feeding and folding sheets of inner packing material about the groups of cigarettes, a strip of foil is unwound off a reel and cut transversely to cut each sheet of inner packing material off the strip.

[0005] Given the steady increase in the output rate of cigarette packing machines, which is now close to 700 packets a minute for single-line packing machines (i.e. with one packing line) and close to 1000 packets a minute for two-line packing machines (i.e. with two side by side packing lines), the average travelling speed of the foil strip on modern cigarette packing machines is extremely high, and makes it difficult to ensure precise positioning of the sheet of inner packing material with respect to the group of cigarettes. Though minor errors in the position of the sheet of inner packing material with respect to the group of cigarettes do not prevent manufacture of the packet of cigarettes, they seriously impair the end quality of the packet, and as such are unacceptable.

[0006] To reduce the average travelling speed of the foil strip on a two-line packing machine, it has been proposed to employ one foil strip of double width, which is cut longitudinally in half into two identical foil strips, which are then cut transversely to cut pairs of sheets of inner packing material off the strips. This solution, however, is

difficult to implement, by involving both longitudinal and transverse cutting operations.

DISCLOSURE OF INVENTION

[0007] It is an object of the present invention to provide a method and packing machine for producing packets of cigarettes, designed to eliminate the aforementioned drawbacks, and which in particular are cheap and easy to implement, while at the same time providing for a high output rate.

[0008] According to the present invention, there are provided a method and packing machine for producing packets of cigarettes, as claimed in the accompanying Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective, with parts removed for clarity, of a cigarette packing machine in accordance with the present invention; Figures 2 and 3 show two further views in perspective of the Figure 1 packing machine; Figure 4 shows a front view in perspective of a packet of cigarettes produced on the Figure 1 packing machine and in a closed configuration; Figure 5 shows a front view in perspective of the Figure 4 packet in an open configuration; Figure 6 shows a rear view in perspective of the Figure 4 packet in a closed configuration; Figure 7 shows a spread-out view of a blank from which to produce the Figure 4 packet.

PREFERRED EMBODIMENT OF THE INVENTION

[0010] Number 1 in Figure 1 indicates as a whole a packing machine for producing rigid, hinged-lid packets 2 of cigarettes.

[0011] As shown in Figures 4-6, each packet 2 of cigarettes comprises a cup-shaped container 3, and a group 4 of cigarettes housed inside container 3. Group 4 of cigarettes is parallelepiped-shaped, is wrapped in a sheet 5 of foil inner packing material, and is housed inside container 3. Before being folded, sheet 5 of inner packing material is rectangular with two long sides and two short sides. Container 3 has an open top end 6; and a cup-shaped lid 7 hinged to container 3 along a hinge 8 to rotate, with respect to container 3, between an open position (Figure 5) and a closed position (Figures 4, 6) opening and closing open top end 6 respectively.

[0012] When lid 7 is in the closed position, container 3 is in the form of a rectangular parallelepiped comprising a top wall 9 and a bottom wall 10 parallel to and opposite each other; two parallel opposite major lateral walls 11,

12; and two parallel opposite minor lateral walls 13. More specifically, one major lateral wall 11 defines a front wall 11 of container 3, and the other major lateral wall 12 defines a rear wall 12 of container 3, and supports hinge 8 of lid 7. Four longitudinal edges 14 are defined between lateral walls 13 and front and rear walls 11 and 12; and eight transverse edges 15 are defined between top and bottom walls 10, 11 and front wall 11, rear wall 12, and lateral walls 13.

[0013] Packet 1 also comprises a collar 16, which is folded into a U and connected (glued) to the inside of container 3, and projects partly out of open top end 6 to engage a corresponding inner surface of lid 7 when lid 7 is in the closed position. Collar 16 comprises a front wall 17 contacting front wall 11 of container 3; and two lateral walls 18 located on opposite sides of front wall 17 and contacting minor lateral walls 13 of container 3.

[0014] As shown in Figure 7, container 3 is formed from a corresponding sheet 19 of outer packing material. More specifically, sheet 19 of outer packing material is rigid and defined by a flat, substantially elongated rectangular blank. In the following description, the component parts of blank 19 are indicated, where possible, using the same reference numbers, with superscripts, as for the corresponding parts of container 3.

[0015] Blank 19 has two longitudinal crease lines 20, and a number of transverse crease lines 21 defining, between the two longitudinal crease lines 20, a panel 11' forming a top portion of front wall 11 (more specifically, the portion forming part of lid 7); a panel 9' forming top wall 9; a panel 12' forming rear wall 12 and therefore having hinge 8; a panel 10' forming bottom wall 10; and a panel 11'' forming a bottom portion of front wall 11 (more specifically, the portion forming part of container 3).

[0016] Each panel 11', 11'', 12' has two lateral wings 13' and 13'', which are located on opposite sides of relative panel 11', 11'', 12', and are separated from relative panel 11', 11'', 12' by longitudinal crease lines 20. Panel 11' has a reinforcing flap 22 for strengthening the bottom edge of lid 7; and each wing 13', 13'' of panel 12' has respective rectangular tabs 23 at opposite ends of wing 13', 13''.

[0017] When forming each packet 2, the corresponding lateral wings 13', 13'' are superimposed and glued to each other to form the minor lateral walls 13 of container 3; each tab 23 is folded squarely with respect to relative lateral wing 13', 13'', and is superimposed on and glued to an inner surface of a relative panel 9', 10' to define an inner portion of a relative wall 9, 10; and reinforcing flap 22 is folded 180° onto and glued to panel 11'.

[0018] In the Figure 4-7 embodiment, longitudinal edges 14 and transverse edges 15 are all square. In a variation not shown, longitudinal edges 14 are rounded; in which case, to form rounded edges 14, blank 19 must have four groups of closely spaced longitudinal crease lines to enable blank 19 to flex locally as required into a circular shape. In further embodiments not shown, at least some of longitudinal edges 14 or at least some of

transverse edges 15 are rounded or bevelled (as in the packet of cigarettes described in Patent Application EP-A1-0764595). Alternatively, some longitudinal edges 14 and some transverse edges 15 may be non-square, rounded or bevelled edges, so as to have both non-square, rounded or bevelled longitudinal edges 14 and non-square, rounded or bevelled transverse edges 15.

[0019] In a different embodiment not shown, packet 2 of cigarettes may resemble the packet of cigarettes described in Patent Application EP-A1-1066206; in which case, major lateral walls 11 and 12 are outwardly convex, and each have a flat central portion, and two curved creased lateral bands connecting the flat central portion to minor lateral walls 13 at respective sharp, non-square longitudinal edges 14. Clearly, changes may be made to packets 2 of cigarettes resembling the one described in Patent Application EP-A1-1066206, such as partly curving the convex walls, or curving only one wall as opposed to two opposite facing walls, or curving minor lateral walls 13 as opposed to major lateral walls 11 and 12. By way of example, some variations of the packet of cigarettes described in Patent Application EP-A1-1066206 are proposed in Patent Application WO03026984A1.

[0020] As shown in Figures 1-3, packing machine 1 comprises a number of work stations 24 arranged successively along a packing path. More specifically, packing machine 1 comprises seven work stations 24 : a group-forming station 24a for forming groups 4 of cigarettes; a feed station 24b for feeding sheets 5 of inner packing material; a folding station 24c for folding sheets 5 of inner packing material about groups 4 of cigarettes; a feed-and-fold station 24d for feeding and folding collars 16 about groups 4 of cigarettes and on top of the folded sheets 5 of inner packing material; a feed station 24e for feeding sheets 19 of outer packing material; a folding station 24f for folding sheets 19 of outer packing material about groups 4 of cigarettes and on top of the folded sheets 5 of inner packing material; and a drying station 24g for drying packets 2.

[0021] For each work station 24, the following description is limited to the main operating devices shown in Figures 1-3, though, in actual fact, each work station 24 comprises additional operating devices that cannot be shown in detail in the drawings.

[0022] Station 24a for forming groups 4 of cigarettes comprises a hopper (not shown in detail) with at least three outlets for feeding three groups 4 of cigarettes simultaneously to three pockets of a group-forming conveyor (not shown). By way of example, the group-forming conveyor may comprise a drum rotating intermittently (or "in steps") about a horizontal axis of rotation, and supporting a number of groups of three pockets each.

[0023] A packing conveyor 25 (shown schematically) picks up the groups 4 of cigarettes from group-forming station 24a, and feeds groups 4 of cigarettes along a horizontal packing path P1, which extends through station 24b for feeding sheets 5 of inner packing material, through station 24c for folding sheets 5 of inner packing

material, and through station 24d for feeding and folding collars 16, and terminates at station 24f for folding sheets 19 of outer packing material. By way of example, packing conveyor 25 may comprise a belt conveyor having a conveying branch coinciding with packing path P1, and a return branch, and which supports a number of pushers which push groups 4 of cigarettes along packing path P1. Alternatively, packing conveyor 25 may comprise a number of pushers, each of which is integral with the other pushers and pushes each group 4 of cigarettes forward one respective step of a sequence of steps of each group 4 of cigarettes along packing path P1.

[0024] In a preferred embodiment, packing conveyor 25 simultaneously feeds along packing path P1 three groups 4 of cigarettes arranged side by side in a vertical direction perpendicular to packing path P1. In other words, three vertically offset groups 4 of cigarettes are fed simultaneously along packing path P1 by packing conveyor 25.

[0025] Feed station 24b comprises a feed conveyor 26, which feeds each sheet 5 of inner packing material along a vertical feed path P2 perpendicular to packing path P1, so that each group 4 of cigarettes intercepts a respective sheet 5 of inner packing material, which is thus folded into a U about group 4 of cigarettes. Each sheet 5 of inner packing material is fed through feed station 24b and along feed path P2 with its long sides perpendicular to feed path P2, and its short sides parallel to feed path P2.

[0026] As stated, packing conveyor 25 simultaneously feeds along packing path P1 three groups 4 of cigarettes arranged side by side in a vertical direction (i.e. parallel to feed path P2). Consequently, feed conveyor 26 feeds through feed station 24b and along feed path P2 three successive sheets 5 of inner packing material, which are intercepted simultaneously by three respective side by side groups 4 of cigarettes.

[0027] In a preferred embodiment, each two successive sheets 5 of inner packing material intercepted simultaneously are spaced apart along feed path P2 by a given distance D1 exactly equal to the distance between each two side by side groups 4 of cigarettes; and each two sheets 5 of inner packing material not intercepted simultaneously are spaced apart along feed path P2 by a given distance D2 greater than distance D1. In other words, a succession of groups of three sheets 5 of inner packing material is fed along feed path P2; the three sheets 5 of inner packing material in each group are spaced apart by distance D1 exactly equal to the distance between each two side by side groups 4 of cigarettes; whereas each two successive groups of sheets 5 of inner packing material are spaced apart by distance D2 greater than distance D1.

[0028] In a preferred embodiment shown in the attached drawings, feed station 24b comprises a reel-off device (not shown) for unwinding off a reel (not shown) a strip 27 of packing material of a width equal to the long sides of each sheet 5 of inner packing material; and a

cutting device 28 for cyclically cutting strip 27 of packing material transversely to cut sheets 5 of inner packing material off strip 27 of packing material. Feed conveyor 26 is located immediately downstream from cutting device 28 to receive sheets 5 of inner packing material from cutting device 28, and spaces sheets 5 of inner packing material along feed path P2 as described above.

[0029] Feed conveyor 26 comprises a pair of top suction belts 29 immediately downstream from cutting device 28; and a pair of bottom suction belts 30 downstream from top suction belts 29. The two top suction belts 29 are parallel and side by side, and feed sheets 5 of inner packing material along feed path P2 by retaining two opposite ends of each sheet 5 of inner packing material; similarly, the two bottom suction belts 30 are parallel and side by side, and feed sheets 5 of inner packing material along feed path P2 by retaining two opposite ends of each sheet 5 of inner packing material. The two bottom suction belts 30 being spaced a given distance apart, groups 4 of cigarettes travelling through feed station 24b along packing path P1 pass between the two bottom suction belts 30.

[0030] The two top suction belts 29 are located on the opposite side of sheets 5 of inner packing material with respect to the two bottom suction belts 30, so as to form a transfer area in which each sheet 5 of inner packing material is retained simultaneously by both top suction belts 29 and bottom suction belts 30, and in which each sheet 5 of inner packing material is released by top suction belts 29 to bottom suction belts 30.

[0031] By way of example, each suction belt 29, 30 comprises a perforated belt (or at any rate a belt permeable to air) wound about two end pulleys (one idle and the other powered) and having a conveying branch which runs over a chamber in which a vacuum is formed by a suction pump.

[0032] The travelling speed of top suction belts 29 is set with respect to cutting device 28 to space all the sheets 5 of inner packing material apart by distance D1; and the travelling speed of bottom suction belts 30 is set with respect to top suction belts 29 to space each group of three sheets 5 of inner packing material apart from the next group of three sheets 5 of inner packing material by distance D2.

[0033] Folding station 24c comprises a folding device 31 comprising three superimposed, substantially identical packing conduits, each of which defines a respective straight folding channel along which a respective succession of groups 4 of cigarettes travels along packing path P1. Each straight folding channel is equipped with both fixed (i.e. helical) folders and movable folders, to complete the folding of each sheet 5 of inner packing material about a respective group 4 of cigarettes.

[0034] Station 24d for feeding and folding collars 16 comprises a feed device (not shown), which detaches collars 16 successively from a strip of collars (not shown) unwound off a reel (not shown), to feed groups of three collars 16 to folding station 24d. Collars 16 are fed in

much the same way as sheets 5 of inner packing material. That is, three successive collars 16 are fed through feed station 24d and intercepted simultaneously by three respective side by side groups 4 of cigarettes wrapped in sheets 5 of inner packing material. At station 24d for feeding and folding collars 16, each collar 16 is folded into a U about the respective group 4 of cigarettes and on top of sheet 5 of inner packing material by known folders (not shown).

[0035] Station 24f for folding sheets 19 of outer packing material comprises a vertical packing wheel 32, which rotates clockwise in steps (i.e. intermittently) about a horizontal axis of rotation 33 perpendicular to packing path P1, and has a number of peripheral pockets 34, each for housing a group 4 of cigarettes. In a preferred embodiment, packing wheel 32 is polygonal (in particular, octagonal) with a number of (in particular, eight) sides, along each of which are arranged three parallel, side by side pockets 34.

[0036] At feed station 24e, sheets 19 of outer packing material are inserted inside respective pockets 34 on packing wheel 32, so that each sheet 19 of outer packing material is folded partly inside respective pocket 34. At feed station 24e, three sheets 19 of outer packing material are preferably inserted simultaneously into three pockets 34 along the same side of packing wheel 32.

[0037] Downstream, with respect to the rotation direction of packing wheel 32, from station 24e for feeding sheets 19 of outer packing material, three groups 4 of cigarettes, wrapped in respective sheets 5 of inner packing material and complete with respective collars 16, are inserted simultaneously into three pockets 34 located along the same side of packing wheel 32 and containing respective sheets 19 of outer packing material. As packing wheel 32 rotates further, each sheet 19 of outer packing material is folded about a respective group 4 of cigarettes wrapped in a sheet 5 of inner packing material, to form a respective packet 2 of cigarettes.

[0038] Packets 2 of cigarettes are expelled successively from pockets 34 of packing wheel 32 at drying station 24g. Preferably, folding of each sheet 19 of outer packing material about respective group 4 of cigarettes wrapped in sheet 5 of inner packing material is completed so as to complete respective packet 2 of cigarettes as packet 2 of cigarettes is expelled from respective pocket 34 of packing wheel 32 and fed to drying station 24g. More specifically, at drying station 24g, packet 2 of cigarettes is completed by gumming and folding the outer wings 13', 13" onto the corresponding already-folded wings 13', 13".

[0039] In an alternative embodiment not shown, packing machine 1 may be altered to produce soft packets 2 of cigarettes; in which case, the main differences lie in not using collars 16, and in each sheet 19 of outer packing material being defined by a soft sheet similar to sheet 5 of inner packing material, as opposed to a rigid blank. Consequently, sheets 19 of outer packing material are fed and folded in exactly the same way as sheets 5 of

inner packing material. More specifically, each group 4 of cigarettes wrapped in a sheet 5 of inner packing material is fed along packing path P1 and through station 24e for feeding sheets 19 of outer packing material, each of which is rectangular with two long sides and two short sides; each sheet 19 of outer packing material is fed through feed station 24e and along a feed path perpendicular to packing path P1, with its long sides perpendicular to the feed path and its short sides parallel to the feed path, so that a respective group 4 of cigarettes intercepts sheet 19 of outer packing material, which is thus folded into a U about group 4 of cigarettes. Each sheet 19 of outer packing material is then folded, along packing path P1, about respective group 4 of cigarettes by a folding device similar to folding device 31. As in the case of sheets 5 of inner packing material, three groups 4 of cigarettes, arranged side by side in a direction parallel to the feed path, are fed along packing path P1; so, accordingly, three successive sheets 19 of outer packing material are fed through feed station 24e along the feed path, and are intercepted simultaneously by three respective side by side groups 4 of cigarettes.

[0040] Preferably, a strip of packing material, of a width equal to the long sides of sheet 19 of outer packing material, is unwound off a reel and cut cyclically crosswise by a cutting device to cut sheets 19 of outer packing material off the strip of packing material. Once cut off the strip of packing material, each two successive sheets 19 of outer packing material intercepted simultaneously are spaced apart along the feed path by distance D1; and each two sheets 19 of outer packing material not intercepted simultaneously are spaced apart by distance D2.

[0041] In the embodiment shown in the attached drawings, packing machine 1 processes three groups 4 of cigarettes simultaneously. In alternative embodiments, packing machine 1 may process two groups 4 of cigarettes simultaneously, or even only one group 4 of cigarettes at a time. Reducing the number of groups 4 of cigarettes processed simultaneously obviously reduces the complexity and size of packing machine 1, but also reduces the output rate (i.e. the number of packets 2 of cigarettes produced in a given time interval) of packing machine 1.

[0042] Packing machine 1 as described above has numerous advantages. In particular, by feeding sheets 5 of inner packing material along feed path P2 with the long sides perpendicular to feed path P2 and the short sides parallel to feed path P2, the average travelling speed of sheets 5 of inner packing material is relatively slow, so that highly precise positioning of each sheet 5 of inner packing material with respect to respective group 4 of cigarettes can be achieved easily.

[0043] Moreover, simultaneously packing three groups 4 of cigarettes provides for a high output rate (as many as 1500 packets a minute), while at the same time allowing a relatively long time interval in which to perform each packing operation. As such, each packing operation can be performed extremely accurately, without recourse

to complicated, unproven engineering solutions.

Claims

1. A method of producing packets of cigarettes, each of which comprises a group (4) of cigarettes; a sheet (5) of foil inner packing material enclosing the group (4) of cigarettes to form an inner package; and a sheet (19) of outer packing material enclosing the group (4) of cigarettes and the sheet (5) of inner packing material to form an outer package; the method comprising the steps of:

feeding each group (4) of cigarettes, by means of a packing conveyor (25), along a packing path (P1) and through a first feed station (24b) for feeding the sheets (5) of inner packing material, each of which is rectangular with two long sides and two short sides;

feeding each sheet (5) of inner packing material, by means of a first feed conveyor (26), through the first feed station (24b) and along a first feed path (P2) perpendicular to the packing path (P1), so that a respective group (4) of cigarettes intercepts the sheet (5) of inner packing material, thus folding the sheet (5) of inner packing material into a U about the group (4) of cigarettes; and

folding each sheet (5) of inner packing material about the respective group (4) of cigarettes; the method being **characterized by** comprising the further step of:

feeding each sheet (5) of inner packing material through the first feed station (24b) and along the first feed path (P2), with its long sides perpendicular to the first feed path (P2), and its short sides parallel to the first feed path (P2).

2. A method as claimed in Claim 1, and comprising the further steps of:

feeding along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the first feed path (P2); and feeding through the first feed station (24b) and along the first feed path (P2) at least two successive sheets (5) of inner packing material, which are intercepted simultaneously by two respective side by side groups (4) of cigarettes.

3. A method as claimed in Claim 2, and comprising the further steps of:

feeding along the packing path (P1) three groups (4) of cigarettes arranged side by side in

a direction parallel to the first feed path (P2); and feeding through the first feed station (24b) and along the first feed path (P2) three successive sheets (5) of inner packing material, which are intercepted simultaneously by three respective side by side groups (4) of cigarettes.

4. A method as claimed in Claim 1, 2 or 3, wherein the first feed conveyor (26) comprises two parallel, side by side first suction belts (30), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; and the groups (4) of cigarettes travelling along the packing path (P1) and through the first feed station (24b) pass between the two first suction belts (30).

5. A method as claimed in any one of Claims 1 to 4, and comprising the further steps of:

unwinding off a first reel a first strip (27) of packing material of a width equal to the long sides of the sheet (5) of inner packing material; cyclically cutting the first strip (27) of packing material transversely in a first cutting device (28) to cut the sheets (5) of inner packing material off the first strip (27) of packing material; and spacing apart, along the first feed path (P2), each two successive sheets (5) of inner packing material.

6. A method as claimed in Claim 5, and comprising the further steps of:

spacing apart, along the first feed path (P2) and by a first given distance (D1), each two successive sheets (5) of inner packing material that are intercepted simultaneously; and spacing apart, along the first feed path (P2) and by a second given distance (D2) greater than the first distance (D1), each two sheets (5) of inner packing material that are not intercepted simultaneously.

7. A method as claimed in Claim 6, wherein the first feed conveyor (26) comprises:

two parallel, side by side first suction belts (30), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; the groups (4) of cigarettes travelling along the packing path (P1) and through the first feed station (24b) passing between the two first suction belts (30); and two parallel, side by side second suction belts

(29), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; the two second suction belts (29) being located upstream from the first suction belts (30) and downstream from the first cutting device (28).

8. A method as claimed in Claim 7, wherein:

the travelling speed of the second suction belts (29) is set with respect to the first cutting device (28) to space all the sheets (5) of inner packing material apart by the first distance (D1); and the travelling speed of the first suction belts (30) with respect to the second suction belts (29) is set to space a group of sheets (5) of inner packing material apart from the next group of sheets (5) of inner packing material by the second distance (D2).

9. A method as claimed in any one of Claims 1 to 8, and comprising the further steps of:

feeding each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, along the packing path (P1) and through a second feed station (24d) for feeding collars (16); and folding each collar (16) about the respective group (4) of cigarettes and on top of the sheet (5) of inner packing material at the second feed station (24d) for feeding collars (16).

10. A method as claimed in Claim 9, and comprising the further steps of:

inserting the sheets (19) of outer packing material inside respective pockets (34) of a packing wheel (32), so that each sheet (19) of outer packing material is folded partly inside the respective pocket (34); downstream from the second feed station (24d) for feeding collars (16), inserting each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, inside a pocket (34) of the packing wheel (32) containing a respective sheet (19) of outer packing material; and folding each sheet (19) of outer packing material about a respective group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, to form a respective packet (2) of cigarettes.

11. A method as claimed in Claim 10, and comprising the further steps of:

expelling the packets (2) of cigarettes successively from the pockets (34) of the packing wheel

(32); and

completing the folding of each sheet (19) of outer packing material about a respective group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, so as to complete a respective packet (2) of cigarettes as the packet (2) of cigarettes is expelled from the respective pocket (34) of the packing wheel (32).

12. A method as claimed in Claim 11, and comprising the further step of feeding the packets (2) of cigarettes to a drying station (24g) downstream from the packing wheel (32).

13. A method as claimed in Claim 10, 11 or 12, wherein the packing path (P1) is horizontal, the first feed path (P2) is vertical, and the packing wheel (32) is vertical and rotates about a horizontal axis of rotation (33) perpendicular to the packing path (P1).

14. A method as claimed in any one of Claims 1 to 8, and comprising the further steps of:

feeding each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, along the packing path (P1) and through a third feed station (24e) for feeding the sheets (19) of outer packing material, each of which is rectangular with two long sides and two short sides; feeding each sheet (19) of outer packing material through the third feed station (24e) and along a second feed path, perpendicular to the packing path (P1), with the long sides perpendicular to the second feed path, and the short sides parallel to the second feed path, so that a respective group (4) of cigarettes intercepts the sheet (19) of outer packing material, thus folding the sheet (19) of outer packing material into a U about the group (4) of cigarettes; and folding each sheet (19) of outer packing material about the respective group (4) of cigarettes along the packing path (P1).

15. A method as claimed in Claim 14, and comprising the further steps of:

feeding along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the second feed path; and feeding through the third feed station (24e) and along the second feed path at least two successive sheets (19) of outer packing material, which are intercepted simultaneously by two respective side by side groups (4) of cigarettes.

16. A method as claimed in Claim 14 or 15, and comprising the further steps of:

unwinding off a second reel a second strip of packing material of a width equal to the long sides of the sheet (19) of outer packing material; cyclically cutting the second strip of packing material transversely in a second cutting device to cut the sheets (19) of outer packing material off the second strip of packing material; and spacing apart, along the second feed path, each two successive sheets (19) of outer packing material.

17. A method as claimed in Claim 16, and comprising the further steps of:

spacing apart, along the second feed path and by a first given distance (D1), each two successive sheets (19) of outer packing material that are intercepted simultaneously; and spacing apart, along the second feed path and by a second given distance (D2) greater than the first distance (D1), each two sheets (19) of outer packing material that are not intercepted simultaneously.

18. A packing machine for producing packets of cigarettes, each of which comprises a group (4) of cigarettes; a sheet (5) of foil inner packing material enclosing the group (4) of cigarettes to form an inner package; and a sheet (19) of outer packing material enclosing the group (4) of cigarettes and the sheet (5) of inner packing material to form an outer package; the packing machine (1) comprising:

a first feed station (24b) for feeding the sheets (5) of inner packing material, each of which is rectangular with two long sides and two short sides;

a packing conveyor (25) for feeding each group (4) of cigarettes along a packing path (P1) and through the first feed station (24b) for feeding the sheets (5) of inner packing material;

a first feed conveyor (26) for feeding each sheet (5) of inner packing material through the first feed station (24b) and along a first feed path (P2), perpendicular to the packing path (P1), so that a respective group (4) of cigarettes intercepts the sheet (5) of inner packing material, thus folding the sheet (5) of inner packing material into a U about the group (4) of cigarettes; and

a folding device (31) for folding each sheet (5) of inner packing material about the respective group (4) of cigarettes;

the packing machine (1) being **characterized in that** the first feed conveyor (26) feeds each sheet (5) of inner packing material through the first feed station (24b) and along the first feed path (P1) with its long sides perpendicular to the

first feed path (P2), and its short sides parallel to the first feed path (P2).

19. A packing machine (1) as claimed in Claim 18, wherein:

the packing conveyor (25) feeds along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the first feed path (P2); and the first feed conveyor (26) feeds through the first feed station (24b) and along the first feed path (P2) at least two successive sheets (5) of inner packing material, which are intercepted simultaneously by two respective side by side groups (4) of cigarettes.

20. A packing machine as claimed in Claim 19, wherein:

the packing conveyor (25) feeds along the packing path (P1) three groups (4) of cigarettes arranged side by side in a direction parallel to the first feed path (P2); and the first feed conveyor (26) feeds through the first feed station (24b) and along the first feed path (P2) three successive sheets (5) of inner packing material, which are intercepted simultaneously by three respective side by side groups (4) of cigarettes.

21. A packing machine as claimed in Claim 18, 19 or 20, wherein the first feed conveyor (26) comprises two parallel, side by side first suction belts (30), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; and the packing conveyor (25) feeds the groups (4) of cigarettes along the packing path (P1) and through the first feed station (24b) by passing between the two first suction belts (30).

22. A packing machine as claimed in any one of Claims 18 to 21, and comprising :

a first reel-off device for unwinding off a first reel a first strip (27) of packing material of a width equal to the long sides of the sheet (5) of inner packing material; and a first cutting device (28) for cyclically cutting the first strip (27) of packing material transversely to cut the sheets (5) of inner packing material off the first strip (27) of packing material.

23. A packing machine as claimed in Claim 22, wherein:

the first feed conveyor (26) spaces apart, along the first feed path (P2) and by a first given dis-

tance (D1), each two successive sheets (5) of inner packing material that are intercepted simultaneously; and
the first feed conveyor (26) spaces apart, along the first feed path (P2) and by a second given distance (D2) greater than the first distance (D1), each two sheets (5) of inner packing material that are not intercepted simultaneously.

- 24.** A packing machine as claimed in Claim 23, wherein the first feed conveyor (26) comprises:

a first cutting device (28) wherein the first strip (27) of packing material is cut cyclically;
two parallel, side by side first suction belts (30), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; the groups (4) of cigarettes travelling along the packing path (P1) and through the first feed station (24b) passing between the two first suction belts (30);
two parallel, side by side second suction belts (29), which feed the sheets (5) of inner packing material along the first feed path (P2) by retaining each sheet (5) of inner packing material by two opposite ends of the sheet (5) of inner packing material; the two second suction belts (29) being located upstream from the first suction belts (30) and downstream from the first cutting device (28).

- 25.** A packing machine as claimed in Claim 24, wherein:

the travelling speed of the second suction belts (29) is set with respect to the first cutting device (28) to space all the sheets (5) of inner packing material apart by the first distance (D1);
the travelling speed of the first suction belts (30) with respect to the second suction belts (29) is set to space a group of sheets (5) of inner packing material apart from the next group of sheets (5) of inner packing material by the second distance (D2).

- 26.** A packing machine as claimed in any one of Claims 18 to 25, and comprising a second feed station (24d) for feeding collars (16), which is located along the packing path (P1), and through which each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, is fed by the packing conveyor (25); in the second feed station (24d) for feeding collars (16), each collar (16) being folded about the respective group (4) of cigarettes and on top of the sheet (5) of inner packing material.

- 27.** A packing machine as claimed in Claim 26, and com-

prising a packing wheel (32) with pockets (34), into which sheets (19) of outer packing material are inserted so that each sheet (19) of outer packing material is folded partly inside the respective pocket (34); the packing conveyor (25) terminating, downstream from the second feed station (24d) for feeding collars (16), at the packing wheel (32) to insert each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, inside a pocket (34) of the packing wheel (32) containing a respective sheet (19) of outer packing material; and the packing wheel (32) having folding members for folding each sheet (19) of outer packing material about a respective group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, to form a respective packet (2) of cigarettes.

- 28.** A packing machine as claimed in Claim 27, wherein:

the packing conveyor (25) feeds along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the first feed path (P2);
the packing wheel (32) being polygonal with a number of sides, along each of which two pockets (34) are arranged parallel and side by side.

- 29.** A packing machine as claimed in Claim 28, wherein the packing wheel (32) is octagonal.

- 30.** A packing machine as claimed in Claim 27, 28 or 29, wherein the packets (2) of cigarettes are expelled successively from the pockets (34) of the packing wheel (32); and the folding of each sheet (19) of outer packing material about a respective group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, is completed so as to complete a respective packet (2) of cigarettes as the packet (2) of cigarettes is expelled from the respective pocket (34) of the packing wheel (32).

- 31.** A packing machine as claimed in Claim 30, and comprising a drying station (24g) downstream from the packing wheel (32).

- 32.** A packing machine as claimed in Claim 29, 30 or 31, wherein the packing path (P1) is horizontal, the first feed path (P2) is vertical, and the packing wheel (32) is vertical and rotates about a horizontal axis of rotation (33) perpendicular to the packing path (P1).

- 33.** A packing machine as claimed in any one of Claims 18 to 25, wherein:

the packing conveyor (25) feeds each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, along a packing path (P1) and through a third feed station (24e) for feeding the

sheets (19) of outer packing material, each of which is rectangular with two long sides and two short sides;

each sheet (19) of outer packing material is fed by a second feed conveyor through the third feed station (24e) and along a second feed path, perpendicular to the packing path (P1), with its long sides perpendicular to the second feed path, and its short sides parallel to the second feed path, so that a respective group (4) of cigarettes intercepts the sheet (19) of outer packing material, thus folding the sheet (19) of outer packing material into a U about the group (4) of cigarettes.

34. A packing machine as claimed in Claim 33, wherein:

the packing conveyor (25) feeds along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the second feed path; and
the second feed conveyor feeds through the third feed station (24e) and along the second feed path at least two successive sheets (19) of outer packing material, which are intercepted simultaneously by two respective side by side groups (4) of cigarettes.

35. A packing machine as claimed in Claim 33 or 34, and comprising :

a second reel-off device for unwinding off a second reel a second strip of packing material of a width equal to the long sides of the sheet (19) of outer packing material; and
a second cutting device for cyclically cutting the second strip of packing material transversely to cut the sheets (19) of outer packing material off the second strip of packing material.

36. A packing machine as claimed in Claim 35, wherein:

the second feed conveyor spaces apart, along the second feed path and by a first given distance (D1), each two successive sheets (19) of outer packing material that are intercepted simultaneously; and
the second feed conveyor spaces apart, along the second feed path and by a second given distance (D2) greater than the first distance (D1), each two sheets (19) of outer packing material that are not intercepted simultaneously.

37. A packing machine for producing packets of cigarettes, each of which comprises a group (4) of cigarettes; a sheet (5) of foil inner packing material enclosing the group (4) of cigarettes to form an inner package; and a sheet (19) of outer packing material enclosing the group (4) of cigarettes and the sheet

(5) of inner packing material to form an outer package; the packing machine (1) comprising :

a first feed station (24b) for feeding the sheets (5) of inner packing material;
a packing conveyor (25) for feeding each group (4) of cigarettes along a horizontal packing path (P1) and through the first feed station (24b) for feeding the sheets (5) of inner packing material;
a first feed conveyor (26) for feeding each sheet (5) of inner packing material through the first feed station (24b) and along a vertical first feed path (P2), perpendicular to the packing path (P1), so that a respective group (4) of cigarettes intercepts the sheet (5) of inner packing material, thus folding the sheet (5) of inner packing material into a U about the group (4) of cigarettes;

a folding device (31) located along the packing path (P1) to fold each sheet (5) of inner packing material about the respective group (4) of cigarettes along the packing path (P1); and
a packing wheel (32) with pockets (34), into which sheets (19) of outer packing material are inserted so that each sheet (19) of outer packing material is folded partly inside the respective pocket (34); the packing conveyor (25) terminating at the packing wheel (32) to insert each group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, inside a pocket (34) of the packing wheel (32) containing a respective sheet (19) of outer packing material; and the packing wheel (32) having folding members for folding each sheet (19) of outer packing material about a respective group (4) of cigarettes, wrapped in a sheet (5) of inner packing material, to form a respective packet (2) of cigarettes; the packing machine (1) being **characterized in that** :

the packing conveyor (25) feeds along the packing path (P1) at least two groups (4) of cigarettes arranged side by side in a direction parallel to the first feed path (P2);
the first feed conveyor (26) feeds through the first feed station (24b) and along the first feed path (P2) at least two sheets (5) of inner packing material, which are intercepted simultaneously by two respective side by side groups (4) of cigarettes; and
the packing wheel (32) is vertical, and rotates about a horizontal axis of rotation (33) perpendicular to the packing path (P1).

38. A packing machine for producing packets of cigarettes, each of which comprises a group (4) of cigarettes; a sheet (5) of foil inner packing material enclosing the group (4) of cigarettes to form an inner

package; and a sheet (19) of outer packing material enclosing the group (4) of cigarettes and the sheet (5) of inner packing material to form an outer package; the packing machine (1) comprising :

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a first feed station (24b) for feeding the sheets (5) of inner packing material;

a packing conveyor (25) for feeding each group (4) of cigarettes along a packing path (P1) and through the first feed station (24b) for feeding the sheets (5) of inner packing material;

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a first feed conveyor (26) for feeding each sheet (5) of inner packing material through the first feed station (24b) and along a first feed path (P2), perpendicular to the packing path (P1), so that a respective group (4) of cigarettes intercepts the sheet (5) of inner packing material, thus folding the sheet (5) of inner packing material into a U about the group (4) of cigarettes; and

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a folding device (31) for folding each sheet (5) of inner packing material about the respective group (4) of cigarettes.

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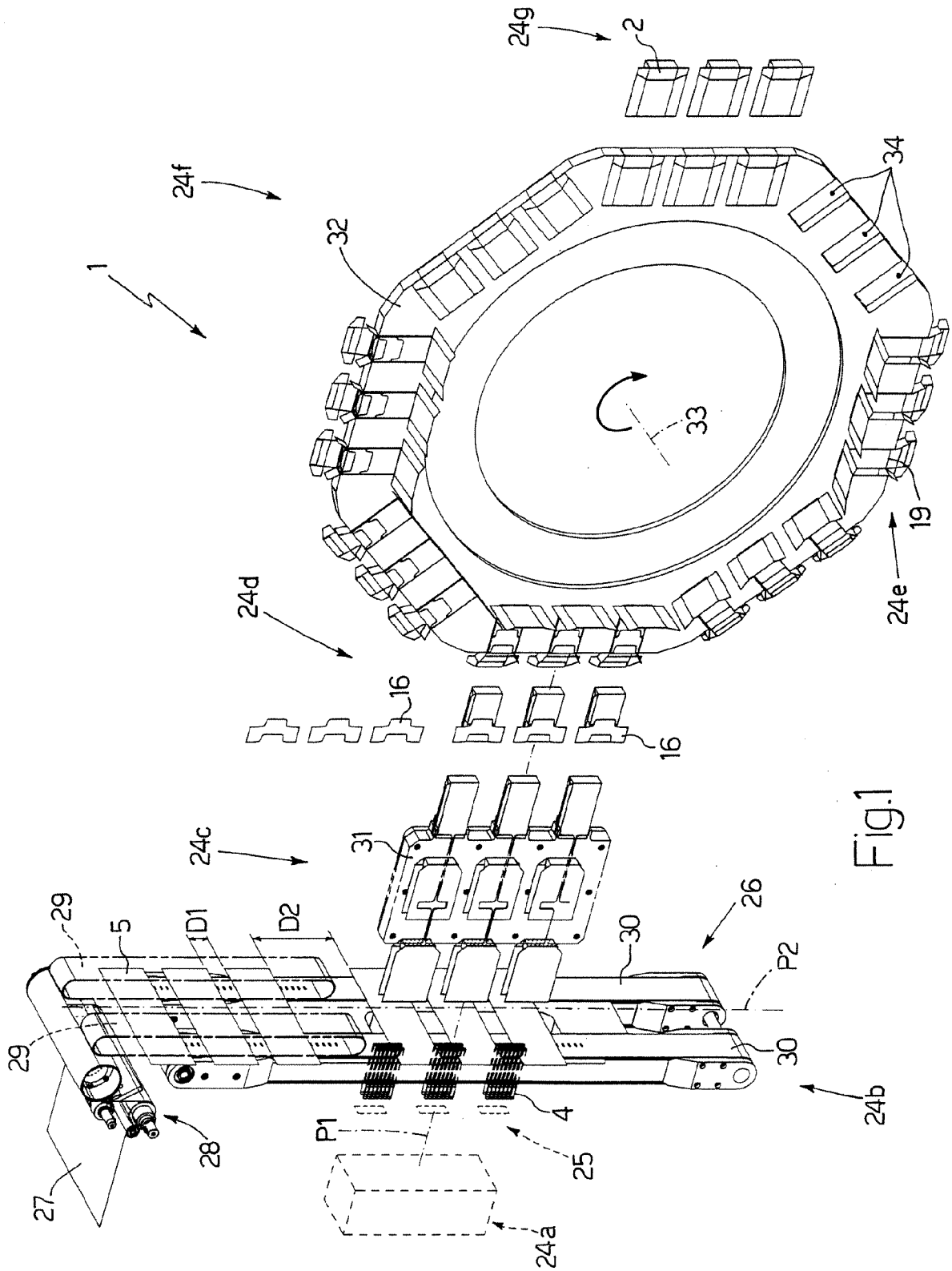
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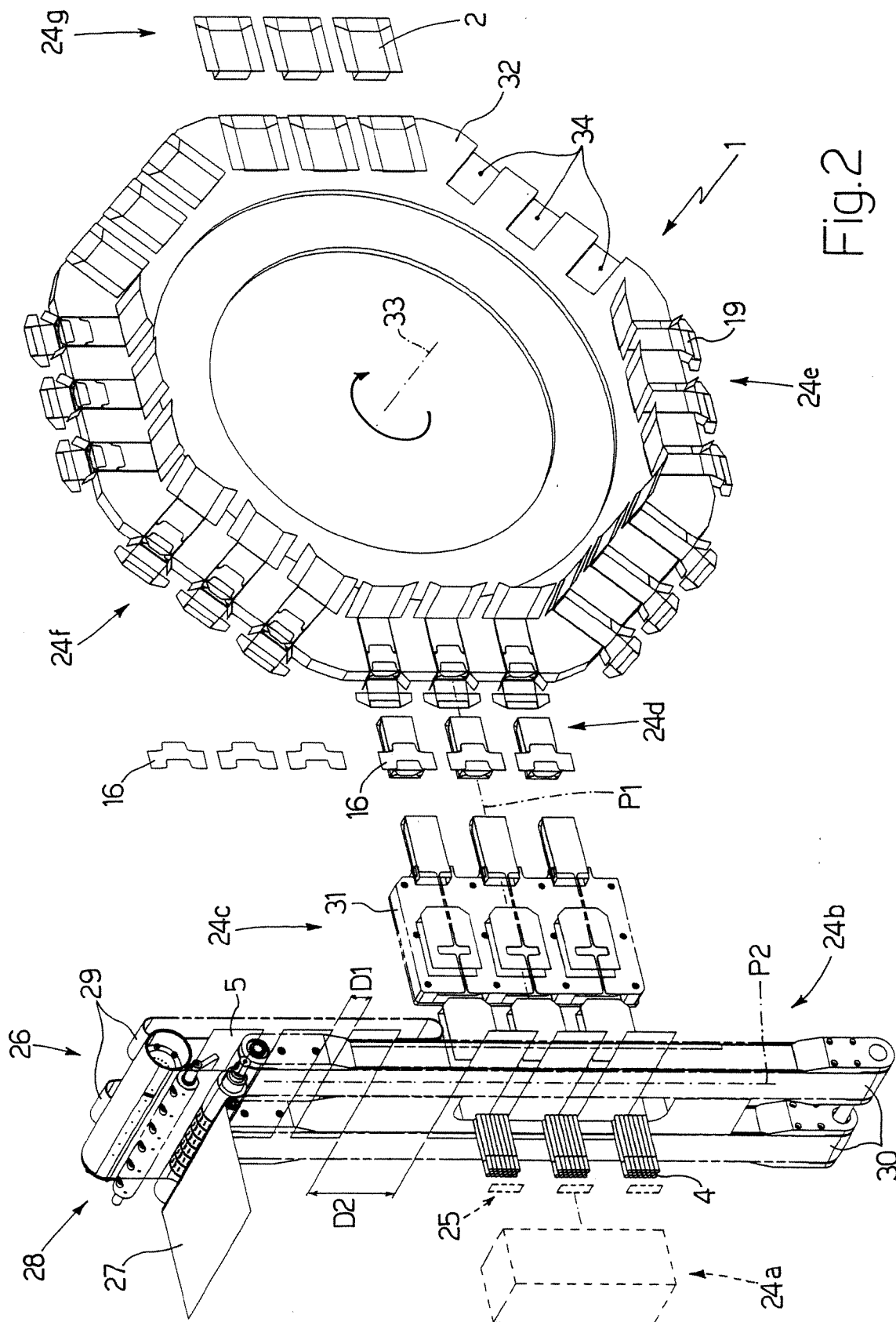


Fig. 2

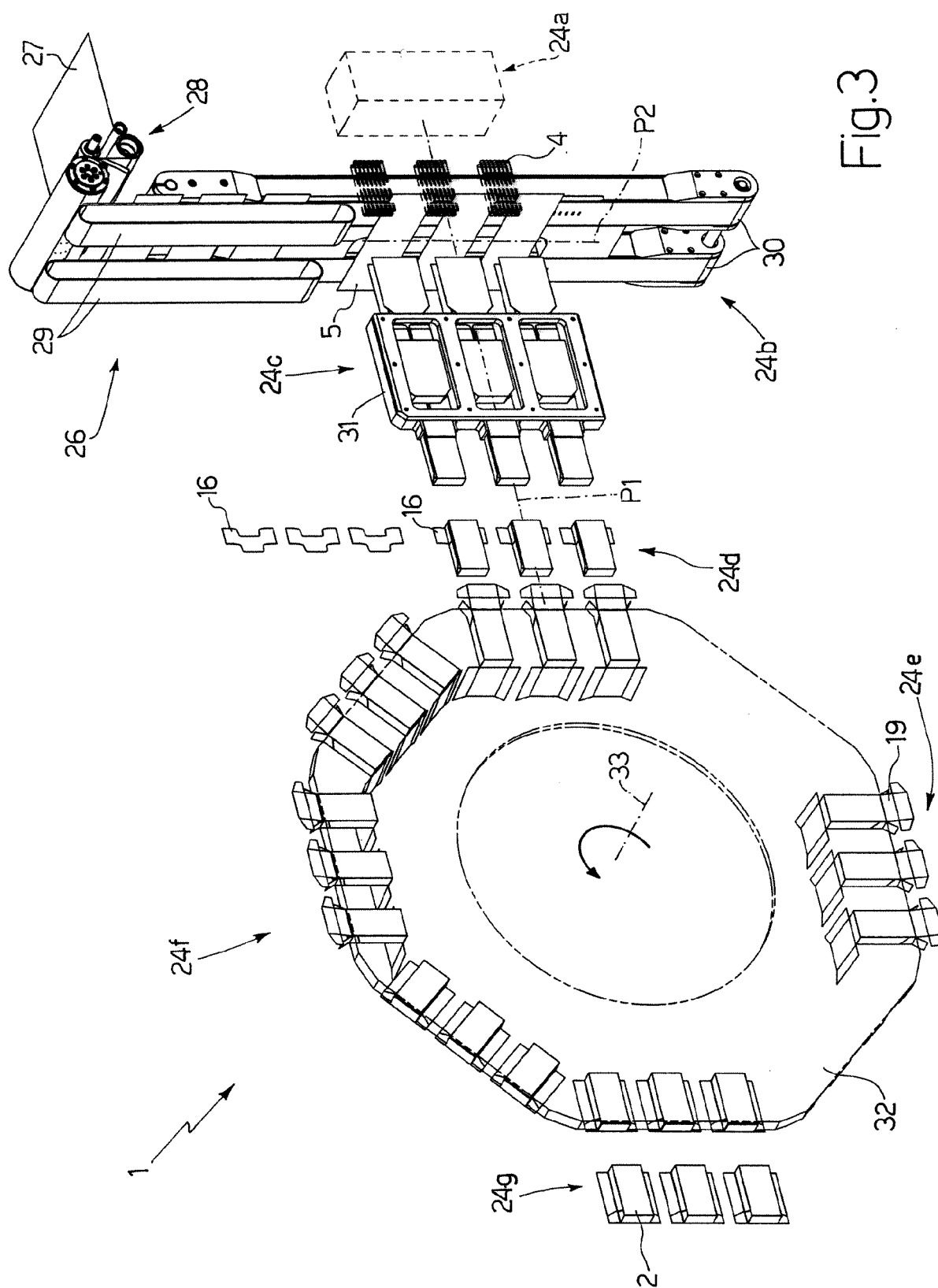


Fig. 3

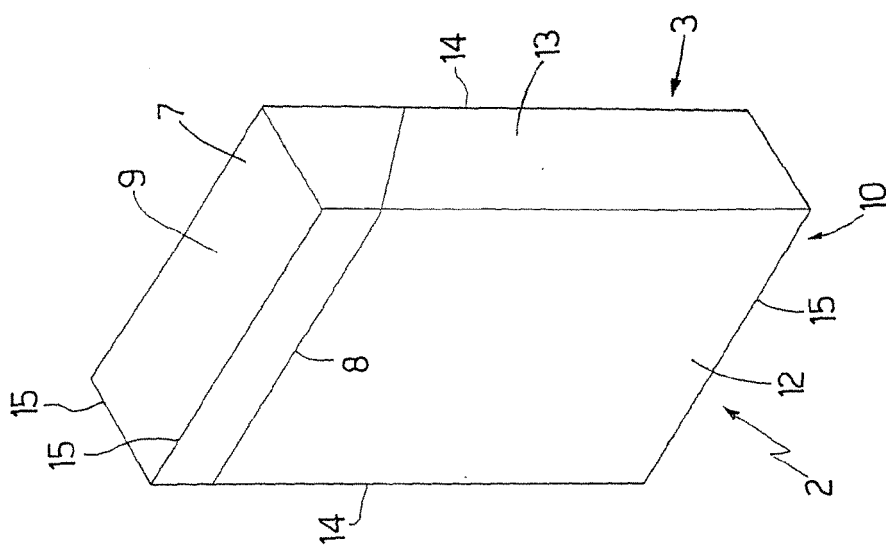


Fig.6

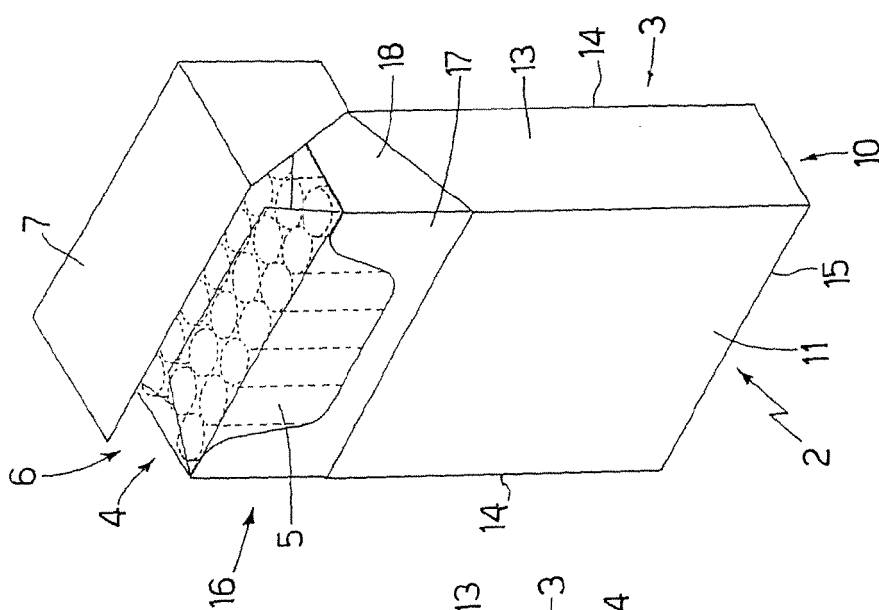


Fig.5

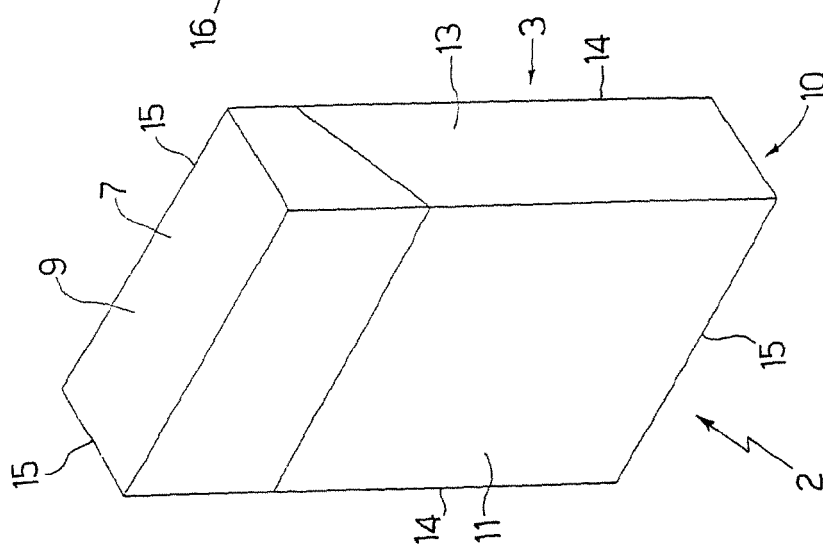


Fig.4

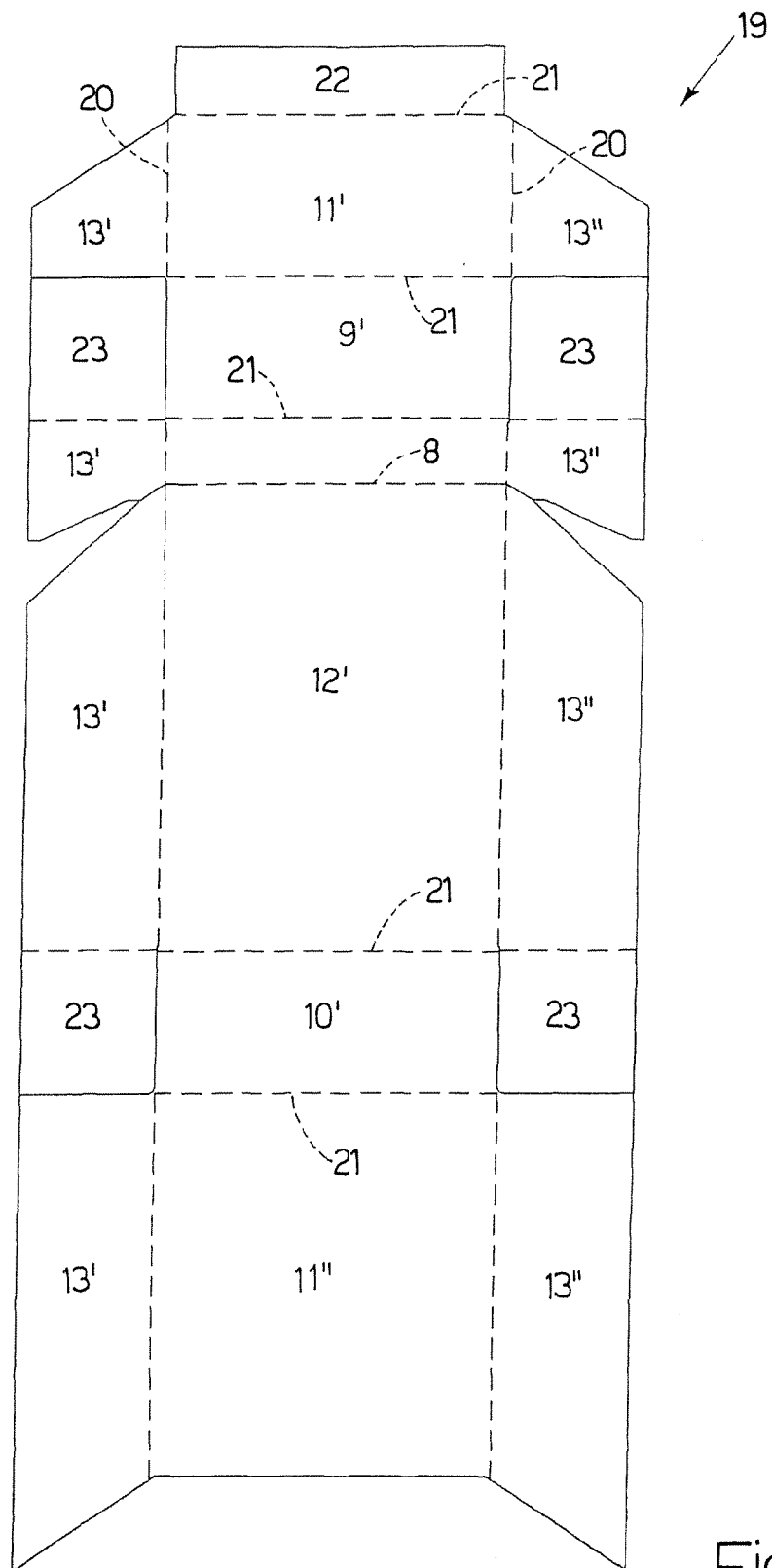


Fig.7

REFERENCES CITED IN THE DESCRIPTION

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