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(54) **COUPLING METHOD AND UNIT TO COUPLE AN INSERT AND A WRAPPING SHEET TO A GROUP OF SMOKING ARTICLES IN A PACKAGING MACHINE**

(57) Coupling method and unit (26) to couple an insert (18) and a wrapping sheet (22) to a group (14) of cigarettes in a packaging machine (24); the group (14) of cigarettes is fed into a spindle (31), which is internally hollow and has the shape of a parallelepiped; the insert (18) is laid on an outer surface of the spindle (31); the

wrapping sheet (22) is laid on the outer surface of the spindle (31); and the group (14) of cigarettes, the insert (18) and the wrapping sheet (22) are extracted together from the spindle (31) by means of a single common extracting device (32) so as to lay the insert (18) and the wrapping sheet (22) on the group (14) of cigarettes.

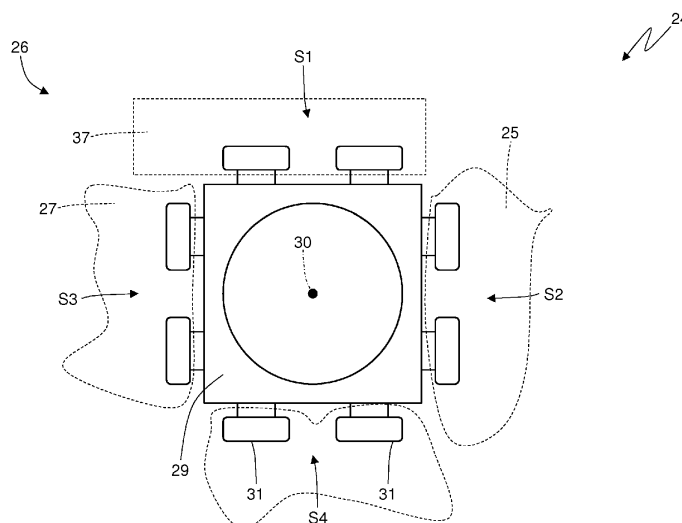


Fig. 16

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102018000008919 filed on 26/09/2018.

TECHNICAL FIELD

[0002] The present invention relates to a coupling method and to a unit to couple an insert and a wrapping sheet to a group of smoking articles in a packaging machine.

[0003] The present invention finds advantageous application in a cigarette packaging machine to which the present description explicitly refers without thereby losing generality.

PRIOR ART

[0004] A packet of cigarettes generally comprises an inner wrap, which is formed by a group of cigarettes wrapped in an inner wrapping sheet, and an outer casing, which encloses the inner wrap and can be formed by an outer wrapping sheet folded around the inner wrap and cup-shaped (soft type packet of cigarettes), or it can be formed by a rigid box with a hinged lid obtained by folding a rigid blank around the inner wrap (rigid type packet of cigarettes).

[0005] In a packet of cigarettes an insert can also be provided, arranged inside the inner wrap (typically a protective element or a collar) or arranged between the inner wrap and the outer wrap (typically a collar and/or a coupon). The feeding of an insert is complex in that the insert must be arranged and kept in a precise position in contact with the group of cigarettes (above or below the inner wrapping sheet) without being glued to the group of cigarettes; only the subsequent folding of the outer wrap (insert arranged between the inner wrap and the outer wrap) or of the inner wrapping sheet (insert arranged inside the inner wrap) around the group of cigarettes stabilizes the position of the insert.

[0006] The feeding of an insert is particularly complex when the insert must be inserted inside the inner wrap, that is, in direct contact with the group of cigarettes, since the group of cigarettes does not provide a uniform supporting surface and does not have a stable shape.

[0007] Patent application EP2008935A1 describes a wrapping method to couple an insert to a group of cigarettes. The group of cigarettes is fed to a first seat of a pocket (the first seat is shaped to contain only the group of cigarettes) while the insert is fed to a second seat of the pocket (the second seat is shaped to contain only the insert and is separated and arranged next to the first seat); subsequently, the group of cigarettes and the insert are extracted together from the pocket (i.e. from the respective seats of the pocket) by means of a single com-

mon extracting device so as to couple the insert to the group of cigarettes.

[0008] However, the wrapping method described in the patent application EP2008935A1 does not allow to operate at a very high speed (expressed as the number of packets of cigarettes made in the time unit) while ensuring perfect folding (i.e. with precise and squared folding angles) of the insert around the group of cigarettes.

DESCRIPTION OF THE INVENTION

[0009] The object of the present invention is to provide a coupling method and unit to couple an insert and a wrapping sheet to a group of smoking articles in a packaging machine, the which coupling method and unit are easy and inexpensive to manufacture and allow an effective and efficient feeding of an insert and of a wrapping sheet to a group of smoking articles even when operating at very high speed.

[0010] According to the present invention, a method and a coupling unit are provided to couple an insert and a wrapping sheet to a group of smoking articles in a packaging machine, according to what is set forth in the attached claims.

[0011] The claims describe preferred embodiments of the present invention forming an integral part of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will now be described with reference to the annexed drawings, which illustrate a non-limiting embodiment, wherein:

- Figure 1 is a front perspective view and in a closed configuration of a packet of cigarettes made according to the present invention;
- Figure 2 is a rear perspective view of the packet of cigarettes of Figure 1 in a closed configuration;
- Figure 3 is a front perspective view of the packet of cigarettes of Figure 1 in an open configuration;
- Figure 4 is a front perspective view of an inner wrap of the packet of Figure 1 in a closed configuration;
- Figure 5 is a perspective view of a group of cigarettes enclosed in the inner wrap of Figure 4;
- Figure 6 is a perspective view of a reinforcing element coupled to the group of cigarettes of Figure 5 and enclosed in the inner wrap of Figure 4;
- Figure 7 is a plan view of a heat-sealable wrapping sheet used to make the inner wrap of Figure 4;
- Figure 8 illustrates a schematic perspective view of a cigarette packaging machine which is designed to produce the inner wrap of Figure 4 and is provided with a coupling unit made according to the present invention;
- Figure 9 is a perspective view of a detail of the coupling unit of Figure 8;
- Figures 10-15 are a series of schematic views illus-

trating the coupling of an insert to a group of cigarettes in the coupling unit of Figure 8;

- Figure 16 is a schematic front view of an alternative of the cigarette packaging machine of Figure 8;
- Figure 17 is a longitudinal sectional view of a spindle of the packaging machine of Figure 16; and
- Figures 18-21 are four schematic side views of the spindle of Figure 17 in as many stations of the packaging machine of Figure 16.

PREFERRED EMBODIMENTS OF THE INVENTION

[0013] In Figures 1, 2 and 3 number 1 denotes, as a whole, a rigid packet of cigarettes. The packet 1 of cigarettes comprises a cup-shaped outer container 2 made of cardboard or rigid paperboard and a sealed wrap 3 (better illustrated in Figure 8) housed inside the container 2.

[0014] The outer container 2 has an open upper end and is provided with a lid 4, which is cup-shaped and is hinged to the outer container 2 along a hinge 5 (illustrated in Figure 2) so as to rotate, with respect to the outer container 2, between an open position (illustrated in Figure 3) and a closed position (illustrated in Figures 1 and 2) of the open upper end. The outer container 2 has a substantially rectangular parallelepiped shape oriented in a prevalent vertical development direction, is cup-shaped, and has the upper end open, a lower wall 6 opposite the upper open end, a front wall 7 and a rear wall 8 (in which the hinge 5 is formed) parallel and opposite to one another, and two side walls 9 parallel and opposite to one another.

[0015] The lid 4 has a substantially rectangular parallelepiped shape, is cup-shaped, and has an open lower end (facing the open upper end of the outer container 2 when the lid 4 is in the closed position), an upper wall 10 (which is parallel and opposite to the lower wall 6 of the outer container 2 when the lid 4 is in the closed position), a front wall 11 (which is parallel and aligned with the front wall 7 of the outer container 2 when the lid 4 is in the closed position), a rear wall 12 (which is parallel and aligned with the rear wall 8 of the outer container 2 when the lid 4 is in the closed position and is hinged to the rear wall 8 of the outer container 2 along the hinge 5), and two side walls 13 parallel and opposite to one another (which are parallel and aligned with, in particular coplanar and adjacent, to the side walls 9 of the outer container 2 when the lid 4 is in the closed position).

[0016] The wrap 3 encloses a group 14 of cigarettes (partially illustrated in Figure 3 and fully illustrated in Figure 5) having a parallelepiped shape; moreover, the wrap 3 has an extraction opening 15 for the cigarettes, at the top and in front, closed by a reusable closing label 16.

[0017] The closing label 16 is fixed to the wrap 3 by means of non-dry re-stick glue 17, which is applied to the inner surface of the closing label 16 (i.e. the surface of the closing label 16 facing the wrap 3) and is arranged around the extraction opening 15 so as to allow the clos-

ing label 16 to be (i.e. at each opening of the packet 1 of cigarettes) partially separated from the wrap 3 several times, and then, fixed again to the wrap 3 (at each closing of the packet 1 of cigarettes).

[0018] The closing label 16 is provided with a connecting tab 17, which is glued, permanently and in a non-separable manner, to the inner surface of the front wall 11 of the lid 4 by means of the permanent glue which is applied to the outer surface of the closing label 16 (i.e. the surface of the closing label 16 facing outwards, that is, from the opposite wall of the wrap 3). In this way, by opening or closing the lid 4, the closing label 16 is also simultaneously opened and closed.

[0019] The inner wrap 3 comprises a reinforcing element 18 (illustrated in Figure 6), which is made of cardboard or rigid paperboard (totally similar to the cardboard or rigid paperboard forming the outer container 2), is "U"-shaped and it is arranged inside the inner wrap 3 in contact with the group 14 of cigarettes. The reinforcing element 18 comprises a rectangular-shaped front wall 19, which is arranged in contact with a front wall of the group 14 of cigarettes and a pair of side walls 20, which are connected to the opposite sides of the front wall 19 and are placed in contact with the side walls of the group 14 of cigarettes. The front wall 19 has a window which is arranged at the top, is delimited by an edge 21, is "U"-shaped, and facilitates the extraction of the cigarettes from the group 14 of cigarettes as it exposes an upper area of the front wall of the group 14 of cigarettes.

[0020] The function of the reinforcing element 18 is to provide greater rigidity and greater shape stability to the sealed wrap 3 so as to prevent the sealed wrap 3 from collapsing in on itself after having extracted some of the cigarettes contained in the sealed wrap 3, thus making the extraction of the remaining cigarettes complicated and in particular making the opening and the subsequent closing of the closing label 17 extremely complicated. A further function of the reinforcing element 18 is to provide an adequate mechanical protection for the cigarettes during the forming and handling of the sealed wrap 3. Finally, another function of the reinforcing element 18 is to keep the lid 4 in the closed position, since in order for the lid 4 to pass from the closed position to the open position (and vice versa) it must slightly elastically deform the upper and front part of the reinforcing element 18.

[0021] As illustrated in Figure 7, the wrap 3 is obtained by folding a heat-sealable wrapping sheet 22, which has a rectangular shape, is folded around the group 14 of cigarettes and, once folded, is stabilized by heat-sealing (i.e. overlapping portions of the wrapping sheet 22 are connected to one another in a stable manner by heat-sealing). The wrapping sheet 22 has an incision 23 which is "U"-shaped and defines the extraction opening 15 of the wrap 3; moreover, the closing label 16 is completely glued to the wrapping sheet 22 which completely covers the incision 23 (i.e. the extraction opening 15). Between the closing label 16 and the wrapping sheet 22 the pres-

sure-sensitive re-stick glue (i.e. which does not dry) is interposed, which also allows, even after long time has passed and for a high number of times, to separate the closing label 16 from the wrapping sheet 22 and then to re-join the closing label 16 to the wrapping sheet 22.

[0022] In Figure 8, number 24 denotes, as a whole, a packaging machine which makes the packet 1 of cigarettes described above.

[0023] The packaging machine 24 comprises a forming unit 25 (of a known type and schematically illustrated in Figure 8) in which the groups 14 of cigarettes are formed in succession, a coupling unit 26 in which, to each group 14 of cigarettes, a corresponding reinforcing element 18 is coupled, which is folded in a "U"-shape around the group 14 of cigarettes, a wrapping unit 27 (of a known type and only partially illustrated in Figure 8) in which around each group 14 of cigarettes a respective wrapping sheet 22 is wrapped and heat-sealed for making a corresponding inner wrap 3, and a wrapping unit 28 (of a known type and schematically illustrated in Figure 8) in which a blank is folded around each inner wrap 3 so as to form an outer container 2 and a lid 4 to complete the making of a packet 1 of cigarettes. It is important to underline that the wrapping machine 24 could comprise only the forming unit 25, the coupling unit 26 and the wrapping unit 27 (in this case each inner wrap 3 is a marketable finished product).

[0024] The coupling unit 26 comprises a coupling wheel 29 which is mounted rotatable around a horizontal rotation axis 30 and supports four pairs of spindles 31 (only one of which is illustrated in Figure 8 for clarity). According to a different embodiment not illustrated, the coupling wheel 29 could be replaced by a different type of conveyor, for example by a closed loop conveyor belt. Each spindle 31 is tubular, has a parallelepiped shape, and is internally hollow to receive a group 14 of cigarettes on the inside thereof; in particular, the group 14 of cigarettes axially enters through an end of the spindle 31 and axially exits from the opposite end.

[0025] The coupling wheel 29 rotates with intermittent motion (i.e. cyclically alternating moving steps and stopping steps) to cyclically move each pair of spindles 31 along a circular coupling path which crosses: a feeding station S1 in which a group 14 of cigarettes is fed inside each spindle 31 of a pair of spindles 31, a subsequent feeding station S2 in which an insert 18 is laid on an outer surface of each spindle 31 of a pair of spindles 31 (therefore on the opposite side of the group 14 of cigarettes which is arranged inside the spindle 31), and finally an extraction station S3 in which from each spindle 31 of a pair of spindles 31 the group 14 of cigarettes and the reinforcing insert 18 are extracted together by means of a single common extracting device 32 so as to lay the reinforcing element 18 on the group 14 of cigarettes.

[0026] Accordingly, up to the extraction station S3, each reinforcing element 18 is separated from the corresponding group 14 of cigarettes, and therefore does not touch the corresponding group 14 of cigarettes, as

between the reinforcing element 18 and the corresponding group 14 of cigarettes a spindle 31 is interposed. In fact, up to the extraction station S3, each reinforcing element 18 is laid on the outer surface of a spindle 31 whereas the corresponding group 14 of cigarettes is arranged inside the spindle 31.

[0027] In the embodiment illustrated in the attached figures, the coupling unit 26 operates on a double line, i.e. two parallel and coupled spindles 31 (a pair of spindles 31) simultaneously receive two corresponding inserts 18 in the feeding station S1, simultaneously receive two corresponding groups 14 of cigarettes in the feeding station S2, and simultaneously release the two groups 14 of cigarettes together with the inserts 18 in the extraction station S3. According to an alternative, and perfectly equivalent embodiment, the coupling unit 26 operates in a single line, i.e. a single spindle 31 at a time receives a corresponding insert 18 in the feeding station S1, receives a corresponding group 14 of cigarettes in the feeding station S2, and releases the group 14 of cigarettes together with the insert 18 in the extraction station S3.

[0028] In the embodiment illustrated in the accompanying figures, each reinforcing element 18 is laid flat (i.e. without any type of folding) on the outer surface of the corresponding spindle 31 and is then folded in a "U"-shape around the spindle 31 after being laid flat on the spindle 31; in particular, each reinforcing element 18 is laid flat on the outer surface of the corresponding spindle 31 in the feeding station S1 and is folded in a "U"-shape around the spindle 31 in the feeding station S2 after inserting the group 14 of cigarettes inside the spindle 31.

[0029] According to alternative embodiments, each reinforcing element 18 could be laid flat (i.e. without any type of folding) on the outer surface of the corresponding spindle 31 and then folded in a "U"-shape around the spindle 31 before the feeding station S2 (directly in the feeding station S1 or in transit from the feeding station S1 to the feeding station S2), in the feeding station S2 and during the feeding of the group 14 of cigarettes, or downstream of the feeding station S2 (i.e. between the feeding station S2 and the extraction station S3). According to a further embodiment, each reinforcing element 18 could be placed already folded in a "U"-shape around the spindle 31 in the feeding station S1, i.e. each reinforcing element 18 could be folded in a "U"-shape against the spindle 31 in the feeding station S1 when laying the reinforcing element 18 against the outer surface of the spindle 31.

[0030] In the embodiment illustrated in the accompanying figures, the feeding station S1, in which the reinforcing elements 18 are laid on the outer surface of the corresponding spindles 31, is arranged upstream of the feeding station S2 in which the groups 14 of cigarettes are inserted inside the corresponding spindles 31; according to an alternative embodiment, not illustrated, the feeding station S1, in which the reinforcing elements 18 are laid on the outer surface of the corresponding spindles 31, is arranged downstream of the feeding station

S2 in which the groups 14 of cigarettes are inserted inside the corresponding spindles 31.

[0031] The extracting device 32, arranged in the extraction station S3, comprises two twin pushers 33, each of which is movable with reciprocating motion and is inserted inside a corresponding spindle 31 for axially pushing both the group 14 of cigarettes (which is arranged inside the spindle 31), and the corresponding reinforcing element 18 (which is folded in a "U"-shape and is laid on an outer surface of the spindle 31) away from the spindle 31. According to a preferred embodiment illustrated in the attached figures, the wrapping unit 27 comprises two twin folding tunnels 34 and the pushers 33 of the extracting device 32 insert the two groups 14 of cigarettes, coupled to the corresponding reinforcing elements 18 into the two folding tunnels 34; immediately downstream of the entrance of the folding tunnels 34, the wrapping sheets 22 (not illustrated for clarity in Figure 8) are fed, which are intercepted by the two groups 14 of cigarettes entering the folding tunnels 34.

[0032] The feeding station S2 comprises two twin pushers 35, each of which is movable with reciprocating motion and pushes a corresponding group 14 of cigarettes inside a spindle 31 standing still in the feeding station S2. In particular, the forming unit 25 cyclically arranges a pair of groups 14 of cigarettes in the feeding station S2 and in front of the pair of spindles 31 which is standing still in the feeding station S2; in this way, the two pushers 35 can push the two groups 14 of cigarettes into the corresponding spindles 31. According to a preferred embodiment, two compressing bodies 36 are arranged immediately upstream of the pair of spindles 31 standing still in the feeding station S2, each of which is (internally) shaped like a funnel, is arranged in front of one end of the corresponding spindle 31 and elastically compresses the group 14 of cigarettes so as to reduce the size of the cross-section of the group 14 of cigarettes. In other words, beforehand, each group 14 of cigarettes is passed through a corresponding compressing body 36 which elastically compresses the group 14 of cigarettes so as to reduce the size of the cross-section of the group 14 of cigarettes and thus facilitate the entry of the group 14 of cigarettes in the corresponding spindle 31 that is standing still. Alternatively, the compressing bodies 36 could be integrated into the spindles 31, each of which has the inlet end shaped like a funnel.

[0033] A feeding device 37 is arranged in the feeding station S1, which cyclically feeds two reinforcing elements 18 to a pair of spindles 31 standing still in the feeding station S1. The feeding device 37 comprises a feeding conveyor 38 which receives the reinforcing elements 18 from the bottom of a hopper (not illustrated) containing a stack of flat reinforcing elements 18 and feeds the flat reinforcing elements 18 near the pair of spindles 31 standing still in the feeding station S1. In the embodiment illustrated in the attached figures, the feeding conveyor 38 comprises a suction belt 39 wound in a loop around two end pulleys 40 (at least one of which is

motorized); according to an alternative embodiment not illustrated, the feeding conveyor 38 comprises a wheel mounted in a rotary manner.

[0034] The feeding device 37 comprises a transfer device 41 which is movable for withdrawing a pair of reinforcing elements 18 from the suction belt 39 of the feeding conveyor 38 and subsequently release the pair of reinforcing elements 18 to the corresponding two spindles 31 standing still in the feeding station S1. The transfer device 41 comprises two sucking holding heads 42, each of which is designed to grasp (by suction) a reinforcing element 18 from the feeding conveyor 38, is designed to hold the reinforcing element 18 during the movement from the feeding conveyor 38 to a corresponding spindle 31 and is designed to release the reinforcing element 18 at the spindle 31. According to what is better illustrated in Figure 9, each holding head 42 is shaped like a fork and has two tines 43, which engage opposite ends of the insert 18 and are arranged at a distance from one another that is greater than the corresponding cross size of the spindle 31; consequently, the two tines 43 of each holding head 42 embrace the corresponding spindle 31 from opposite sides and engage the two side walls 20 of the reinforcing element 18 (as clearly illustrated also in Figures 11 and 12).

[0035] According to the preferred (but non-binding) embodiment illustrated in Figure 9, to each spindle 31 a folding element 44 is coupled, which is "U"-shaped, is designed to embrace the spindle 31 to enable the "U"-folding of a reinforcing element 18 against the spindle 31, and is mounted in a movable manner on the coupling wheel 29 to move radially with respect to the spindle 31; in particular, each folding element 44 is movable radially (for example under the thrust of a cam actuated system which is set in motion by the rotation movement of the coupling wheel 29 around the rotation axis 30) between a receiving position (illustrated in Figures 10-14) in which the folding element 44 is relatively far away from the spindle 31 to allow a holding head 42 to feed a reinforcing element 18 to the spindle 31, and a folding position (illustrated in Figure 15) in which the folding element 44 is pressed against the spindle 31 thus embracing the spindle 31 and therefore enabling the "U"-folding of a reinforcing element 18 against the spindle 31 (in other words, the reinforcing element 18 is "moulded" into a "U"-shape by using the folding element 44 and the spindle 31 as "mould" and "counter-mould", respectively).

[0036] According to the preferred (but non-binding) embodiment illustrated in Figure 9, a locking element 45 is coupled to each spindle 31, which is designed to lock a reinforcing element 18 against the spindle 31 and is mounted in a movable manner on the coupling wheel 29 to move radially with respect to the spindle 31 (independently of the corresponding folding element 44); in particular, each locking element 45 is radially movable (for example under the thrust of a cam actuated system which is set in motion by the rotation movement of the coupling wheel 29 around the rotation axis 30) between a receiving

position (illustrated in Figures 10-12) in which the locking element 45 is relatively far away from the spindle 31 so as to allow a holding head 42 to feed a reinforcing element 18 to the spindle 31, and a locking position (illustrated in the Figures 13-15) in which the locking element 45 is pressed against the spindle 31 by clamping the reinforcing element 18 against the spindle 31.

[0037] As better illustrated in Figure 9, each folding element 44 is arranged beside the corresponding locking element 45 and has a shape complementary to the shape of the locking element so that both the folding element 44 and the locking element 45 can come into contact with the corresponding spindle 31 in a completely independent way. In particular, each folding element 44 is larger than the corresponding locking element 45 and has a through-opening, on the inside of which the locking element 45 is arranged. As previously stated, the radial movement of the folding element 44 is independent of the radial movement of the locking element 45 to allow the two elements 44 and 45 to move radially with differentiated laws of motion.

[0038] As illustrated in Figure 9, each pair of folding elements 44 is rigidly mounted on a single common support bar 46, which is mounted radially movable on the coupling wheel 29, each pair of locking elements 45 is rigidly mounted on a single common support bar 47, which is mounted radially movable on the coupling wheel 29 and is arranged beside the support bar 46, and each pair of spindles 31 is rigidly mounted cantilever on a single common support wall 48 (oriented radially), which is rigidly mounted on the coupling wheel 29 (as the spindles 31 do not perform any type of movement with respect to the coupling wheel 29). In the feeding station S1, each support wall 48 is arranged between the two corresponding spindles 31 (i.e. the two spindles 31 mounted cantilever on the support wall 48) and the feeding device 37; to allow each holding head 42 to feed a reinforcing element 18 to a corresponding spindle 31, the support wall 48 has, for each spindle 31, a through-opening 49 which is arranged under the spindle 31 and allows the passage of a holding head 42.

[0039] With reference to Figures 10-15, the feeding of a reinforcing element 18 and of a group 14 of cigarettes to a spindle 31 is described in the following.

[0040] Initially and as illustrated in Figure 10, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 into the feeding station S1.

[0041] Once the spindle 31 is standing still in the feeding station S1 and as illustrated in Figure 11, a holding head 42 places the reinforcing member 18 under the spindle 31 passing through the through-opening 49 (illustrated in Figure 9) obtained through the support wall 48 of the spindle 31.

[0042] As illustrated in Figure 12, the holding head 42 lays the reinforcing element 18 on the locking element 45 (arranged in the receiving position) by moving radially downwards and then releases the reinforcing element 18 on the locking element 45 thus moving away from the

spindle 31.

[0043] As illustrated in Figure 13, once the holding head 42 has moved away from the spindle 31 leaving the reinforcing element 18 laying on the locking element 45 (arranged in the receiving position), the locking element 45 moves from the receiving position to the locking position by clamping (pushing, pressing) the reinforcing element 18 against the spindle 31.

[0044] Once the locking element 45 has locked the reinforcing element 18 against the spindle 31, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 from the feeding station S1 to the feeding station S2 (as illustrated in Figure 14), in which, on the inside of the spindle 31, the group 14 of cigarettes is axially inserted (in the manner described above). Obviously, in this step, the group 14 of cigarettes does not touch the reinforcing element 18 in any way, as the group 14 of cigarettes is arranged inside the spindle 31 while the reinforcing element 18 is arranged outside the spindle 31 and therefore the spindle 31 is interposed between the group 14 of cigarettes and the reinforcing element 18.

[0045] Once the group 14 of cigarettes has been axially inserted and as illustrated in Figure 15, the folding element 44 (which until now has remained in the receiving position) moves radially to the folding position in which the folding element 44 is pressed against the spindle 31 embracing the spindle 31 and then enables the "U"-folding of the reinforcing element 18 against the spindle 31 (i.e. the two side walls 20 of the reinforcing element 18 fold by 90° with respect to the front wall 19 of the reinforcing element 18).

[0046] In the embodiment illustrated in Figure 8, each spindle 31 receives only a reinforcing element 18 (which is housed outside the spindle 31 and is folded against the spindle 31) in the feeding station S1 and a group 14 of cigarettes (which is housed inside the spindle 31) in the feeding station S2. In the embodiment illustrated in Figure 16, each spindle 31 (which has a different conformation as will be explained in the following) also receives a wrapping sheet 22 (which is housed outside the spindle 31 and is folded against the spindle 31 and above the reinforcing element 18) in a feeding station S4 (arranged between the feeding station S2 and the extraction station S3) provided with a feeding device 22 for the wrapping sheet (known and only schematically illustrated).

[0047] In other words, in the feeding station S4, a wrapping sheet 22 is partially arranged and folded in a "U"-shape around each spindle 31, which partially covers the spindle 31 and the reinforcing element 18 (previously fed); subsequently, in the extraction station S3, from each spindle 31, the group 14 of cigarettes, the reinforcing insert 18 and the wrapping sheet 22 are extracted together by means of a single common extracting device 32 so as to lay the wrapping sheet 22 and the reinforcing element 18 on the group 14 of cigarettes. Consequently, in the embodiment illustrated in Figure 8, the wrapping sheets 22 are fed directly around the groups 14 of cigarettes (coupled to the respective reinforcing elements 18)

downstream of the extraction station S3 (and therefore do not affect in any way the spindles 31), while in the embodiment illustrated in Figure 16 the wrapping sheets 22 are fed to the spindles 31 (thus without initially touching the groups 14 of cigarettes) in the feeding station S4.

[0048] As illustrated in Figure 17, each spindle 31 of the packaging machine 24 illustrated in Figure 16 comprises a tubular cavity 50, which is designed to contain a corresponding group 14 of cigarettes and has an inlet opening 51 at the support wall 48 and an outlet opening 52 opposite to the inlet opening 51; a group 14 of cigarettes enters the tubular cavity 50 of a spindle 31 through the inlet opening 51 (feeding station S2) and exits from the tubular cavity 50 through the outlet opening 52 (extraction station S3). Moreover, each spindle 31 of the packaging machine 24 illustrated in Figure 16 comprises a flat upper wall 53 (of constant and very thin thickness) and a lower wall 54 which is opposite to the upper wall 53 and is shaped like a wedge (therefore it has a greater thickness with respect to the upper wall 53 and progressively increasing from the inlet opening 51 to the outlet opening 52). The lower wall 54 of each spindle 31 is provided with a series of sucking holes 55 which are connected (by means of small channels 56 formed inside the lower wall 54) to a channel 57 which communicates with a suction source (by means of suitable valve means controlled by the rotation of the coupling wheel 29 around the rotation axis 30).

[0049] With reference to Figures 18-20, the feeding of a reinforcing element 18, of a group 14 of cigarettes and of a wrapping sheet 22 to a spindle 31 is described in the following.

[0050] Initially and as illustrated in Figure 18, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 into the extraction station S3 in which the spindle 31 is emptied (i.e. from the inside of the spindle 31 a group 14 of cigarettes is extracted and a reinforcing element 18 and a wrapping sheet 22 are withdrawn from the outside of the spindle 31).

[0051] Subsequently and as illustrated in Figure 19, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 into the feeding station S1. Once the spindle 31 is standing still in the feeding station S1, the (still flat) reinforcing element 18 is fed to the spindle 31 in the manner described previously with reference to Figures 10-13; then the front wall 19 of the reinforcing insert 18 is laid on the lower wall 54 of the spindle 31 (which holds the wall 19 by means of the suction exerted by the sucking holes 55). In this embodiment, the lower wall 54 of the spindle 31 is inclined and holds the front wall 19 of the reinforcing insert 18 by suction (generated through the sucking holes 55), thus the locking element 45 is not provided, which is substituted by the sucking holes 55.

[0052] Subsequently and as illustrated in Figure 20, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 into the feeding station S2. Once the spindle 31 is standing still in the feeding station

S2, two operations are performed (in a more or less simultaneous manner): inside the spindle 31 the group 14 of cigarettes is inserted axially (with the methods described above) and the folding element 44 (which until now has always remained in the receiving position) moves radially in the folding position in which the folding element 44 is pressed against the spindle 31 embracing the spindle 31 and therefore determining the "U"-folding of the reinforcing element 18 against the spindle 31 (i.e. the two side walls 20 of the reinforcing element 18 are folded by 90° with respect to the front wall 19 of the reinforcing element 18).

[0053] Subsequently and as illustrated in Figure 21, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 into the feeding station S4. Once the spindle 31 is standing still in the feeding station S4, the folding element 44 is moved from the folding position to the receiving position so as to free the reinforcing element 18 and then the wrapping sheet 22 is folded into a "U"-shape around the spindle 31 (therefore around and in direct contact with the reinforcing element 18 which is arranged around the spindle 31 and around and in indirect contact with the group 14 of cigarettes, which is arranged inside the spindle 31).

[0054] The wrapping sheet 22 is kept folded in a "U"-shape in contact with the spindle 31 by locking members (retaining members) of known type and not illustrated which act from the feeding station S4 (where the wrapping sheet 22 is fed) to the extraction station S3 (where the group 14 of cigarettes, the reinforcing insert 18 and the wrapping sheet 22 are extracted together by means of a single common extracting device 32).

[0055] Subsequently and as illustrated in Figure 18, the rotation of the coupling wheel 29 around the rotation axis 30 brings the spindle 31 (again) into the extraction station S3 where the group 14 of cigarettes, the reinforcing insert 18 and the wrapping sheet 22 are extracted together by means of a single common extracting device 32. Immediately downstream of the extraction station S3, the reinforcing insert 18 (already folded into a "U"-shape) rests against the group 14 of cigarettes and the U-shaped folding of the wrapping sheet 22 against the group 14 of cigarettes is completed (in the spindle 31, as illustrated in Figure 21, the "U"-folded sheet 22 is slightly open due to the wedge shape of the lower wall 54 of the spindle 31).

[0056] In the embodiment described above, the coupling unit 26 couples, to each group 14 of cigarettes, an insert formed by the reinforcing element 18; according to a different embodiment not illustrated, the coupling unit 26 couples, to each group 14 of cigarettes, an insert formed by a coupon (in this case generally the coupon could not even be subjected to a "U"-fold, i.e. the coupon may not provide any type of folding).

[0057] The embodiment illustrated in the attached Figures refers to the manufacturing of a packet of cigarettes, but the present invention is applicable without substantial modifications also to the manufacturing of any other type of packet of smoking articles (for example a packet of

cigars, a packet of electronic cigarettes of the liquid vaporization type, a new generation packet of cigarettes without tobacco combustion...).

[0058] The embodiments described herein can be combined with each other without departing from the scope of protection of the present invention.

[0059] The wrapping method described above has numerous advantages.

[0060] Firstly, the wrapping method described above enables a simple, precise and reliable coupling of an insert (in particular a reinforcing element 18) and the wrapping sheet 22 to a group 14 of cigarettes; in this way, it is possible to operate at very high speed (expressed as the number of packets 1 of cigarettes produced per time unit), thus ensuring, at the same time, a perfect folding (i.e. with precise and square folding angles) of the insert (i.e. of the reinforcing element 18) and of the wrapping sheet 22 around the group 14 of cigarettes.

[0061] Moreover, the wrapping method described above can be implemented in a relatively simple and inexpensive manner in a packaging machine as it does not require particularly complex movements or parts having a large number of different movements.

Claims

1. A coupling method to couple an insert (18) and a wrapping sheet (22) to a group (14) of smoking articles in a packaging machine (24); the coupling method comprises the steps of:

feeding the group (14) of smoking articles into a tubular spindle (31), which is internally hollow and has the shape of a parallelepiped; and laying the insert (18) on an outer surface of the spindle (31) ;
the coupling method is **characterized in that** it comprises the further steps of:

laying the wrapping sheet (22) on the outer surface of the spindle (31); and extracting from the spindle (31) the group (14) of smoking articles, the insert (18) and the wrapping sheet (22) together by means of one single common extracting device (32), so as to lay the insert (18) and the wrapping sheet (22) on the group (14) of smoking articles.

2. The coupling method according to claim 1 and comprising the further step of folding the insert (18) around the spindle (31) at least in a "U"-shape.
3. The coupling method according to claim 2 and comprising the further steps of:

laying the insert (18) flat on an outer surface of

the spindle (31); and

folding the insert (18) around the spindle (31) in a "U"-shape after having laid the insert (18) flat on the spindle (31) .

4. The coupling method according to claim 2 or 3, wherein the insert (18) is folded in a "U"-shape around the spindle (31) by moving a "U"-shaped folding element (44) towards the spindle (31), so as to push the insert (18) against the spindle (31).
5. The coupling method according to one of the claims from 1 to 4 and comprising the further step of locking the insert (18) against the spindle (31) by generating a suction through at least one wall (54) of the spindle (31).
6. The coupling method according to claim 5, wherein the spindle (31) has a lower wall (54), which is provided with a series of sucking holes (55) and is shaped like a wedge.
7. The coupling method according to claim 6, wherein the lower wall (54) of the spindle (31) has a thickness progressively increasing from an inlet opening (51) of the group (14) of smoking articles to an outlet opening (52) of the group (14) of smoking articles.
8. The coupling method according to one of the claims from 1 to 7 and comprising the further step of folding the insert (18) around the spindle (31) in a "U"-shape by moving a "U"-shaped folding element (44) towards the spindle (31), so as to push the insert (18) against the spindle (31).
9. The coupling method according to one of the claims from 1 to 8 and comprising the further step of folding the wrapping sheet (22) on the insert (18) and around the spindle (31) in a "U"-shape.
10. The coupling method according to one of the claims from 1 to 9 and comprising the further step of moving a coupling conveyor (29), which supports the spindle (31), along a coupling path and through:

a first feeding station (S1), where the insert (18) is laid on the outer surface of the spindle (31), a second feeding station (S2), which is arranged downstream of the first feeding station (S1) and where the group (14) of smoking articles is fed into the spindle (31), a third feeding station (S4), which is arranged downstream of the first feeding station (S1) and where the wrapping sheet (22) is laid on the outer surface of the spindle (31); and finally, an extraction station (S3), where the group (14) of smoking articles, the insert (18) and the wrapping sheet (22) are extracted to-

gether from the spindle (31).

11. The coupling method according to claim 10, wherein the second feeding station (S2) is arranged between the first feeding station (S1) and the third feeding station (S4). 5
12. The coupling method according to claim 10 or 11 and comprising the further step of folding the insert (18) around the spindle (31) at least in a "U"-shape at the second feeding station (S2). 10
13. The coupling method according to claim 10, 11 or 12, wherein two spindles (31), which are beside and coupled to one another, simultaneously receive two corresponding inserts (18) in the first feeding station (S1), simultaneously receive two corresponding groups (14) of smoking articles in the second feeding station (S2), simultaneously receive two corresponding wrapping sheets (22) in the third feeding station (S4), and simultaneously release the two groups (14) of smoking articles together with the inserts (18) and the wrapping sheets (22) in the extraction station (S3). 15 20 25
14. The coupling method according to one of the claims from 1 to 13 and comprising the further steps of:
feeding, by means of a feeding conveyor (38), an insert (18) in proximity to the spindle (31); 30
engaging the insert (18) carried by the feeding conveyor (38) by means of a sucking holding head (42); and
moving the sucking holding head (42) from the feeding conveyor (38) to the spindle (31) so as to lay the insert (18) on the spindle (31). 35
15. The coupling method according to claim 14, wherein the sucking holding head (42) is shaped like a fork and has two tines (43), which engage opposite ends of the insert (18) and are arranged at a distance from one another that is greater than the corresponding cross size of the spindle (31) . 40
16. The coupling method according to claim 14 or 15, wherein the spindle (31) is mounted in a support wall (48), which is oriented perpendicularly to the spindle (31) and has a through-opening (49), which is arranged under the spindle (31) and allows the passage of the holding head (42) . 45 50
17. A coupling unit (26) to couple an insert (18) to a group (14) of smoking articles in a packaging machine (24); the coupling unit (26) comprises:
a tubular spindle (31), which is internally hollow and has the shape of a parallelepiped;
a coupling conveyor (29), which supports and

feeds the spindle (31);

a first feeding station (S1), where the group (14) of smoking articles is fed into the spindle (31); and

a second feeding station (S2), where the insert (18) is laid on an outer surface of the spindle (31);

the coupling unit (26) is **characterized in that** it comprises:

a third feeding station (S4), where the wrapping sheet (22) is laid on the outer surface of the spindle (31); and

an extraction station (S3), where the group (14) of smoking articles, the insert (18) and the wrapping sheet (22) are extracted together from the spindle (31) by means of one single common extracting device (32), so as to lay the insert and the wrapping sheet (22) on the group (14) of smoking articles.

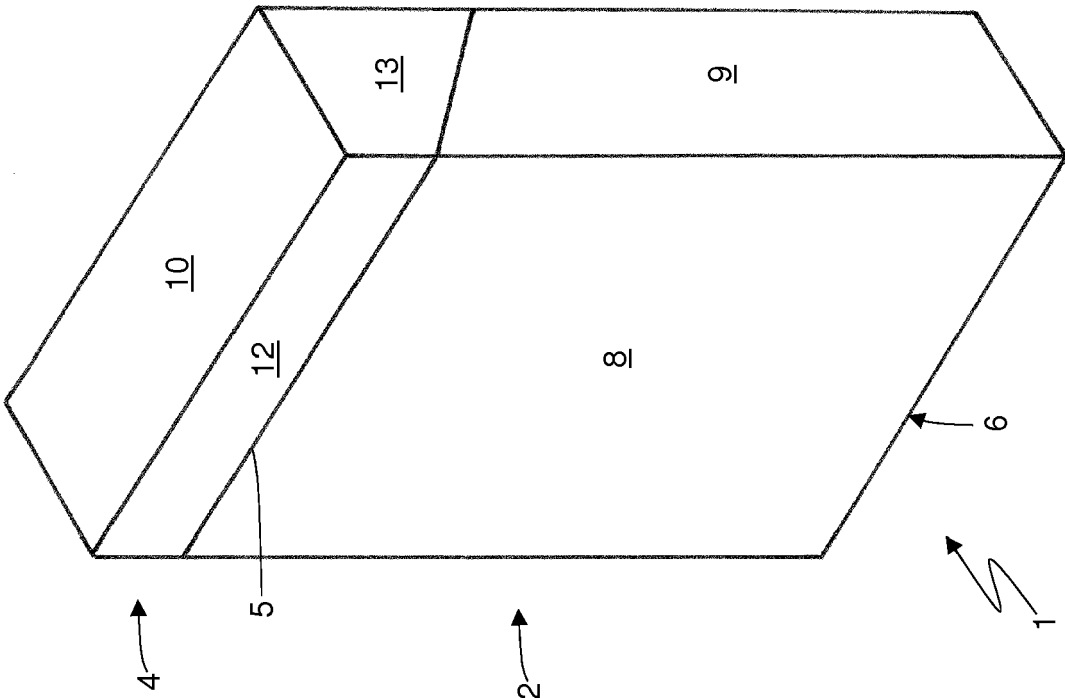


Fig. 1

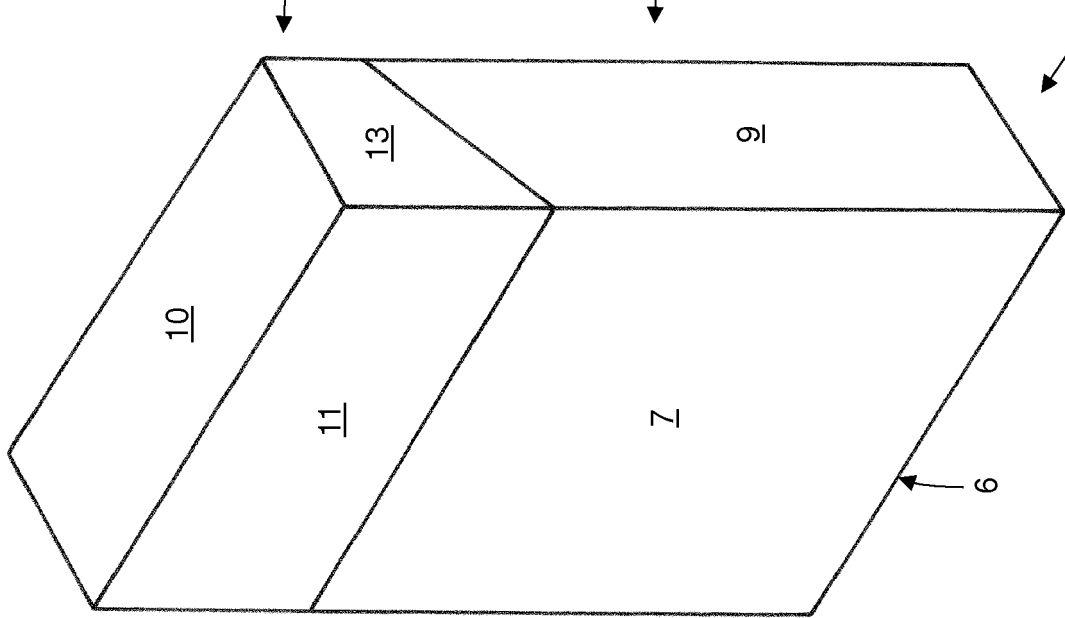
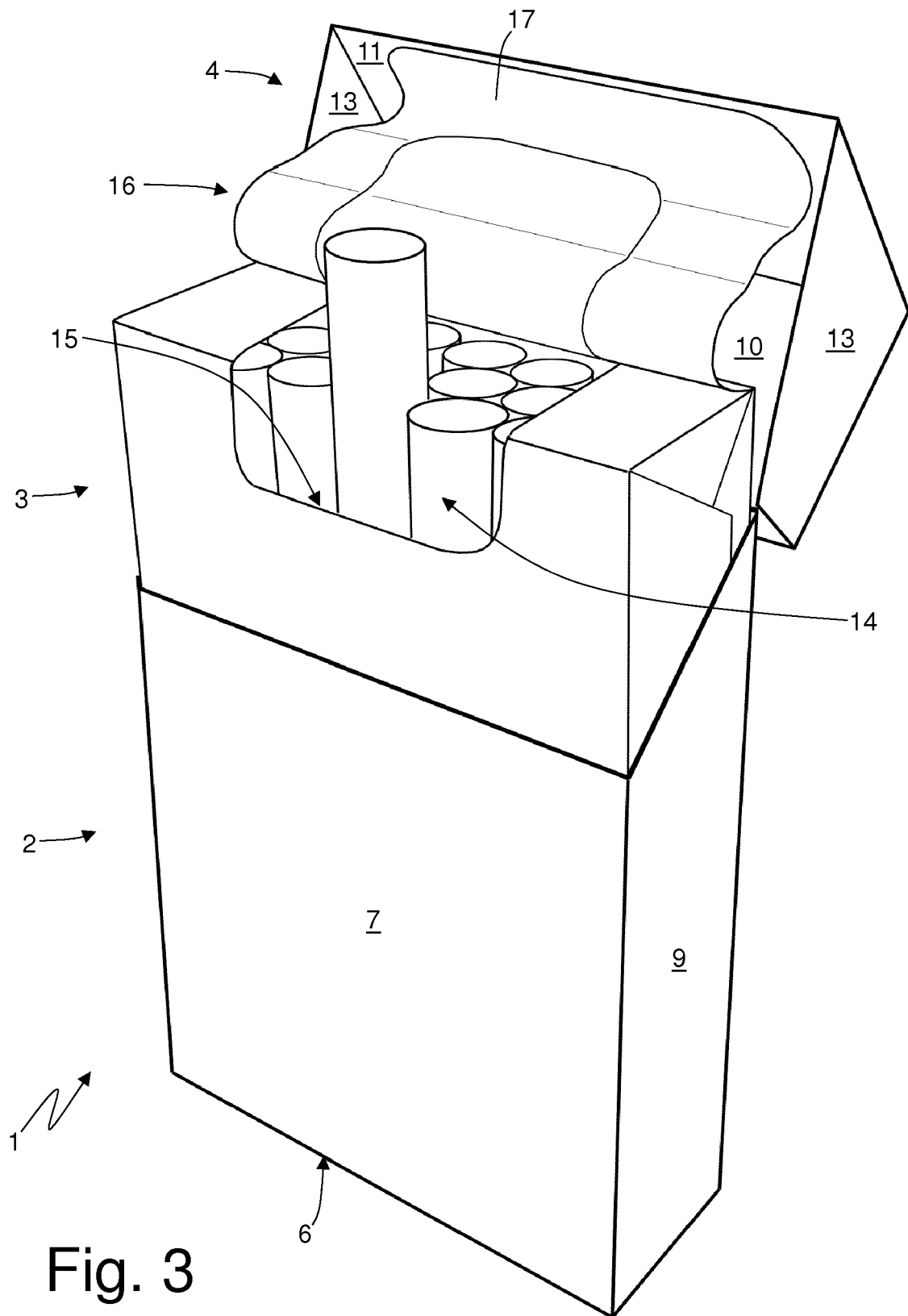


Fig. 2



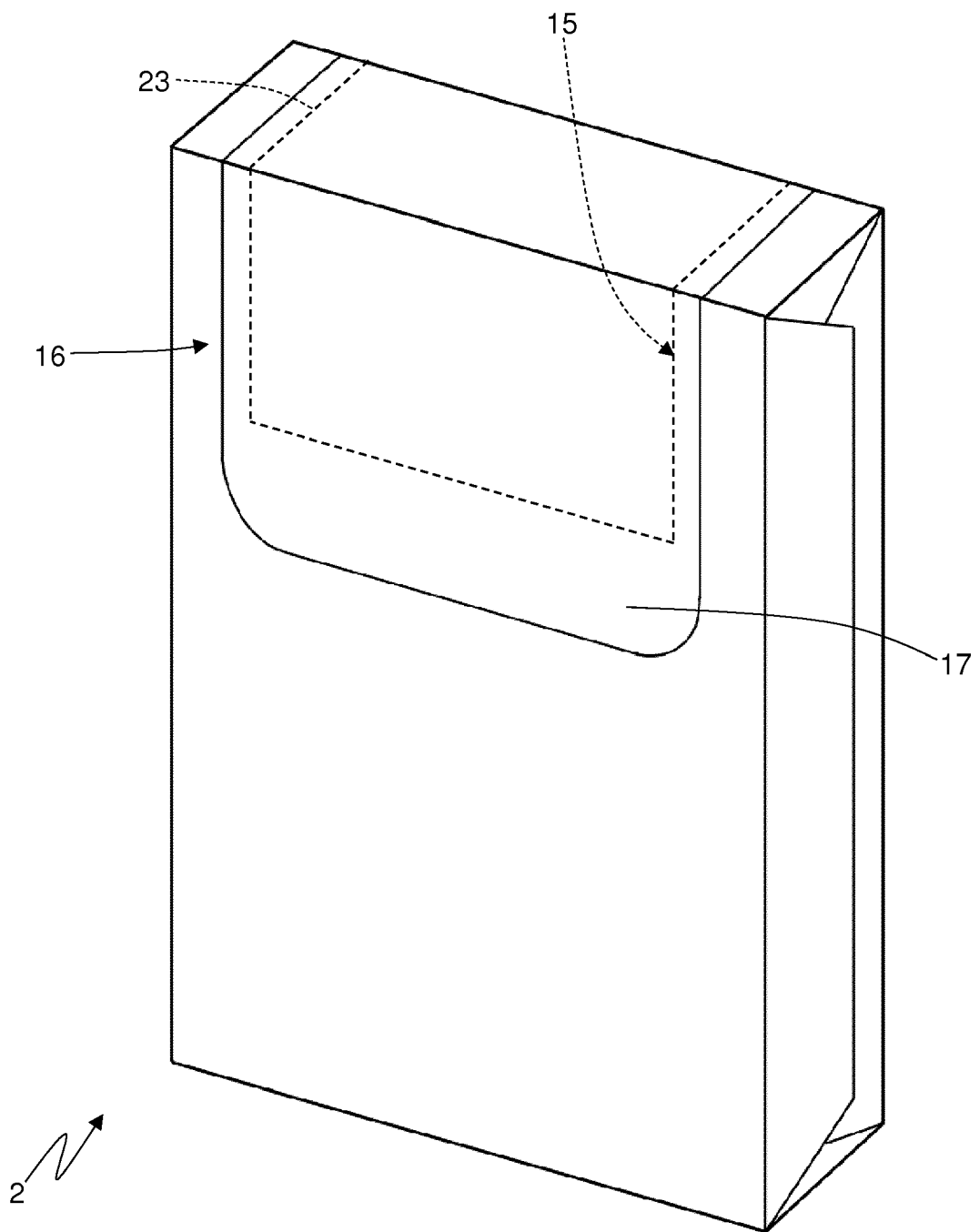


Fig. 4

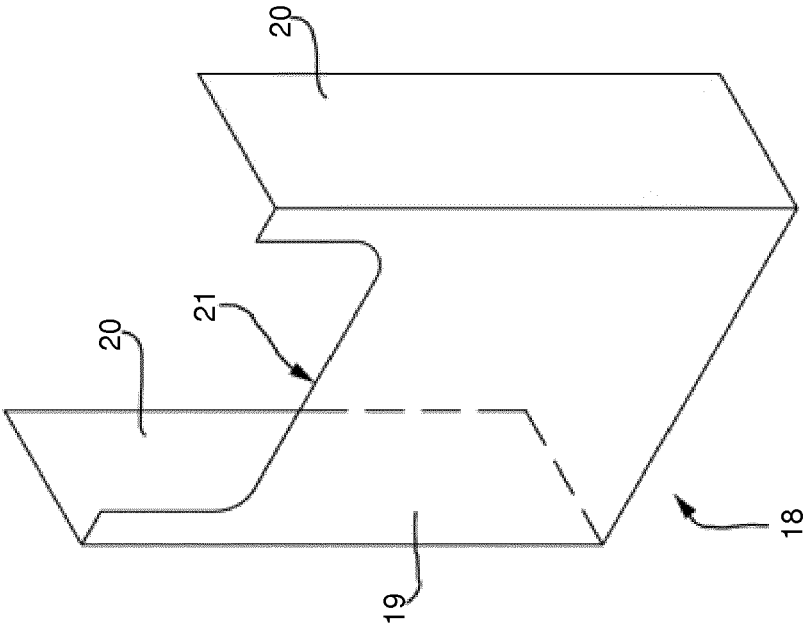


Fig. 6

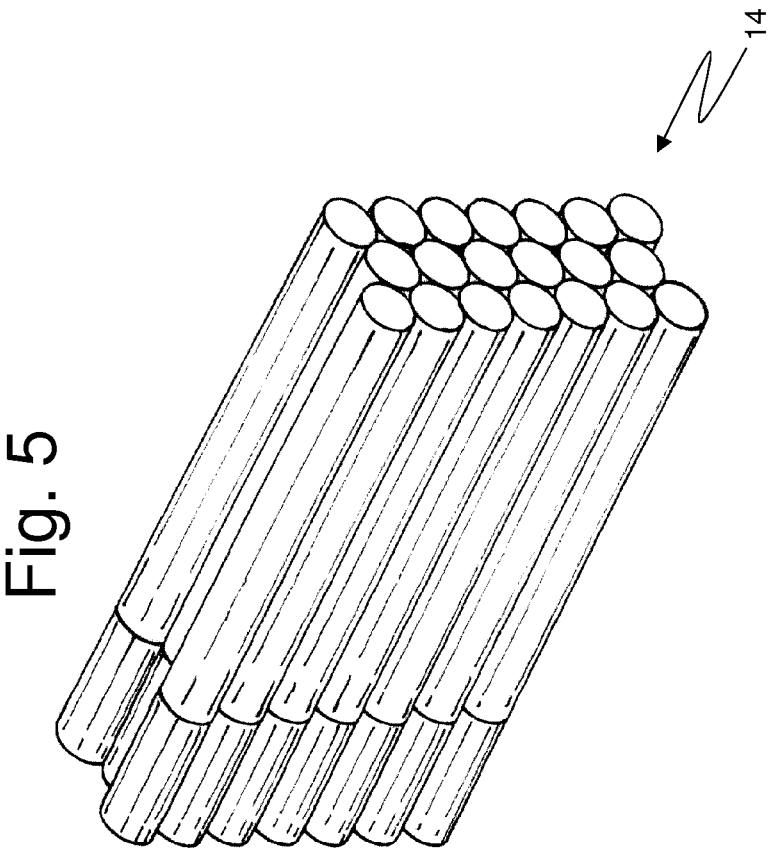
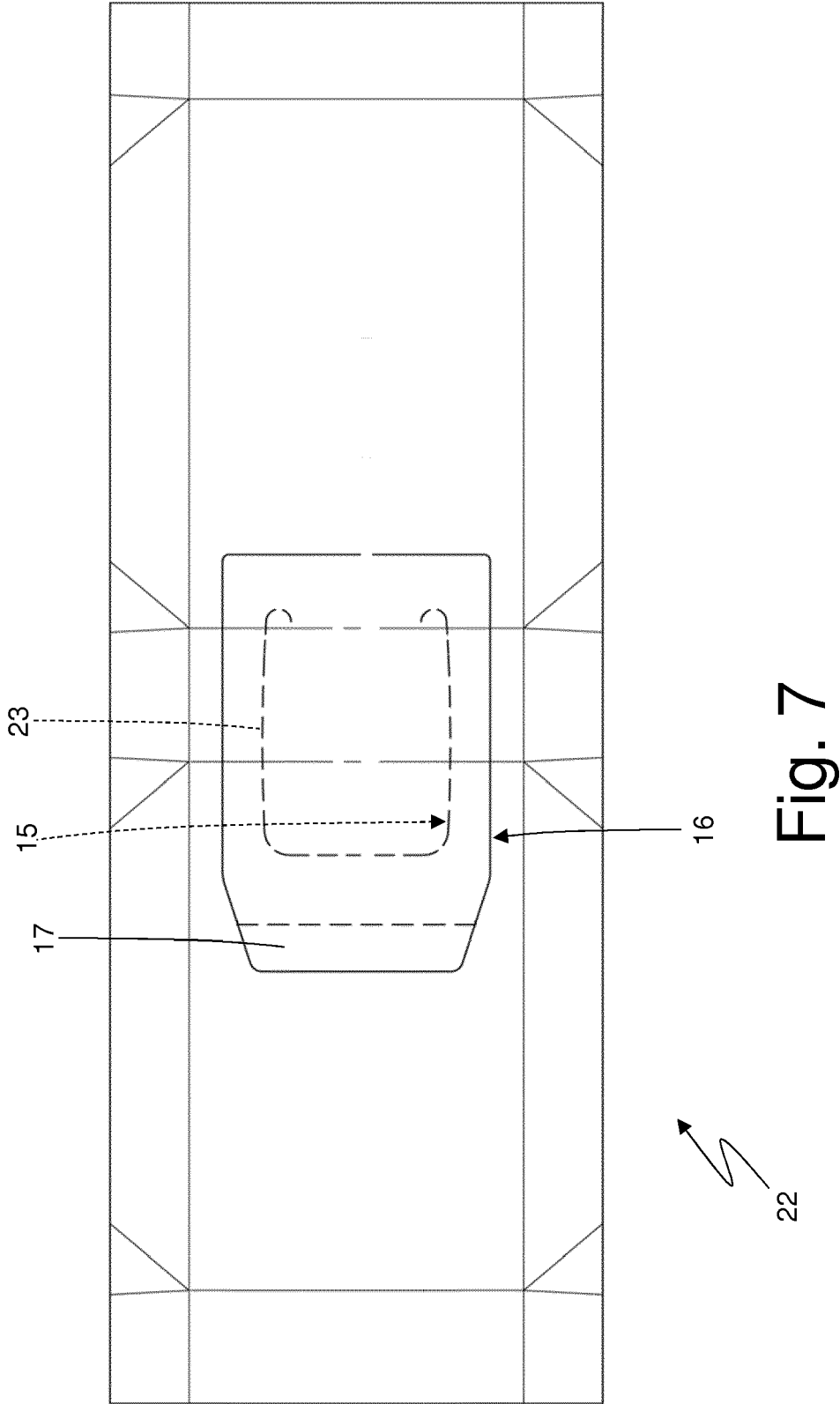


Fig. 5



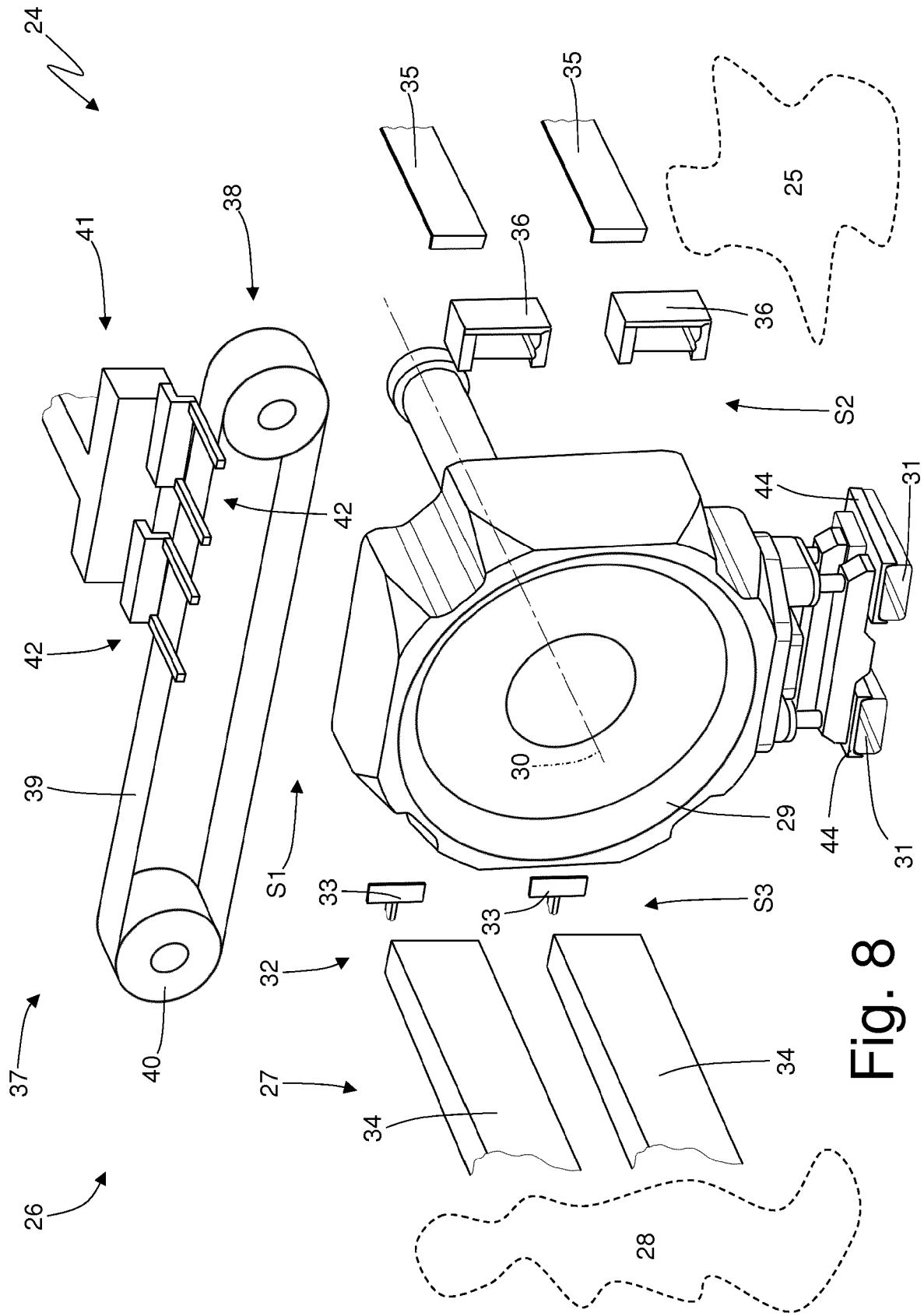


Fig. 8

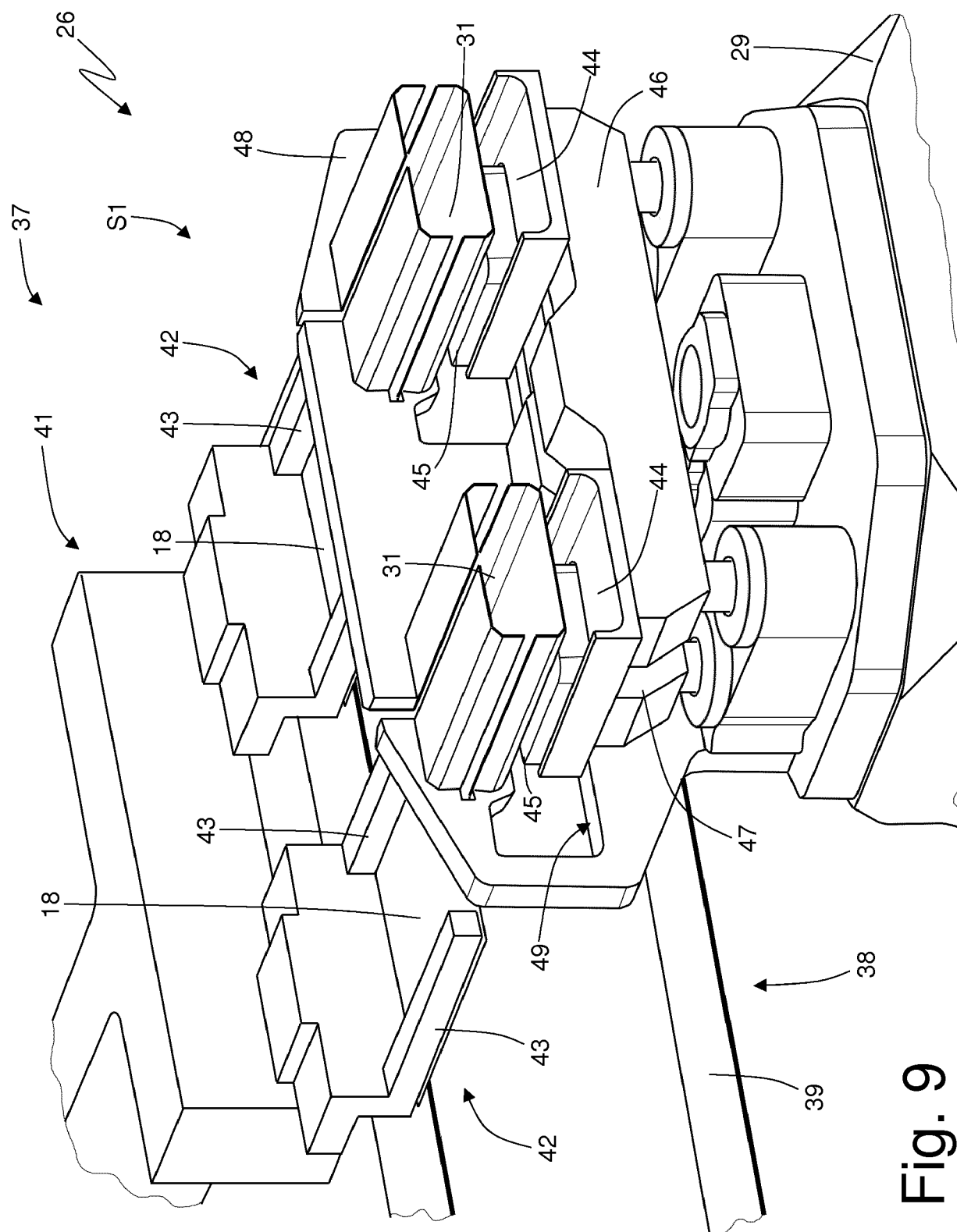


Fig. 9

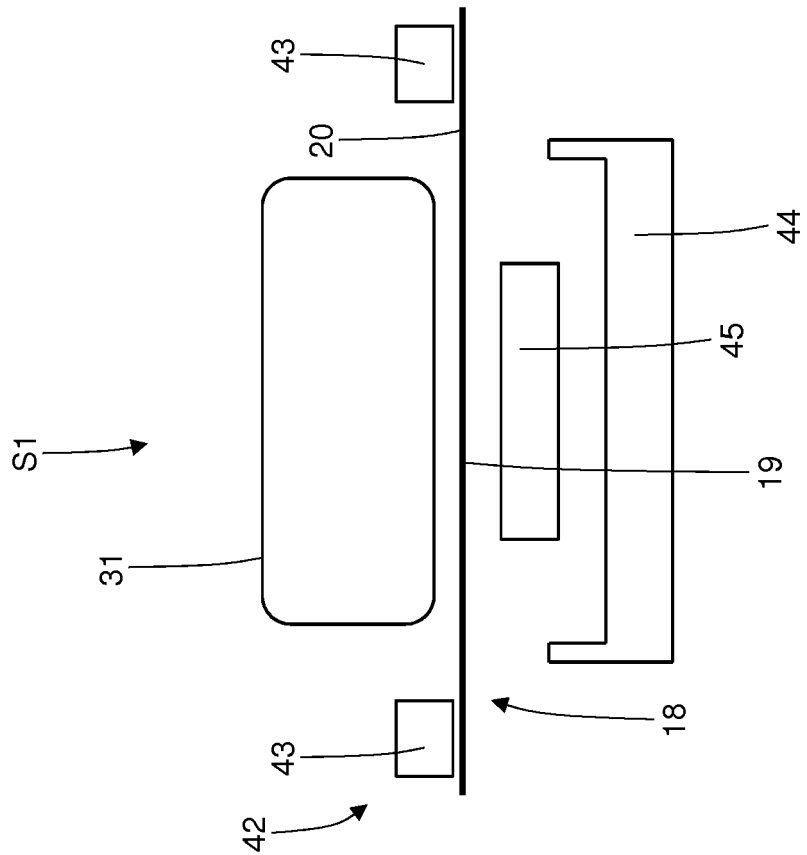


Fig. 11

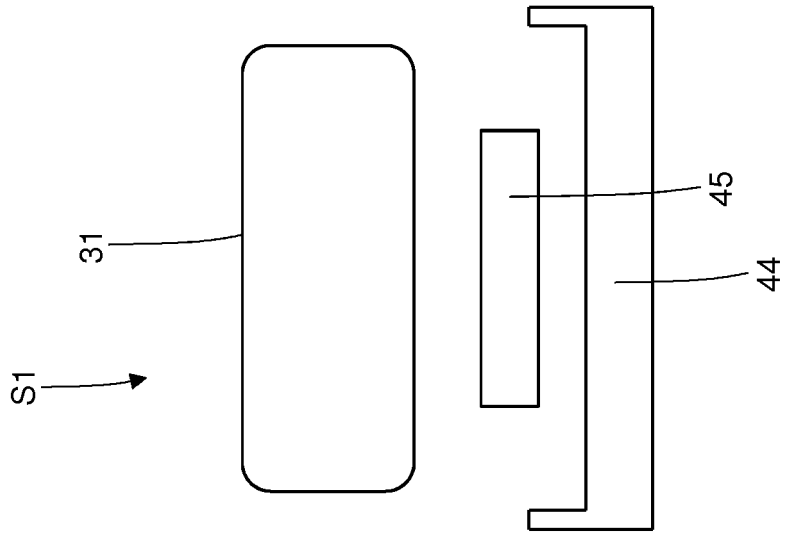


Fig. 10

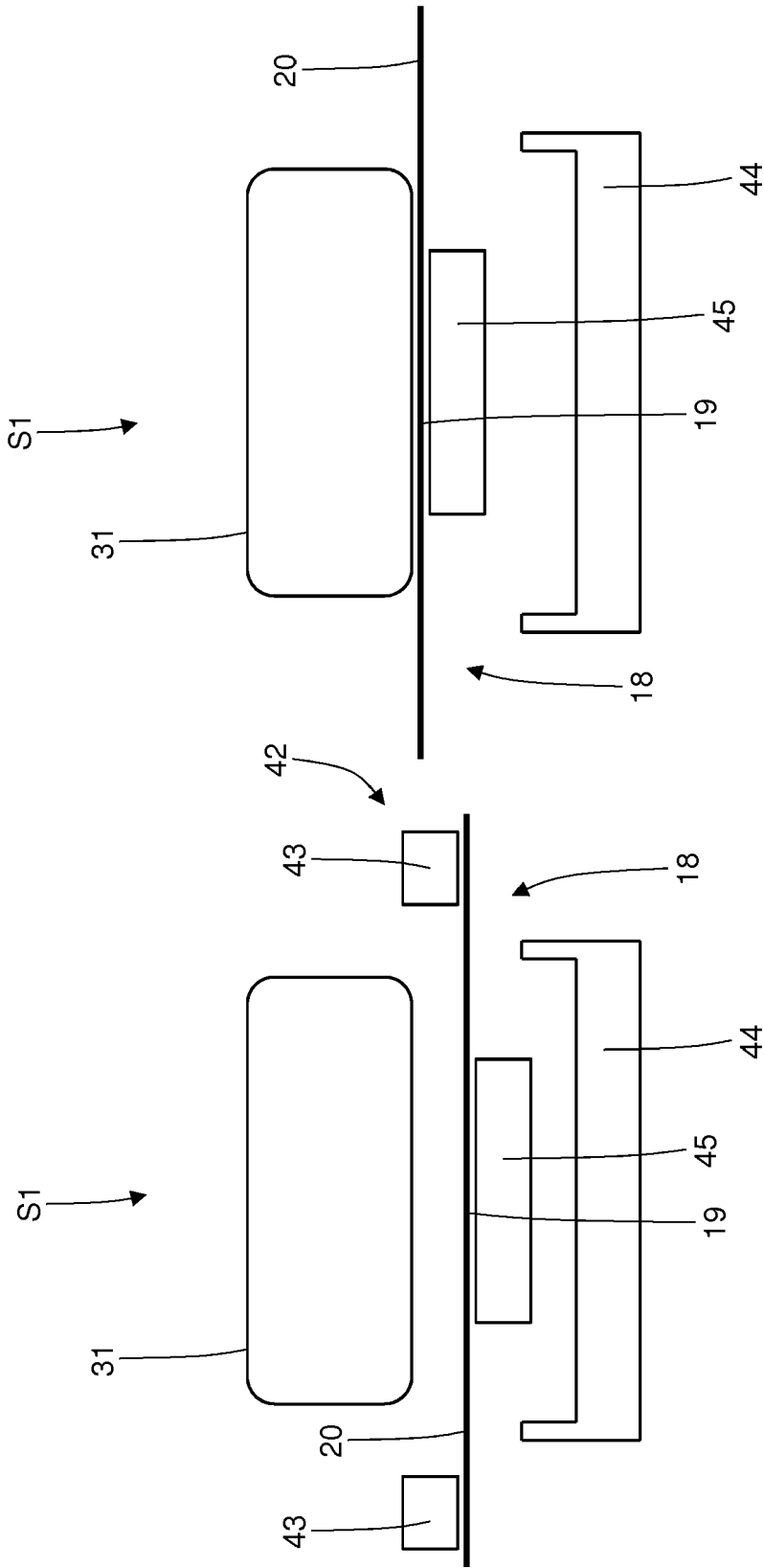


Fig. 13

Fig. 12

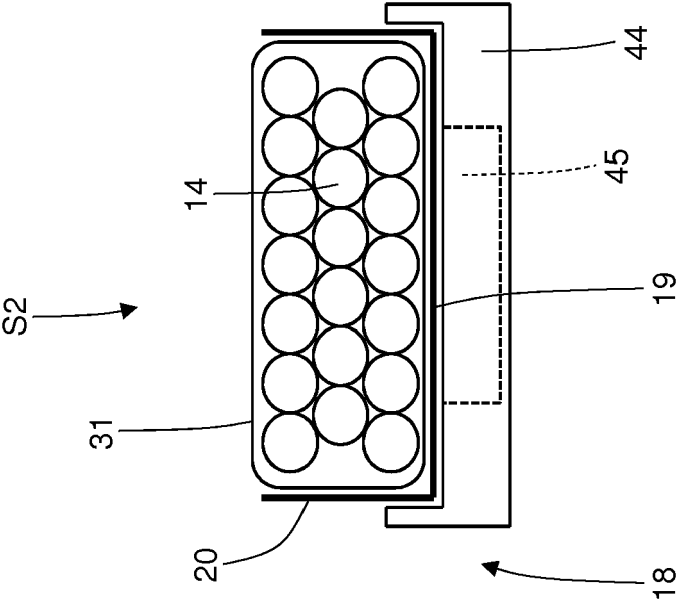


Fig. 14

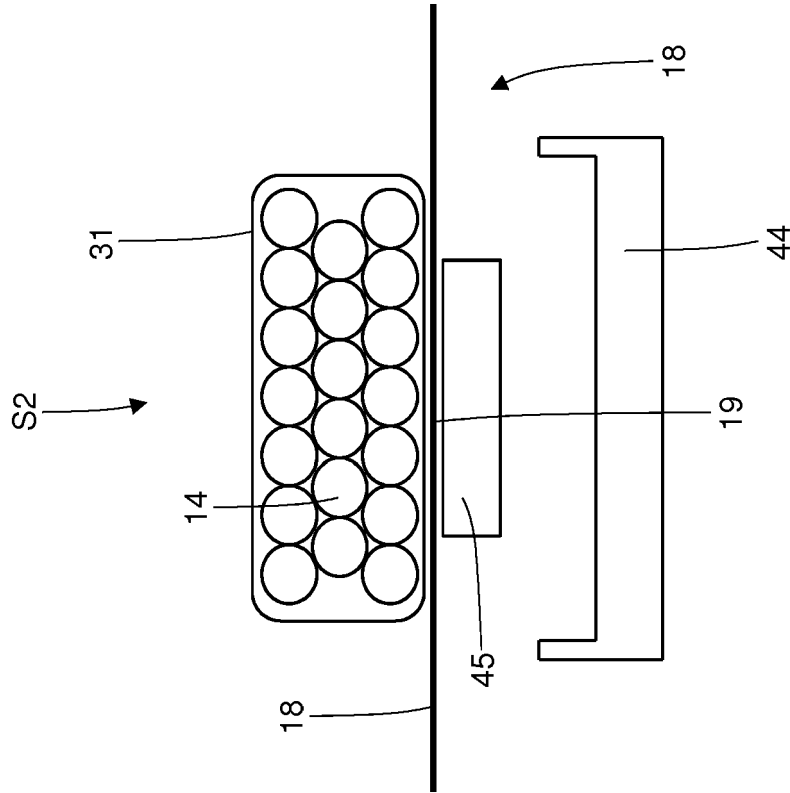


Fig. 15

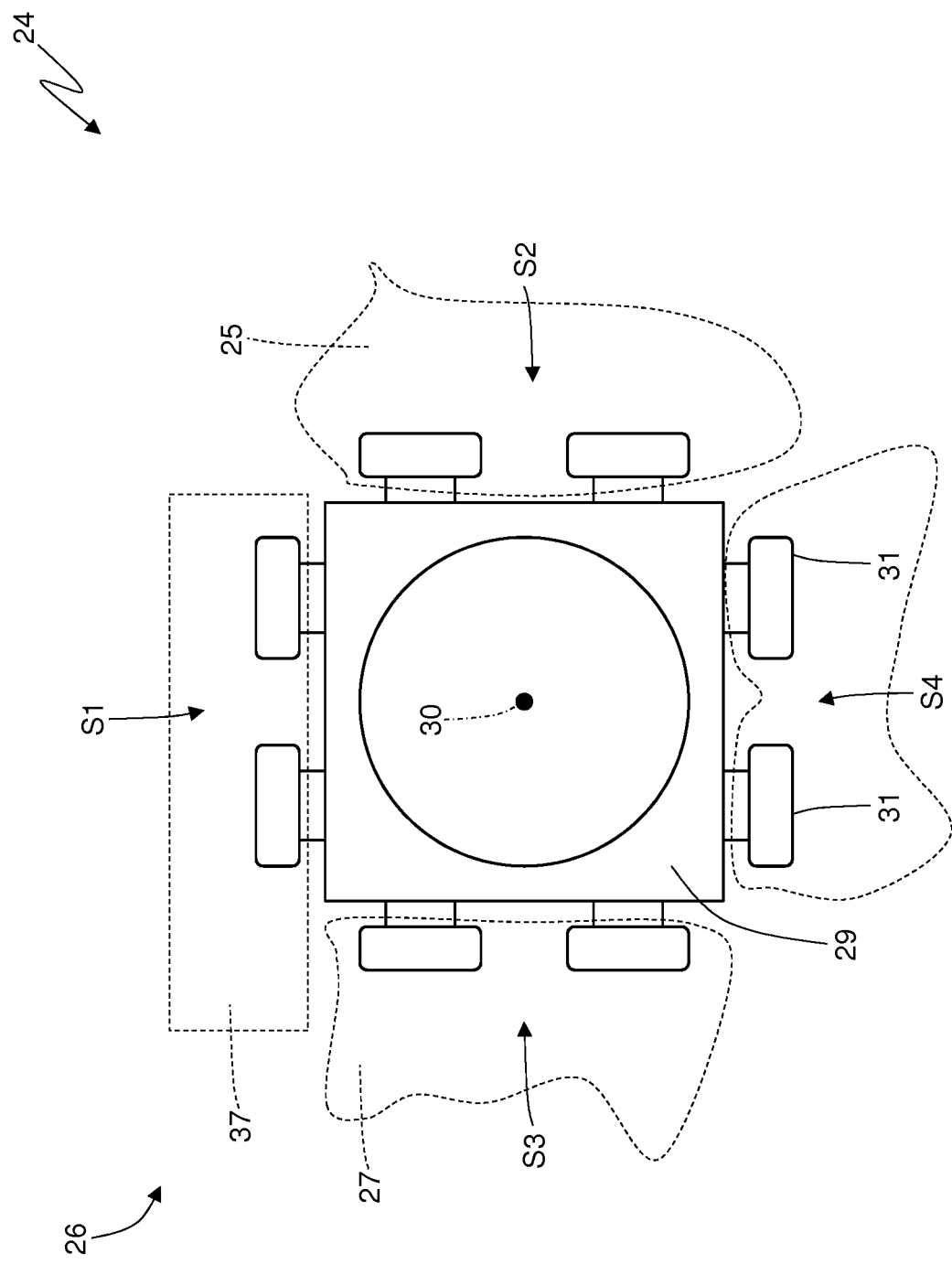


Fig. 16

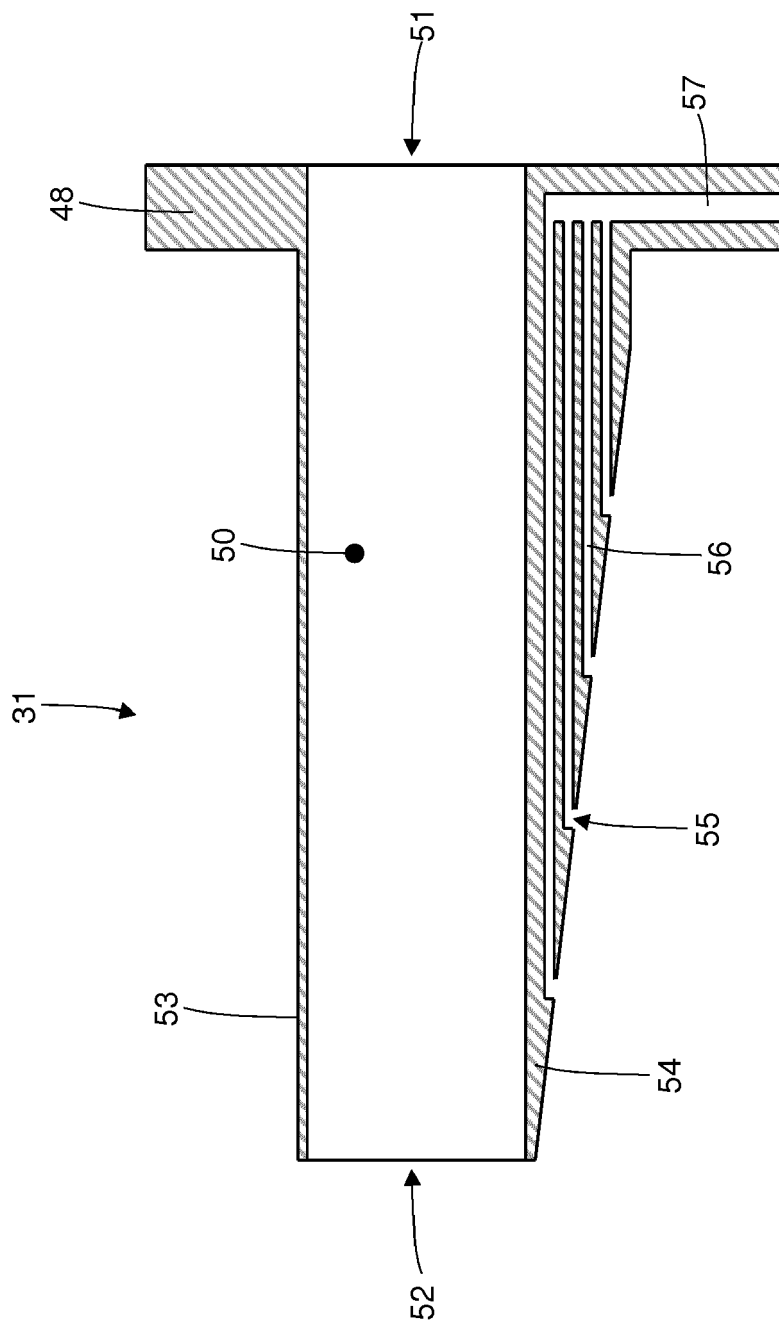


Fig. 17

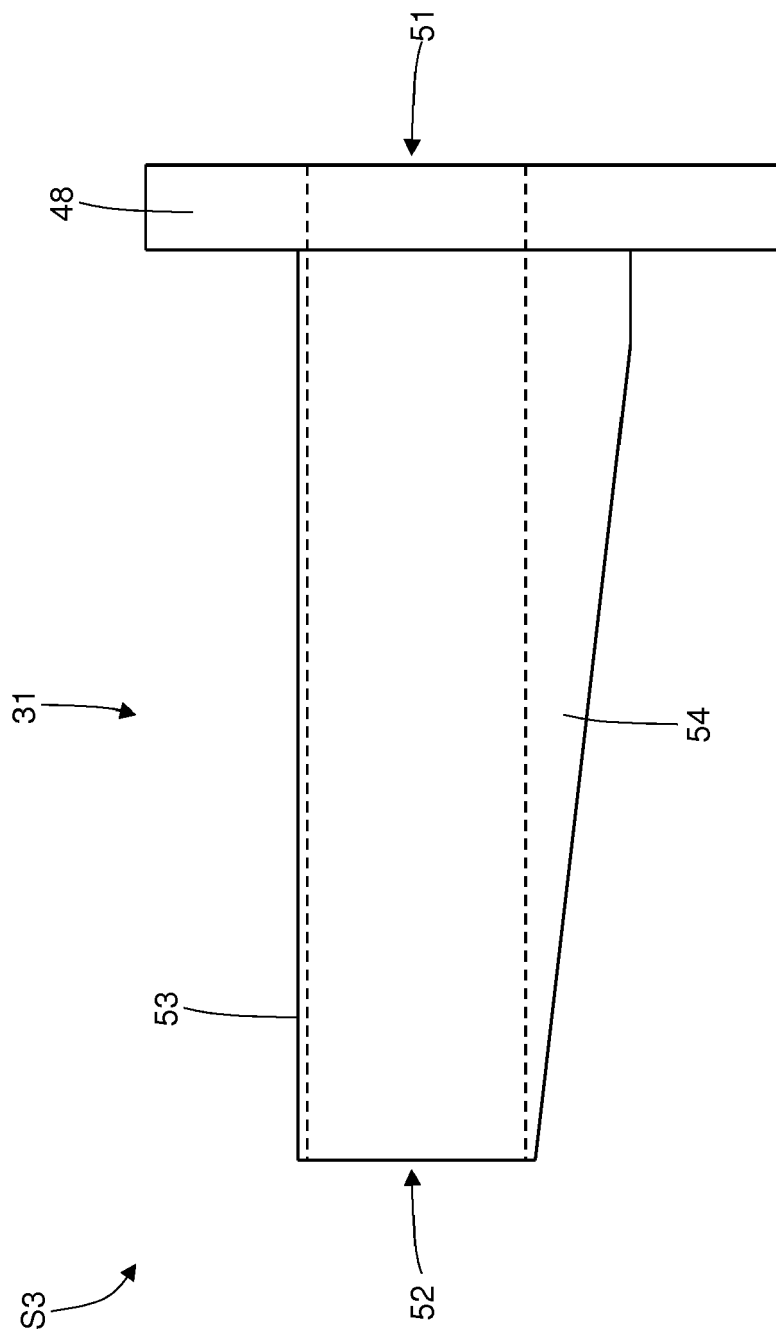


Fig. 18

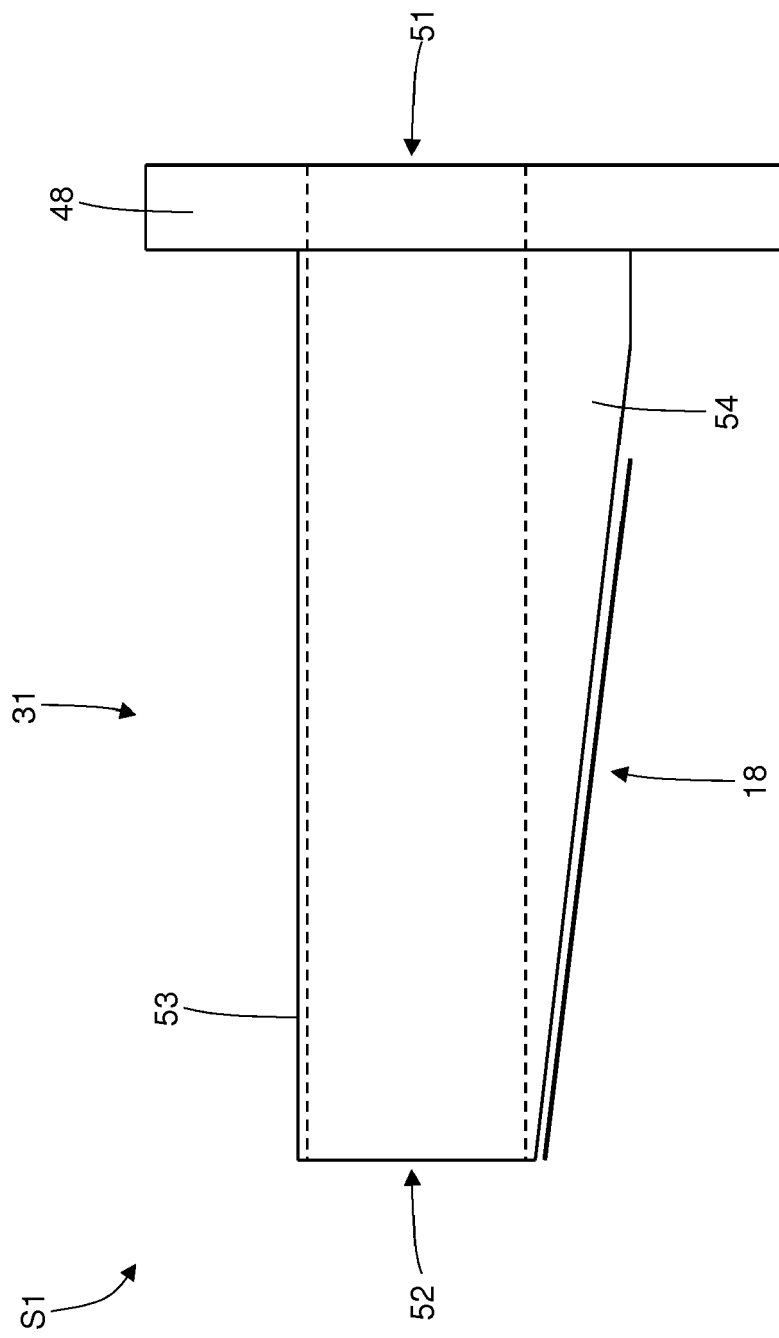


Fig. 19

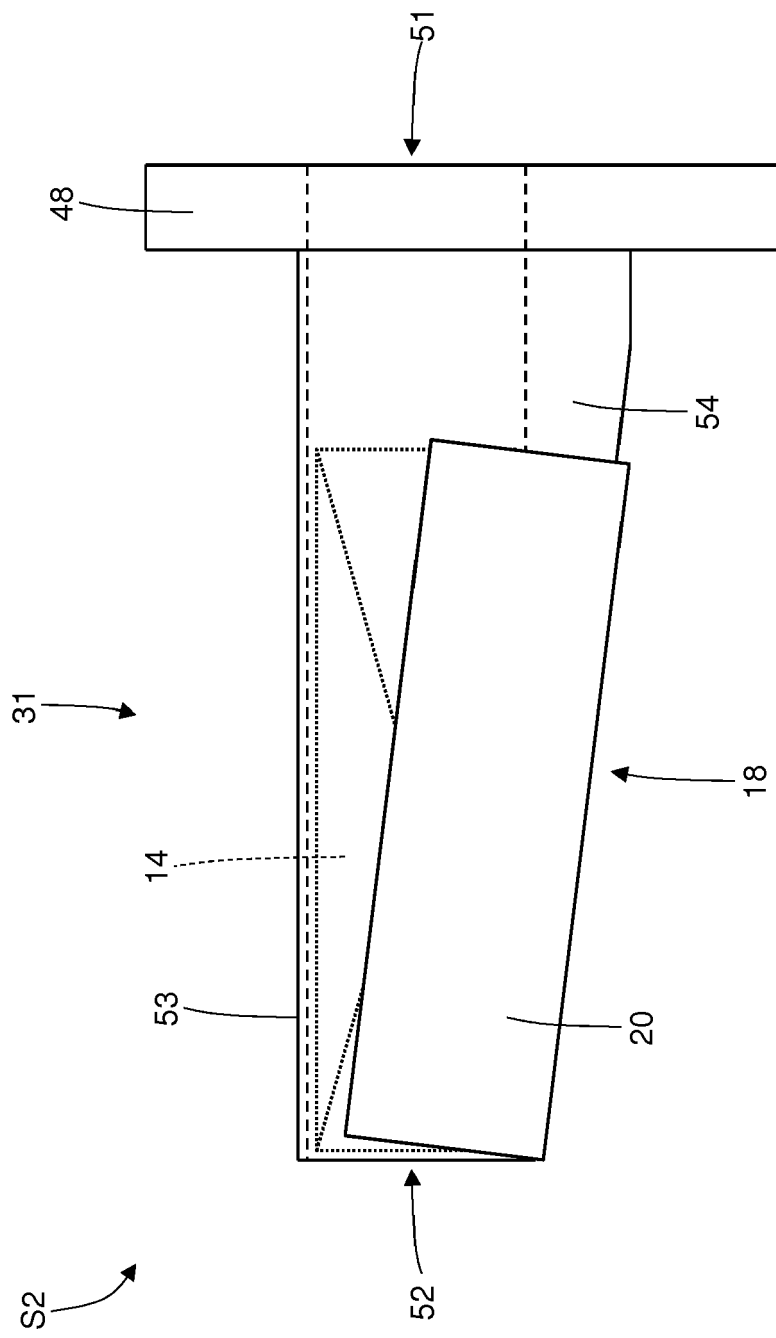


Fig. 20

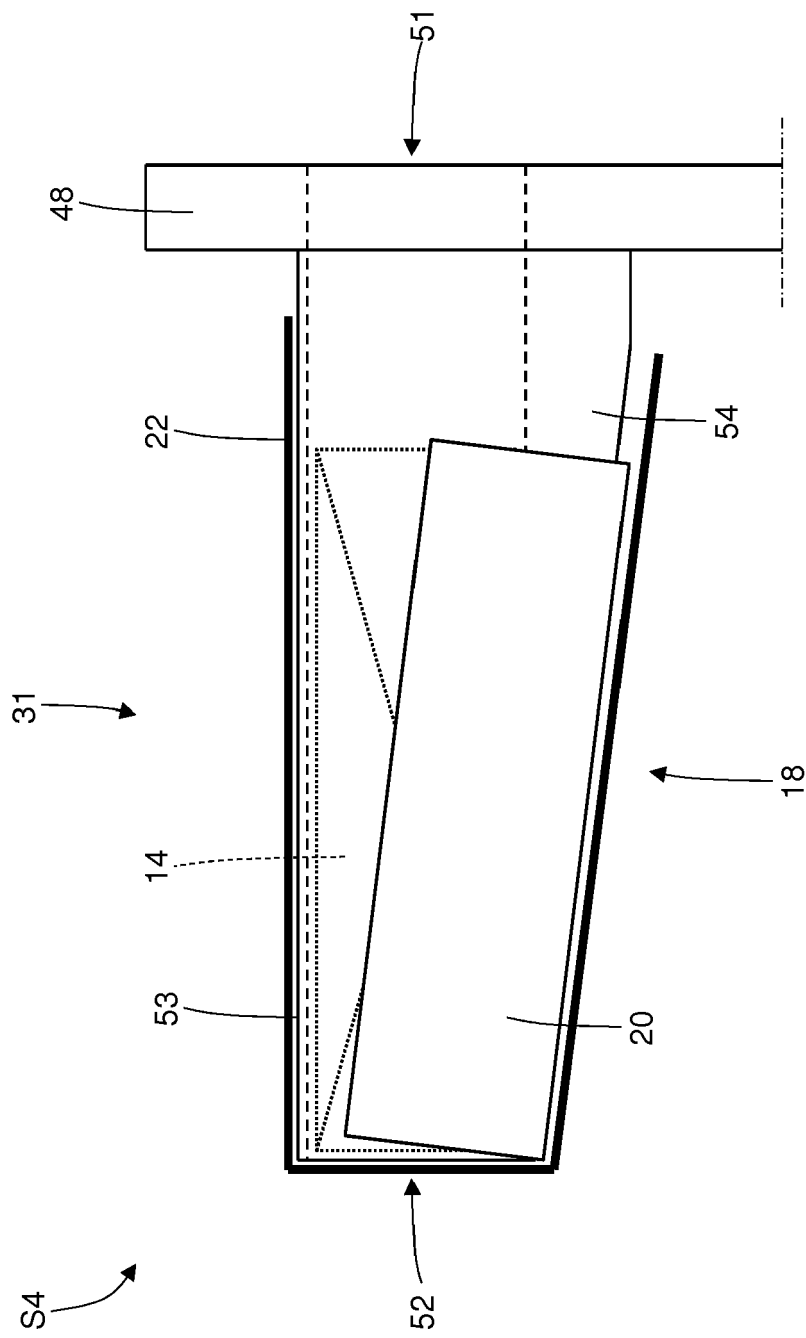


Fig. 21



EUROPEAN SEARCH REPORT

Application Number
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A	EP 2 008 935 A1 (GD SPA [IT]) 31 December 2008 (2008-12-31) * the whole document * -----	1,17	
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			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 January 2020	Examiner Ungureanu, Mirela
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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