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

(11) **EP 3 222 532 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.09.2017 Bulletin 2017/39

(51) Int Cl.:
B65B 19/22 *(2006.01)* ***B65B 35/56*** *(2006.01)*

(21) Application number: **17162182.4**

(22) Date of filing: **21.03.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **21.03.2016 IT UA20161855**

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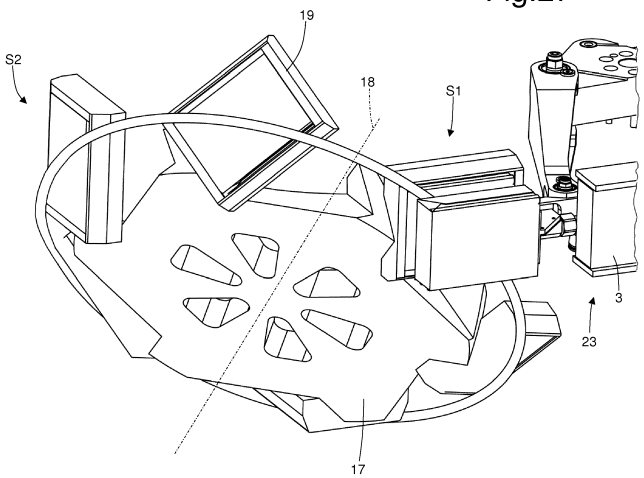
(54) **ORIENTATION UNIT AND METHOD FOR CAUSING A CHANGE IN ORIENTATION OF A PARALLELEPIPED-SHAPED ARTICLE IN A PACKING MACHINE**

(57) Orientation unit (16) and method for causing a change in orientation of a parallelepiped-shaped article (3) in a packing machine (12); the orientation unit (16) having: an input station (S1) in which the article (3) is oriented according to an input plane (A); an output station (S2) in which the article (3) is oriented according to an output plane (B); and an orientation drum (17) which can rotate around a rotation axis (18) and supports a parallelepiped-shaped pocket (19) which advances along an orientation path (P1) between the input station (S1) and the output station (S2); the rotation axis (18) of the orientation drum (17) is arranged obliquely, i.e. neither parallel nor perpendicular with respect to the input plane (A) and to the output plane (B) and/or the rotation axis (18) of the orientation drum (17) is arranged obliquely, i.e. neither parallel nor perpendicular with respect to the walls of the pocket (19).

Fig.27



EP 3 222 532 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an orientation unit and to a method for causing a change in orientation of a parallelepiped-shaped article in a packing machine" The present invention also relates to a packing machine and to a wrapping method for the production of a packet of tobacco articles.

[0002] The present invention finds beneficial application to a packet of cigarettes, to which the following description will make explicit reference without loss of generality.

PRIOR ART

[0003] A packet of cigarettes normally comprises an inner wrapping, which consists of a group of cigarettes wrapped in a wrap made of metallised paper or of heat-sealable plastic material, and an outer container which houses the inner wrapping and may be of the soft type (i.e. consisting of a flexible wrap that surrounds the inner wrapping) or of the rigid type (i.e. consisting of a rigid paperboard blank and generally equipped with a hinged lid).

[0004] A known packing machine for producing a packet of cigarettes comprises a forming unit which forms the group of cigarettes, a first wrapping unit which forms the inner wrapping around the group of cigarettes by folding a wrap, a second wrapping unit which forms the outer container around the inner wrapping by folding a blank, and an orientation unit which receives the inner wrapping from the first wrapping unit in an input station and releases the inner packing material to the second wrapping unit in an output station.

[0005] The orientation unit imparts a change of orientation to the inner wrapping that is made necessary by the fact that the first wrapping unit operates more effectively/efficiently if the inner wrapping has a first orientation, while the second wrapping unit operates more effectively/efficiently if the inner wrapping has a second orientation different from the first orientation. For example, the inner wrapping advances through the first wrapping unit with the upper wall arranged perpendicularly to the direction of travel, while the inner wrapping advances through the second wrapping unit with the front (or rear) wall arranged perpendicularly to the direction of travel.

[0006] The known orientation units generally comprise a drum provided with a plurality of peripheral pockets, each of which is suitable to contain an inner wrapping and is mounted to rotate with respect to the drum under the control of an actuating cam system; between the input station (in which an inner wrapping enters a pocket coming from the first wrapping unit) and the outlet station (in which the inner packing material exits from the pocket toward the second wrapping unit) the pocket rotates with respect to the drum thus varying the orientation of the inner wrapping.

[0007] However, a known orientation unit of the type described above is relatively complex, heavy and expensive, since it is necessary to provide a mounting and an actuating cam system that enables each pocket to rotate cyclically with respect to the drum. The complexity and weight of the orientation unit can also have a negative impact during a format change operation (i.e. an operation to change the type of cigarette packet which is being made) that requires modification of the orientation change imparted by the orientation unit; in fact, in these situations the orientation unit drum is removed and replaced with a different drum, but this replacement operation is long and laborious due to the complexity and weight of the orientation unit.

[0008] The patent application EP2540626A1 describes a packing machine that creates packets of cigarettes and comprises a plurality of types of rotary conveyors which are removably connectable to respective movement shafts to allow the replacement of the conveyors with conveyors of a different type and/or the movement of the conveyors to a different position with respect to the other conveyors so as to achieve different configurations depending on the type of packets to be manufactured and the type of wrapping material to be used.

DESCRIPTION OF THE INVENTION

[0009] The objective of the present invention is to provide an orientation unit and a method for causing a change in orientation of a parallelepiped-shaped article in a packing machine, the unit and method of orientation being free from the drawbacks described above and at the same time being inexpensive and easy to produce.

[0010] A further objective of the present invention is to provide a packing machine and a wrapping method for the production of a packet of tobacco articles, the packing machine and wrapping method being free from the drawbacks described above and at the same time being inexpensive and easy to produce.

[0011] In accordance with the present invention, an orientation unit and a method for causing a change in orientation of a parallelepiped-shaped article in a packing machine are provided, as claimed in the appended claims.

[0012] Further in accordance with the present invention, a packing machine and a wrapping method for the production of a packet of tobacco articles are also provided, as claimed in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention will now be described with reference to the accompanying drawings which show several non-limiting examples of embodiments, wherein:

- figure 1 is a front perspective view of a packet of

cigarettes with a hinged lid in a closed configuration

- figure 2 is a rear perspective view of the packet of cigarettes of figure 1
- figure 3 is a perspective view of a group of cigarettes contained in the packet of cigarettes of figure 1
- figure 4 is a front perspective view of a sealed inner wrapping contained in the packet of cigarettes of figure 1
- figure 5 is a rear perspective view of the sealed inner wrapping of figure 4;
- Figure 6 is a perspective view of a rigid reinforcing element which surrounds the group of cigarettes of figure 3 inside the sealed inner wrapping of figure 4;
- figure 7 is a plan view of an unfolded wrap which is folded around the group of cigarettes of figure 3 to form the sealed inner wrapping of figure 4;
- figure 8 is a front perspective view of an unsealed inner wrapping which can be contained in the packet of cigarettes of figure 2 instead of the sealed inner wrapping of figure 4;
- figure 9 is a plan view of an unfolded wrap which is folded around the group of cigarettes of figure 3 to form the unsealed inner wrapping of figure 8;
- figure 10 is a blank which is folded around the sealed inner wrapping of figure 4 or the unsealed inner wrapping of figure 8 to form an external container of the packet of cigarettes of figure 1;
- figure 11 is a collar which can be glued inside the external container of the packet of cigarettes of figure 1;
- figure 12 is a perspective view of a packing machine suitable to manufacture the packet of cigarettes of figure 1 containing the sealed inner wrapping of figure 4 or, alternatively, the unsealed inner wrapping of figure 8;
- figure 13 is a perspective view of an orientation unit of the packing machine of figure 12;
- figure 14 is a schematic perspective view of an inner wrapping at an input station of the orientation unit of figure 13 and of an inner wrapping at an output station of the orientation unit of figure 13;
- figure 15 is a front view of the orientation unit of figure 13;
- figure 16 is a plan view of the orientation unit of figure 13;
- figure 17 is a front view of a wrapping unit of the packing machine of figure 12;
- figure 18 is a perspective view of a variant of the packing machine of figure 12;
- figure 19 is a perspective view of an orientation unit of the packing machine of figure 18;
- figure 20 is a front view of the orientation unit of figure 19;
- figure 21 is a plan view of the orientation unit of figure 19;
- figure 22 is a front perspective view of an alternative embodiment of a rigid packet of cigarettes with a hinged lid in a closed configuration;
- figure 23 is a front perspective view of an external container of the packet of cigarettes of figure 22 in an open configuration;
- figure 24 is a blank which is folded around the sealed inner wrapping of figure 4 or the unsealed inner wrapping of figure 8 to form the external container of the packet of cigarettes of figure 22;
- figure 25 is a collar which can be glued inside the external container of the packet of cigarettes of figure 22;
- figure 26 is a perspective view of a variant of the packing machine of figure 12 suitable to manufacture the packet of cigarettes of figure 21;
- figures 27 and 28 are two different perspective views of an orientation unit of the packing machine of figure 26;
- figure 29 is a schematic perspective view of an inner wrapping at an input station of the orientation unit of figure 26 and of an inner wrapping at an output station of the orientation unit of figure 26;
- figure 30 is a front view of the orientation unit of figure 26; and
- figure 31 is a plan view of the orientation unit of figure 26.

PREFERRED EMBODIMENTS OF THE INVENTION

[0014] In figures 1 and 2 the number 1 indicates a rigid packet of cigarettes in its entirety. The packet 1 of cigarettes comprises an outer container 2 made of cardboard or stiff paperboard and shaped like a cup and an inner wrapping 3 (shown in figures 4 and 5 or in figure 8) which is housed inside the container 2 and encloses a parallelepiped-shaped group 4 of filter cigarettes (shown in figure 3).

[0015] In the embodiment shown in figures 4-7, the inner wrapping 3 is sealed and has at the top and front an opening 5 for extracting the cigarettes, closed by a reusable closure label 6; the inner wrapping 3 is formed using a rectangular-shaped heat-sealable wrap 7 (shown in figure 7), which is folded around the group 4 of cigarettes and once folded is stabilised by heat sealing (i.e. superimposed portions of the wrap 7 are stably attached together by means of heat sealing). Preferably (but not necessarily) a rigid reinforcing element 8 (shown in figure 6) is arranged around the group 4 of cigarettes, which is thus located inside the inner wrapping 3 (i.e. it is completely surrounded by the inner wrapping 3). In the alternative embodiment shown in figures 8 and 9, the inner wrapping 3 is not sealed and is formed by folding a wrap 9 (shown in figure 9) made of metallised paper around the group 4 of cigarettes; once folded, the wrap 9 is not normally stabilised, i.e. it is entirely free of glue or welding.

[0016] The outer container 2 of the packet 1 of cigarettes is obtained by folding a blank 10 (shown in figure 10) around the inner wrapping 3 (of the sealed type as shown in figures 4-7 or the non-sealed type as shown in

figures 8 and 9). According to a possible embodiment, the packet 1 of cigarettes may comprise a collar 11 (shown unfolded in figure 11) which is attached (normally by gluing) folded into a "U" inside the outer container 2 to partially protrude outside an open top end and engage a corresponding inner surface of the lid when the lid is arranged in a closed position. Generally, but not necessarily, the collar 11 is absent when the inner wrapping 3 is sealed (and therefore is internally provided with the reinforcing element 8 that also partly performs the function of the collar 11) and the collar 11 is present when the inner wrapping 3 is not sealed.

[0017] In figure 12, the numeral 12 denotes in its entirety an intermittent packing machine (i.e. operated with an intermittent motion that provides a cyclic alternation between motional and stationary phases) which is suitable to make the packet 1 of cigarettes. The packing machine 12 comprises a forming unit 13 of known type in which the group 4 of cigarettes is formed, a wrapping unit 14 in which the inner wrapping 3 is made by folding the wrap 7 around the group 4 of cigarettes (to form the inner wrapping 3 of the sealed type) or by folding the wrap 9 around the group 4 of cigarettes (to form the inner wrapping 3 of the non-sealed type), and a wrapping unit 15 in which the outer container 2 is made by folding the blank 10 around the inner wrapping 3. The packing machine 12 also comprises an orientation unit 16 which connects the wrappings units 14 and 15 together causing a change of orientation of the inner wrapping 3, i.e. it receives the inner wrapping 3 from the wrapping unit 14 in an input station S1 where the inner wrapping 3 is oriented according to an input plane A (shown in figure 14) and feeds the inner wrapping 3 to the wrapping unit 15 in an output station S2 where the inner wrapping 3 is oriented according to an output plane B (shown in figure 14) different from the input plane A (in particular, perpendicular to the input plane A). As shown in figures 13, 15 and 16, the orientation unit 16 comprises an orientation drum 17 which is mounted so that it can rotate (with intermittent motion) about a horizontal rotation axis 18 and supports a plurality of peripheral pockets 19, each of which has a parallelepiped shape and is suitable to contain an inner wrapping. The rotation axis 18 is perpendicular to the orientation drum 17, i.e. it is perpendicular to the plane in which the orientation drum 17 lies. Each pocket 19 is rigidly fitted on the orientation drum 17 and thus it does not carry out any type of movement relative to the orientation drum 17. The rotation of the orientation drum 17 about the rotation axis 18 moves each pocket 19 along a circular orientation path P1 (shown in figure 17) that starts at the input station S1, wherein the pocket 19 receives an inner wrapping 3 (containing a group 4 of cigarettes) from the wrapping unit 14, and ends at the output station S2 wherein the inner wrapping 3 is transferred to the wrapping unit 15.

[0018] The orientation drum 17 is arranged obliquely (in geometry, of a geometric entity that is neither parallel nor perpendicular to another geometrical entity) with respect to the input plane A and to the output plane B, i.e. the rotation axis 18 of the orientation drum 17 is arranged obliquely, i.e. neither parallel nor perpendicular to the input plane A and to the output plane B; in other words, the rotation axis 18 of the orientation drum 17 is incident to the input plane A and to the output plane B (i.e. not parallel either to the input plane A or to the output plane B) and the rotation axis 18 of the orientation drum 17 forms an angle to the input plane A and to the output plane B that is not 90°.

[0019] The pockets 19 (i.e. the walls of the pockets 19) of the orientation drum 17 are also arranged obliquely: each pocket 19 is (i.e. the walls of each pocket 19 are) neither parallel nor perpendicular with respect to the orientation drum 17, i.e. with respect to the rotation axis 18. Thanks to the fact that the rotation axis 18 of the orientation drum 17 is inclined (oblique) with respect to the input plane A and to the output plane B and that the pockets 19 (i.e. the walls of each pocket 19) are arranged obliquely with respect to the rotation axis 18, the pockets 19 are themselves oriented according to the input plane A at the input station S1 and, at the same time, are oriented according to the output plane B at the output station S2. In other words, thanks to the inclination of the rotation axis 18 of the orientation drum 17 with respect to the planes A and B and the simultaneous inclination of the pockets 19 (i.e. of the walls of each pocket 19) with respect to the rotation axis 18, each pocket 19 is oriented according to the input plane A at the input station S1 (and is therefore suitable to receive an inner wrapping 3 having an orientation according to the input plane A in the input station S1) and is oriented according to the output plane B at the output station S2 (and is therefore suitable to receive an inner wrapping 3 having an orientation according to the output plane B in the output station S2). Consequently, each pocket 19 causes a change of orientation of the corresponding inner wrapping 3 from the input plane A to the output plane B along the orientation path P1 (i.e. from the input station S1 to the output station S2).

[0020] In the preferred embodiments shown in the accompanying figures, the input plane A is perpendicular to the output plane B, thus the change of orientation imparted by the orientation drum 17 just provides a rotation of the inner wrappings 3 by 90°; according to alternative embodiments not shown, the input plane A may form an angle with respect to the output plane B which differs from 90°.

[0021] In the embodiment shown in figures 12-17, the main wall of each pocket 19 (i.e. the largest wall against which a rear or front wall of the inner wrapping 3 rests) is inclined, i.e. forms a non-right angle with respect to the orientation drum 17, i.e. with respect to the rotation axis 18, only about a single inclination axis arranged tangentially with respect to the orientation drum 17, i.e. with respect to the rotation axis 18. In the embodiment shown in figures 12-17, the input plane A is perpendicular to the output plane B and the rotation axis 18 of the orientation

drum 17 forms an angle of 45° with respect to both the input plane A and the output plane B; in particular, in the embodiment shown in figures 12-17, the main wall of each pocket 19 (i.e. the largest wall against which a rear or front wall of the inner wrapping 3 rests) forms an angle of 45° with respect to the rotation axis 18.

[0022] As shown in figure 12, the forming unit 13 comprises a hopper 20 provided with a plurality of outlets from which the groups 4 of cigarettes are cyclically extracted; a forming conveyor 21 belt is arranged in front of the hopper 20 which supports a plurality of forming pockets 22, each of which receives a corresponding group 4 of cigarettes from an outlet of the hopper 20. According to a preferred embodiment, the reinforcing elements 8 (obviously only when provided) are inserted into the forming pockets 22 upstream of the hopper 20 and are then coupled to the corresponding groups 4 of cigarettes when the groups 4 of cigarettes are inserted into the forming pockets 22 at the hopper 20.

[0023] As shown in figure 12, the wrapping unit 14 comprises a straight wrapping conveyor 23 which receives each group 4 of cigarettes from a forming pocket 22 of the forming conveyor 21 together with a wrap 7 which is folded into a "U" around the group 4 of cigarettes entering the wrapping conveyor 23. A feeding conveyor 24 is interposed between the forming conveyor 21 and the wrapping conveyor 23, which advances the wraps 7 vertically in such a way as to insert each wrap 7 between a forming pocket 22 of the forming conveyor 21 and the wrapping conveyor 23. The wrapping conveyor 23 advances the group 4 of cigarettes along a straight wrapping path P2 which extends from the forming conveyor 21 to the orientation drum 17.

[0024] As better shown in figure 17, the wrapping unit 15 comprises a wrapping drum 25 which rotates in steps about a horizontal rotation axis 26 (which is oblique with respect to the rotation axis 18 of the orientation drum 17) and is provided with a plurality of pockets 27, each of which advances along a circular wrapping path P3 to receive a collar 11 in a feeding station S3, and subsequently receives an inner wrapping 3 from a pocket 19 of the orientation drum 17 in the output station S2 (arranged between the orientation drum 17 and the wrapping drum 25). In the feeding station S3, each collar 11 is folded into a "U" inside a corresponding ("empty") pocket 27 (i.e. devoid of an inner wrapping 3); subsequently, at the output station S2 located downstream of the feeding station S3, an inner wrapping 3 enters the pocket 27 and is coupled to the previously fed collar 11. According to a possible embodiment, each collar 11 is folded into a "U" in the feeding station S3 entering into the pocket 27 of the wrapping drum 25; alternatively, each collar 11 remains unfolded in the feeding station S3 and is bent into a "U" around the inner wrapping 3 (containing a group 4 of cigarettes) in the input station S2 when the inner wrapping 3 enters the pocket 27 of the wrapping drum 25, or each collar 11 remains unfolded in the feeding station S3 and is bent into a "U" around the inner wrapping 3 (containing a group 4 of cigarettes) in the output station S2 when the inner wrapping 3 exits the pocket 27 of the wrapping drum 25.

[0025] A feeding unit 28 (better shown in figure 12) is arranged at the feeding station S3, which cyclically feeds collars 11 into the pockets 27 of the wrapping drum 25. According to a possible embodiment, the feeding unit 28 could feed a coupon as well as a collar 11 into each pocket 27 of the wrapping drum 25.

[0026] The wrapping unit 15 comprises a wrapping drum 29 which rotates in steps about a horizontal rotation axis 30 (which is parallel to the rotation axis 26 of the wrapping drum 25 and oblique with respect to the rotation axis 18 of the orientation drum 17) and is provided with a plurality of pockets 31, each of which advances along a circular wrapping path P4 to receive a blank 10 in a feeding station S4, and subsequently receives an inner wrapping 3 coupled with a collar 11 from a pocket 27 of the wrapping drum 25 in the transfer station S5 (arranged between the wrapping drum 25 and the wrapping drum 29).

[0027] A feeding unit 32 (shown schematically in figure 12) is arranged at the feeding station S4, which cyclically feeds blanks 10 into the pockets 31 of the wrapping drum 29.

[0028] A transfer device is arranged in the transfer station S5 which transfers each inner wrapping 3 (containing a group 4 of cigarettes) coupled to a collar 11 from the respective pocket 27 of the wrapping drum 25 to the respective pocket 31 of the wrapping drum 29. The transfer device is of known type and by way of example could comprise a pusher and a follower (counter-pusher), which are arranged on opposite sides of the inner wrapping 3 and hold (clamp) the inner wrapping 3 between them, engaging two opposite faces of the inner wrapping 3 and horizontally move the inner wrapping 3 of the respective pocket 27 of the wrapping drum 25 to the pocket 31 of the wrapping drum 29. Obviously, in the transferring station S5 a pocket 27 of the wrapping drum 25 is aligned with a corresponding pocket 31 of the wrapping drum 29.

[0029] According to a possible embodiment shown in the attached figures, the wrapping unit 15 comprises a further feeding station S6 which is arranged along the periphery of the wrapping drum 25, is different and separated from the feeding station S3, and is arranged in an opposed position with respect to the feeding station S3 (i.e. the feeding station S6 is arranged along the periphery of the wrapping drum 25 at 180° with respect to the feeding station S3). In other words, the output station S2 is arranged along the wrapping path P3 between the feeding station S3 and the feeding station S6; the output station S2 is also arranged opposite (i.e. is arranged at 180°) to the transfer station S5 and the feeding station S3 is opposite (i.e. arranged at 180°) to the feeding station S6.

[0030] The feeding station S6 can be used in combination with the feeding station S3: in this case, the feeding station S3 feeds a first wrapping element (in particular,

the collar 11) to the pockets 27 of the wrapping drum 25 and the feeding station S6 (operating simultaneously to the feeding station S3) feeds a second wrapping element (in particular, a coupon) to the pockets 27 of the wrapping drum 25. Alternatively, the feeding station S6 can be used instead of (as a replacement for) the feeding station S3: in this case, only one of the feeding station S3 and the feeding station S6 operates to feed the same wrapping element (in particular, the collar 11); or one and the same wrapping element (in particular, the collar 11) can be fed to the pockets 27 of the wrapping drum 25 from the feeding station S3 or, alternatively, from the feeding station S6.

[0031] The presence of two distinct (mutually cooperating or alternative) feeding stations S3 and S6 at the wrapping drum 25 makes it possible for the feeding of the wrapping elements (in particular of the collar 11) to be very flexible so as to adapt with ease to all possible formats of packets of cigarettes which may be produced in the packing machine 12. For example, in the embodiment shown in the attached figures, the feeding station S3 is located upstream from the output station S2 (wherein inner wrappings 3 enter the pockets 27 of the wrapping drum 25) while the feeding station S6 is located downstream of the output station S2 (wherein inner wrappings 3 enter the pockets 27 of the wrapping drum 25): thus it is possible to choose whether to feed the collars 11 at the feeding station S3 (i.e. before inserting the inner wrappings 3 into the pockets 27 of the wrapping drum 25) or to feed the collars 11 at the feeding station S6 (i.e. after inserting the inner wrappings 3 into the pockets 27 of the wrapping drum 25); this choice is made so as to optimise the feeding operations and folding of the collars 11 as a function of the format (size and shape) of the collars 11 and the format (size and shape) of the wrappings 3. In other words, during an operation to change the format (i.e. an operation to change the type of packet of cigarettes which is being made) it is possible to choose whether to feed collars 11 in the feeding station S3 or in the feeding station S6 to optimise the operations of the packing machine 12 with respect to the new format.

[0032] According to a preferred embodiment, each drum 17, 25 and 29 of the packing machine 12 is provided with its own independent motor drive (i.e. its own electric motor, separate and independent from the other electric motors); in this way, during an operation to change the format (i.e. an operation to change the type of the packet of cigarettes which is being made) it is possible to choose the optimum direction of rotation of the wrapping drum 25 with respect to the new format, i.e. it is possible to choose whether to rotate the wrapping drum 25 in an anti-clockwise direction (as shown in the attached figures, in which the feeding station S3 is located upstream from the output station S2 and the feeding station S6 is located downstream of the output station) or in a clockwise direction (in which the feeding station S3 is located downstream of the output station S2 and the feeding station S6 is located upstream from the output station S2). In other words, when the packing machine 12 is at a standstill, the direction of rotation of the wrapping drum 25 can be reversed so as to alternatively arrange the feeding station S3 upstream of the output station S2 and the feeding station S6 downstream of the output station S2 or the feeding station S3 downstream of the output station S2 and the feeding station S6 upstream of the output station S2. Obviously, during an operation to change the format (i.e. an operation to change the type of packet of cigarettes which is being made) it is possible to choose the direction of rotation of the wrapping drum 25 to optimise the operations of the packing machine 12 with respect to the new format.

[0033] It is important to note that the orientation drum 17 (i.e. the orientation path P1 and consequently the rotation axis 18) is arranged obliquely (i.e. is neither parallel nor perpendicular) both with respect to the wrapping path P2 that ends at the input station S1 of the orientation drum 17, and with respect to the wrapping path P3 that begins at the output station S2 of the orientation drum 17.

[0034] According to a possible embodiment, the orientation drum 17 may also be used to perform the optical inspection of the inner wrappings 3 and subsequent disposal of defective inner wrappings 3. According to a preferred embodiment, an optical inspection device is arranged upstream from the output station S2 and in the vicinity of the periphery of the orientation drum 17, which performs an optical inspection of each inner wrapping 3 which passes in front of the optical inspection device, while an extraction device is arranged downstream of the output station S2 which extracts (discards) defective inner wrappings 3 which have passed through to the output station S2 from the corresponding pockets 19 of the orientation drum 17; a collector for defective inner wrappings 3 is arranged below the extraction device to receive the defective inner wrappings which fall by gravity from the orientation drum 17. In use, when the optical inspection device detects the presence of a defective internal wrapping 3, the optical inspection device drives a transfer device that is arranged in the output station S2 to stop defective inner wrapping 3 advancing towards the wrapping drum 25; consequently, the defective inner wrapping 3 passes beyond the output station S2 and arrives at the extraction device which extracts (discards) defective inner wrappings 3 from the corresponding pockets 19 of the orientation drum 17.

[0035] In the embodiment shown in figures 12-17, the inner wrapping 3 enters the corresponding pockets 19 of the orientation drum 17 in the input station S1, entering from the front (i.e. travelling towards the inside of the packing machine 12, i.e. closer to the frame of the packing machine 12 arranged behind the orientation drum 17). According to an alternative and perfectly equivalent embodiment not shown, the inner wrapping 3 enters the corresponding pockets 19 of the orientation drum 17 in the input station S1, entering from the back (i.e. travelling towards the outside of the packing machine 12, i.e. further from the frame of the packing machine 12 arranged be-

hind the orientation drum 17); this embodiment has a lower accessibility to the pusher of the input station S 1 (in as much as the pusher is "hidden" behind the orientation drum 17) but has the advantage of being better for the folding sequence of the wrap 9 that constitutes the inner wrapping 3 (i.e. better preserves the folds of the wrap 9).

[0036] It is important to note that it is possible to perform both the folding operations on the collar 11 and the gumming operations (i.e. glue deposition) on the collar 11 in the wrapping drum 25; in other words, while a collar 11 is advanced by a pocket 27 of the wrapping drum 25 along the wrapping path P3, the collar 11 may be subjected both to bending operations and to gumming operations.

[0037] In the variant shown in figures 18-21, the wrapping unit 15 of the packing machine 12 is devoid of the wrapping drum 25 and thus the orientation drum 17 is directly coupled to the wrapping drum 29, i.e. the inner wrappings 3 coupled to the corresponding collars 11 are transferred directly from the pockets 19 of the orientation drum 17 to the pockets 31 of the wrapping drum 29 at the output station S2. In this embodiment, the orientation drum 17 is larger because in addition to receiving the inner wrappings 3 it must also receive the collars 11 at the feeding station S3 (now coupled to the orientation drum 17 since the wrapping drum 25 is no longer present). Also in this embodiment, two feeding stations S3 and S6 may be provided, both coupled to the wrapping drum 29 and opposite each other; as stated above, as a function of the format of the packets of cigarettes to be produced, the two feeding stations S3 and S6 may be used either together or alternatively for feeding corresponding wrapping elements.

[0038] In substance, the only difference between the packing machine 12 shown in figures 12-17 and the packing machine 12 shown in figures 18-21 is the presence of the wrapping drum 25: in the packing machine 12 shown in figures 12-17 the wrapping drum 25 is present, arranged between the orientation drum 17 and the wrapping drum 29, and performs the function of receiving wrapping materials (hence the orientation drum 17 can be smaller, not having to receive packing materials), whereas in the packing machine 12 shown in figures 18-21 the wrapping drum 25 is not present and thus the orientation drum 17 must also receive the wrapping materials (and therefore is larger). In the packing machine 12 shown in figures 18-21 the feeding of the wrapping elements (in particular of the collars 11) at the feeding stations S3 and S6 is more complex in that the wrapping elements (in particular the collars 11) must be fed to the pockets 19 of the orientation drum 17 that is arranged obliquely with respect to all the other components of the packing machine 12.

[0039] In the variant shown in figures 26-31, the packing machine 12 is suitable to produce the packet 1 of cigarettes shown in figures 22 and 23 which has a different type of outer container 2 called a "*zippo*". A blank 10 with longitudinal extension (shown in figure 10) and a small traditional collar 11 (shown in figure 11) are used to produce the traditional outer container 2 shown in figures 1 and 2; a blank 33 with transverse extension (shown in figure 24) and a large extended collar 34 (shown in figure 25) are instead used for making the "*zippo*" outer container 2 shown in figures 22 and 23.

[0040] In the variant of the packing machine 12 shown in figures 26-31, the orientation of the pockets 27 of the wrapping drum 25 and of the pockets 31 of the wrapping drum 29 are changed, being rotated by 90° with respect to the corresponding pockets 27 of the drum 25 and the pockets 31 of the wrapping drum 29 in the embodiment shown in figures 12-21; this modification makes it possible not to rotate the entire wrapping drum 29 which may remain in the same position (obviously it is necessary to replace the pockets 31 of the wrapping drum 29 and the folding devices associated with the wrapping drum 29, but the position of the wrapping drum 29 remains unchanged). In other words, the blank 10 has a longitudinal extension while the blank 33 has a transverse extension (i.e. the blanks 10 and 33 have extensions which are perpendicular to each other), thus the inner wrapping 3 (containing a group 4 of cigarettes) must be rotated by 90° at the entrance to the wrapping drum 29 (i.e. at the transfer station S5) to be able to bend both the blanks 10 and 33 in the same type of wrapping drum 29 (i.e. without changing the position and orientation of the wrapping drum 29). Obviously, the 90° rotation of the inner wrapping 3 (containing a group 4 of cigarettes) at the wrapping drums 25 and 29 involves a rotation of 90° of the inner wrapping 3 (containing a group 4 of cigarettes) at the outlet station S2 of the orientation unit 16 that is obtained by modifying the shape of the orientation drum 17 (always keeping in mind the fact that each pocket 19 is rigidly mounted on the orientation drum 17 and therefore does not itself perform any type of movement with respect to the orientation drum 17).

[0041] Consequently, in the variant of the packing machine 12 shown in figures 26-31, the shape of the orientation drum 17 is changed to change the orientation of the output plane B (the orientation of the input plane A is unchanged) as shown in figure 29; in particular, the orientation (i.e. the arrangement in space) of the pockets 19 of the orientation drum 17 with respect to the rotation axis 18 is changed. In other words, the orientation drum 17 of the embodiment shown in the figures 26-31 imparts a different orientation to the inner wrappings 3 with respect to the orientation drum 17 of the embodiment shown in the figures 12-21, as is immediately evident by comparing the orientations of the planes A and B shown in figures 14 and 29.

[0042] According to a further embodiment not shown, each pocket 19 in the orientation drum 17 is inclined, i.e. forms a non-right angle with respect to the orientation drum 17, i.e. with respect to the rotation axis 18, only about a single inclination axis arranged radially with respect to the orientation drum 17, i.e. with respect to the

rotation axis 18.

[0043] In the embodiments shown in the accompanying figures, the longitudinal and transverse edges of the outer container 2 are straight; alternatively, the longitudinal and transverse edges of the outer container 2 may be rounded or bevelled.

[0044] In the embodiments shown in the accompanying figures, the packet 1 of cigarettes contains a group 4 of cigarettes; alternatively, the packet 1 of cigarettes may contain any other type of tobacco articles such as cigars, electric or electronic cigarettes (i.e. cigarettes that generate an aerosol without combustion), cartridges or refills for electronic cigarettes, or next generation cigarettes.

[0045] The orientation unit 16 described above has numerous benefits.

[0046] First, the orientation unit 16 described above is extremely simple, light and economical since it comprises a single orientation drum 17 which is relatively small and above all free of moving parts (i.e. each pocket 19 is rigidly mounted on the orientation drum 17).

[0047] In addition, the orientation unit 16 described above makes it possible to perform relatively quick format changes, since it is easy and quick to remove the existing pockets 19 to fit new pockets 19 suitable for the new format; this operation of replacing the pockets 19 is easy and quick since the pockets 19 are rigidly mounted on the wrapping drum 17.

[0048] Thanks to the presence of the orientation unit 16 described above, the packing machine 12 has a straight shape (i.e. is devoid of 90° corners) in plan view, which allows an optimum accessibility to all parts of the packing machine 12; in other words, the presence of the orientation unit 16 described above avoids the possibility of the packing machine 12 presenting an "L" shape or a "C" shape in plan view which would make accessibility to the various parts of the packing machine 12 difficult.

[0049] Finally, the orientation unit 16 described above also permits fast replacement of the existing orientation drum 17 with a new orientation drum 17 suitable for the new format (and, if necessary, capable of imparting a different type of orientation to the inner wrappings 3); it is important to note that the orientation drum 17 is extremely simple, light and economical since it has no moving parts and thus handling the orientation drum 17 is easy and preparing more orientation drums 17 for alternative uses does not entail high costs.

Claims

1. An orientation unit (16) for causing a change in orientation of a parallelepiped-shaped article (3) in a packing machine (12); the orientation unit (16) comprises:

   an input station (S1), where the article (3) is oriented according to an input plane (A);
   an output station (S2), where the article (3) is oriented according to an output plane (B) that is oriented differently from the input plane (A); and
   an orientation drum (17), which can rotate around a rotation axis (18) and supports at least one parallelepiped-shaped pocket (19), which is fed along an orientation path (P1) between the input station (S1), where it receives the article (3) oriented according to the input plane (A), and the output station (S2), where it releases the article (3) oriented according to the output plane (B);
   the orientation unit (16) is **characterised in that** the rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the input plane (A) and to the outlet plane (B) and/or the rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the walls of the pocket (19).

2. An orientation unit (16) according to claim 1, wherein the input plane (A) is perpendicular to the output plane (B).

3. An orientation unit (16) according to claim 1 or 2, wherein the pocket (19) is rigidly fitted on the orientation drum (17) and, therefore, it does not carry out any type of movement relative to the orientation drum (17).

4. An orientation unit (16) according to claim 1, 2 or 3, wherein a main wall of the pocket (19) is oblique, i.e. neither parallel nor perpendicular, relative to the rotation axis (18).

5. An orientation unit (16) according to any of the claims from 1 to 4, wherein a main wall of the pocket (19) forms a 45° angle relative to the rotation axis (18).

6. An orientation method for causing a change in orientation of a parallelepiped-shaped article (3) in a packing machine (12);
   the orientation method comprises the step of feeding the article (3) from an input station (S1), where the article (3) is oriented according to an input plane (A), to an output station (S2), where the article (3) is oriented according to an output plane (B) that is oriented differently from the input plane (A), inside a parallelepiped-shaped pocket (19) of an orientation drum (17), which can rotate around a rotation axis (18) to feed the pocket (19) along an orientation path (P1) between the input station (S1) and the output station (S2);
   the orientation method is **characterised in that** the rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the input plane (A) and to the outlet plane (B) and/or the rotation axis (18) of the orientation drum

(17) is oblique, i.e. neither parallel nor perpendicular, relative to the walls of the pocket (19).

7. A packing machine (12) for the production of a packet (1) of tobacco articles comprising an inner wrapping (3) containing a group (4) of tobacco articles and an outer container (2), which houses the inner wrapping (3); the packing machine (12) comprises:

a first wrapping unit (14), which wraps the inner wrapping (3) around the group (4) of tobacco articles by folding a wrap (7; 9);
a second wrapping unit (15), which creates the outer container (2) around the inner wrapping (3) by folding a blank (10; 33); and
an orientation unit (16), which receives the inner wrapping (3) from the first wrapping unit (14) in an input station (S1), where the article (3) is oriented according to an input plane (A), releases the inner wrapping (3) to the second wrapping unit (15) in an output station (S2), where the article (3) is oriented according to an output plane (B) that is oriented differently from the input plane (A), and comprises an orientation drum (17), which can rotate around a first rotation axis (18) and supports a first parallelepiped-shaped pocket (19), which is fed along an orientation path (P1) between the input station (S1) and the output station (S2);
the packing machine (12) is **characterised in that** the first rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the input plane (A) and to the outlet plane (B) and/or the first rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the walls of the first pocket (19).

8. A packing machine (12) according to claim 7, wherein the second wrapping unit (15) comprises:

a wrapping drum (25), which can rotate around a second rotation axis (26) and supports at least one second pocket (27), which is fed along a wrapping path (P3), receives the inner wrapping (3) from the first pocket (19) of the orientation drum (17) in the output station (S2), and releases the inner wrapping (3) in a transfer station (S5); and
a first feeding station (S3), which is arranged along the periphery of the wrapping drum (25) and feeds a first wrapping element to the second pocket (27).

9. A packing machine (12) according to claim 8, wherein the second wrapping unit (15) comprises a second feeding station (S6), which is arranged along the periphery of the wrapping drum (25), is different and separate from the first feeding station (S3), and feeds a second wrapping element to the second pocket (27) in combination with the first feeding station (S3) or feeds the first wrapping element to the second pocket (27) replacing the first feeding station (S3).

10. A packing machine (12) according to claim 9, wherein the output station (S2) is arranged along the wrapping path (P3) between the first feeding station (S3) and the second feeding station (S6).

11. A packing machine (12) according to claim 9 or 10, wherein the output station (S2) is arranged at 180° relative to the transfer station (S5) and the first feeding station (S3) is arranged at 180° relative to the second feeding station (S6).

12. A packing machine (12) according to claim 9, 10 or 11, wherein, when the packing machine (12) is at a standstill, the direction of rotation of the wrapping drum (25) can be reversed so as to alternatively arrange the first feeding station (S3) upstream of the output station (S2) and the second feeding station (S6) downstream of the output station (S2) or the first feeding station (S3) downstream of the output station (S2) and the second feeding station (S6) upstream of the output station (S2).

13. A packing machine (12) according to claim 7 and comprising at least one first feeding station (S3), which is arranged along the periphery of the orientation drum (17) and feeds a wrapping element to the first pocket (19).

14. A wrapping method for the production of a packet (1) of tobacco articles comprising an inner wrapping (3) containing a group (4) of tobacco articles and an outer container (2), which houses the inner wrapping (3); the wrapping method comprises the steps of:

wrapping the inner wrapping (3) around the group (4) of tobacco articles in a first wrapping unit (14) by folding a wrap (7; 9);
creating the outer container (2) around the inner wrapping (3) in a second wrapping unit (15) by folding a blank (10; 33); and
feeding the inner wrapping (4) from the first wrapping unit (14) to the second wrapping unit (15) by means of an orientation unit (16), which receives the inner wrapping (3) from the first wrapping unit (14) in an input station (S1), where the article (3) is oriented according to an input plane (A), releases the inner wrapping (3) to the second wrapping unit (15) in an output station (S2), where the article (3) is oriented according to an output plane (B) that is oriented differently from the input plane (A), and comprises an orientation drum (17), which can rotate around a

rotation axis (18) and supports a first parallelepiped-shaped pocket (19), which is fed along an orientation path (P1) between the input station (S1) and the output station (S2);
the wrapping method is **characterised in that** the rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the input plane (A) and to the outlet plane (B) and/or the rotation axis (18) of the orientation drum (17) is oblique, i.e. neither parallel nor perpendicular, relative to the walls of the pocket (19).

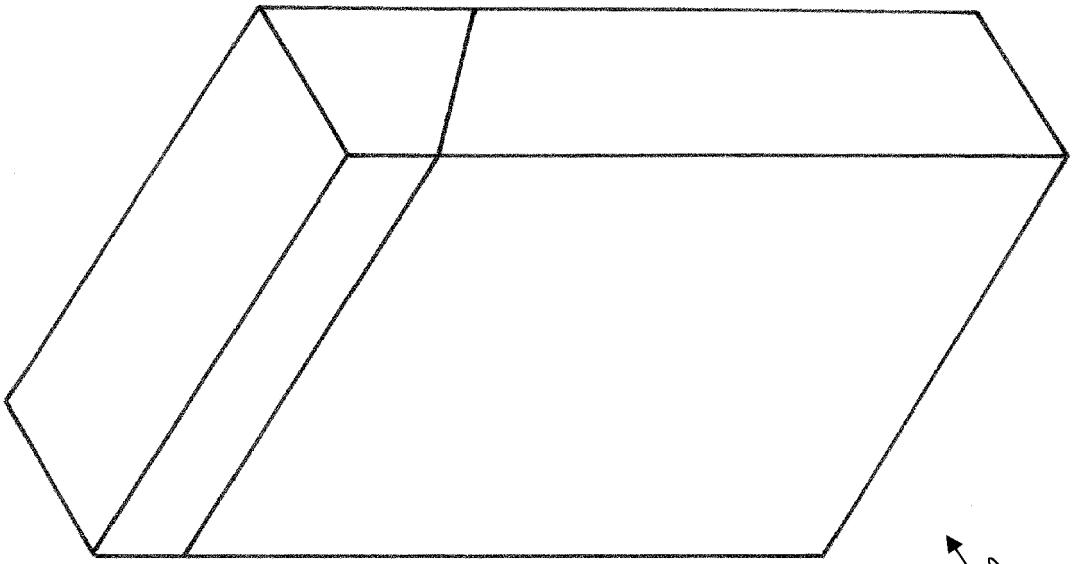


Fig.2

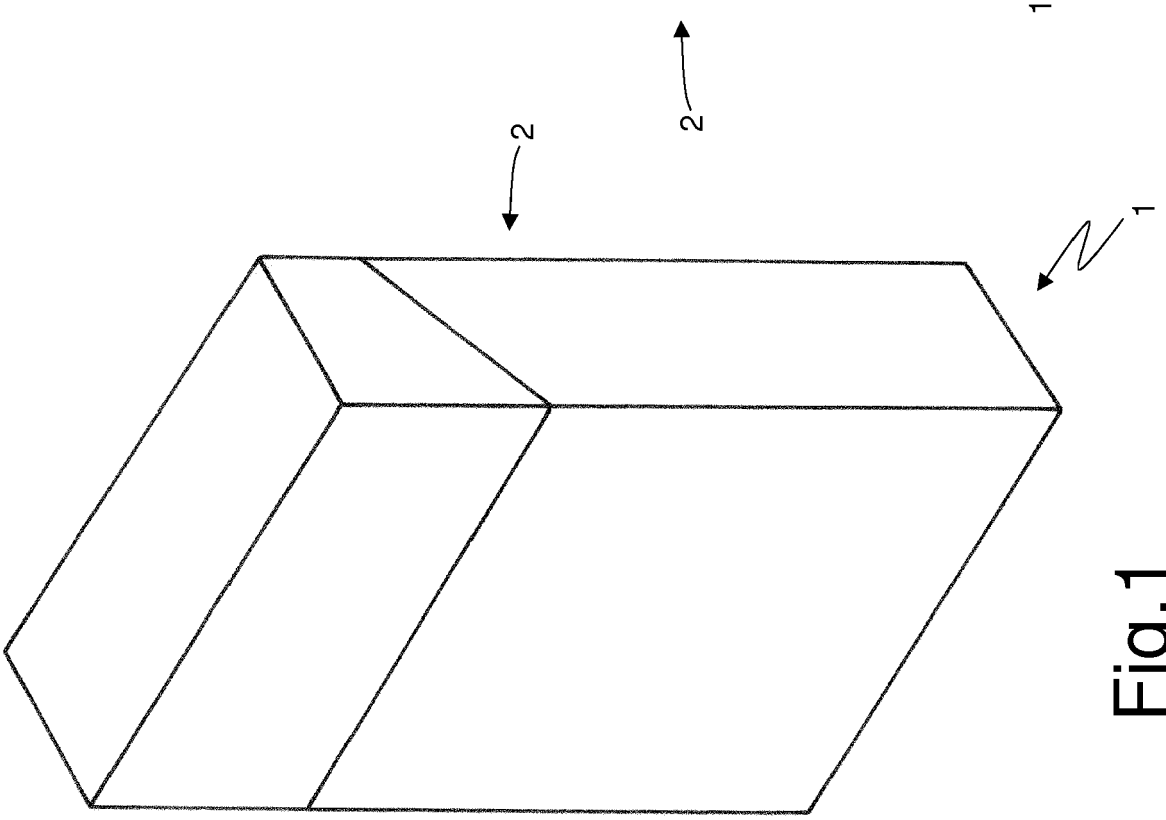


Fig.1

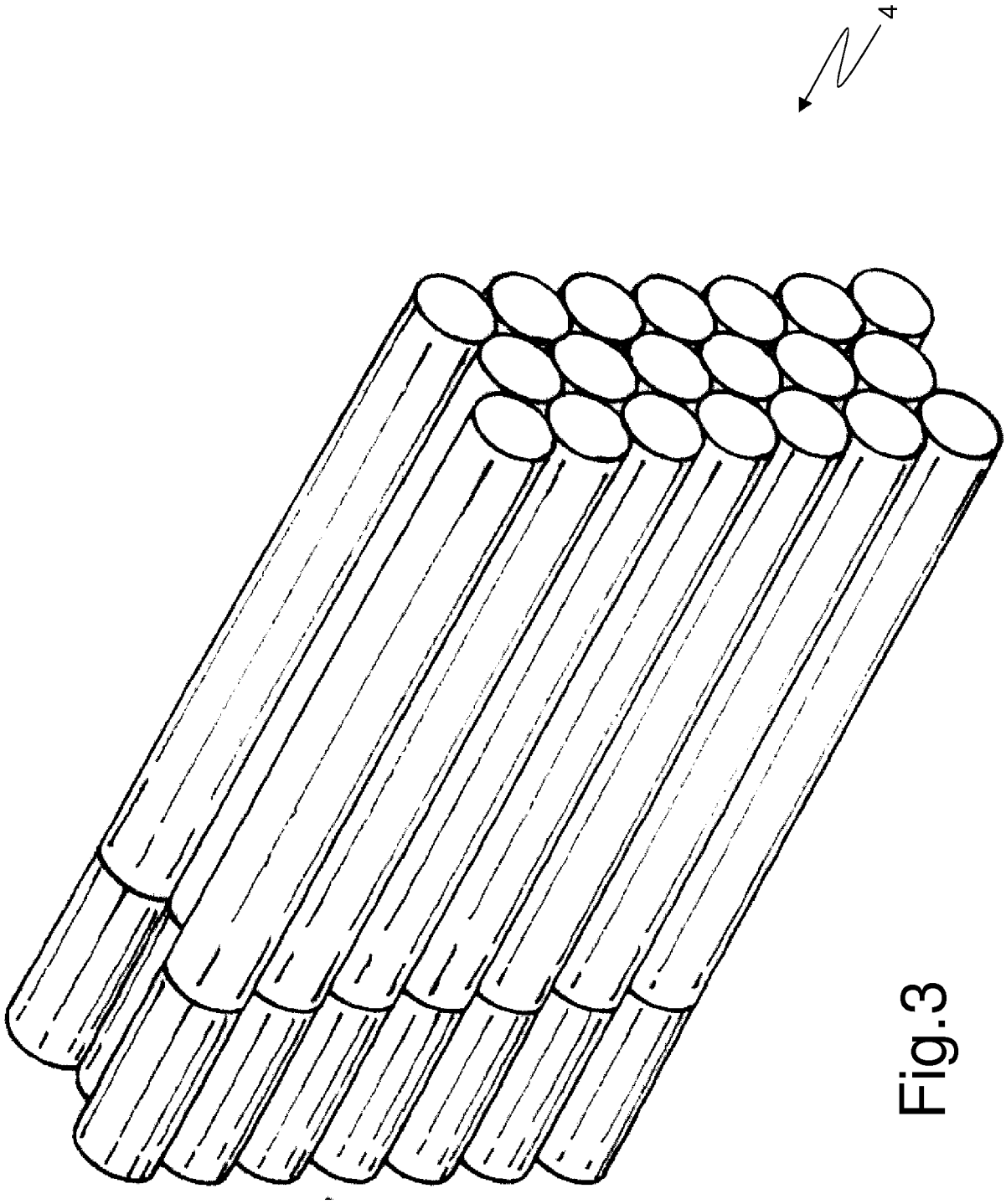


Fig.3

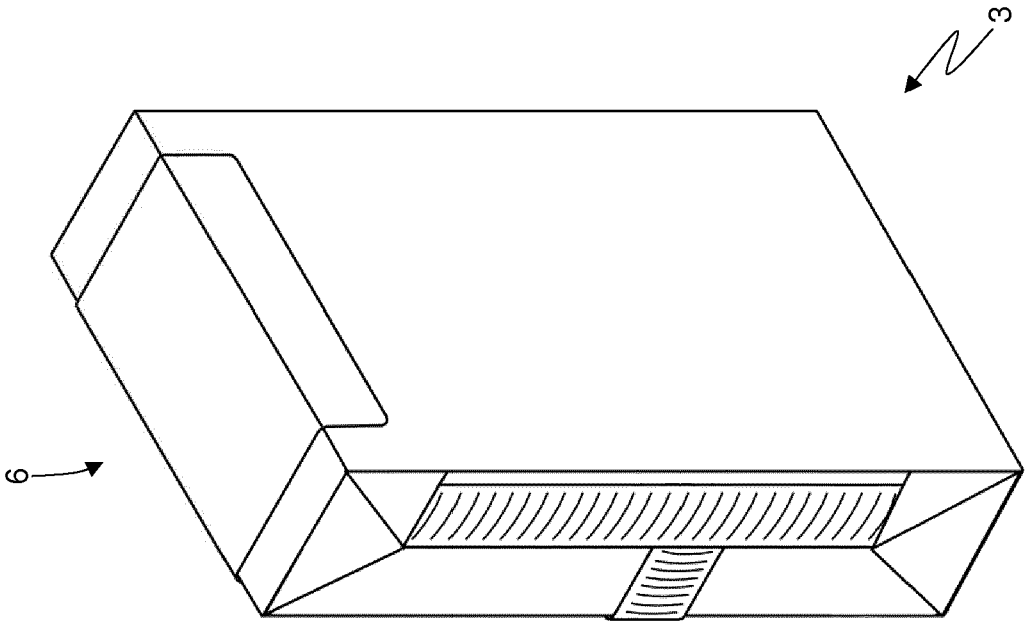


Fig.5

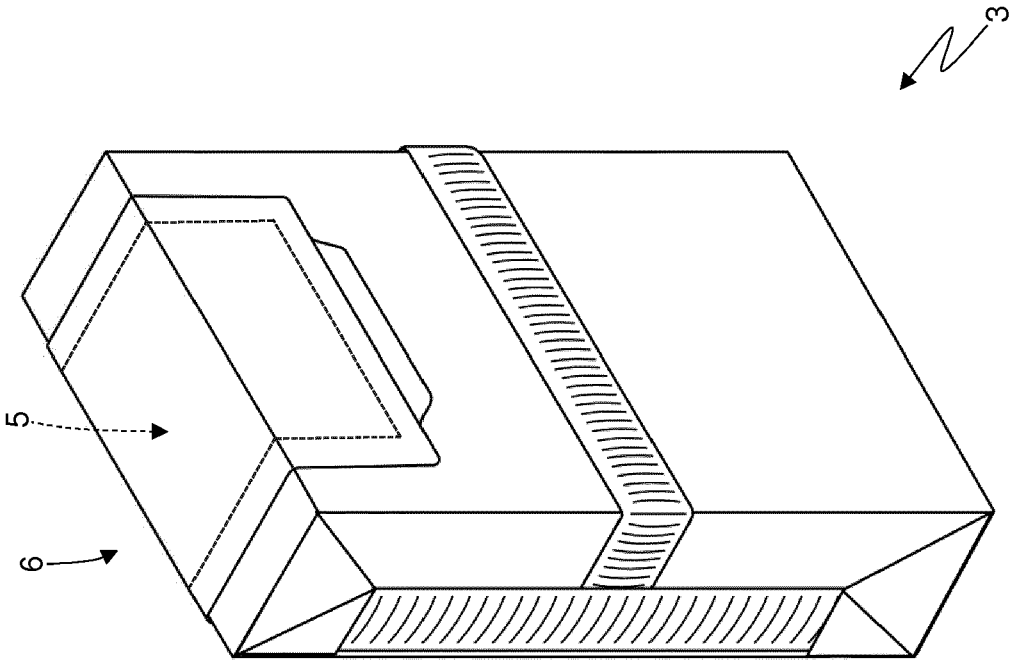


Fig.4

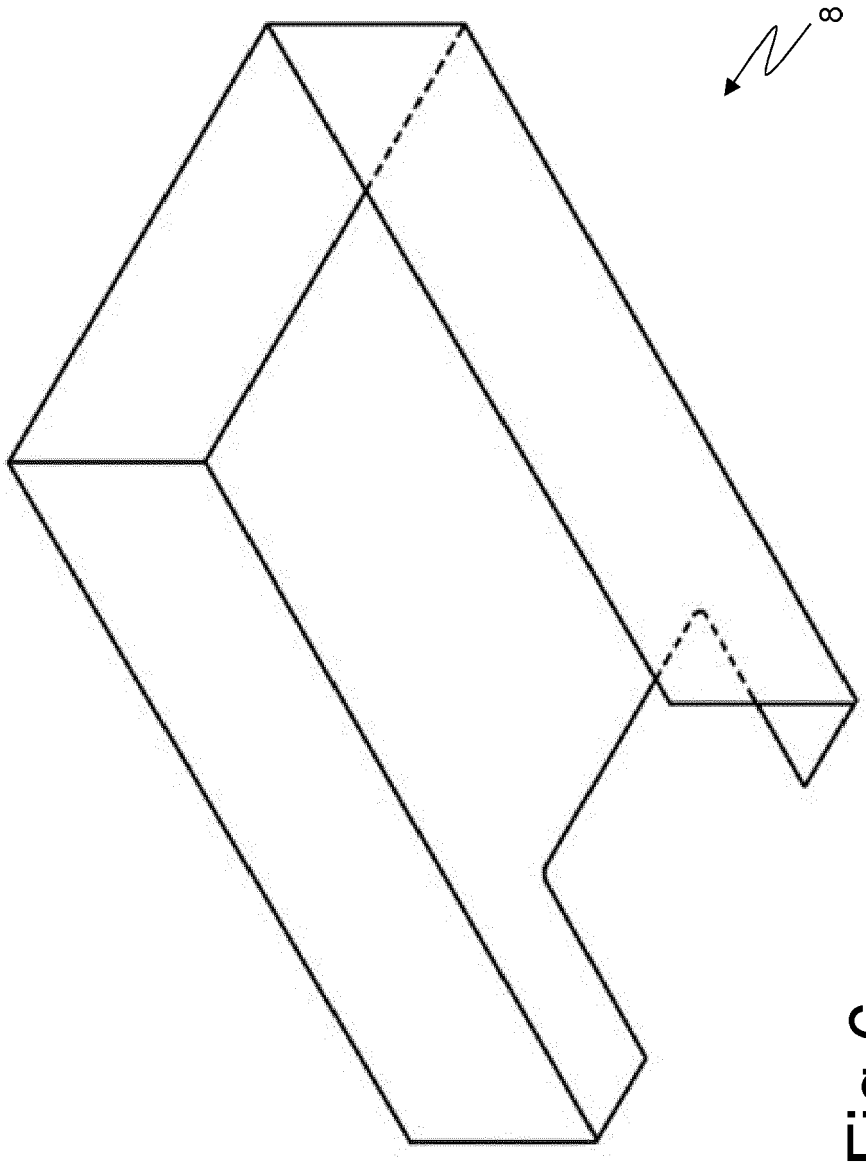


Fig.6

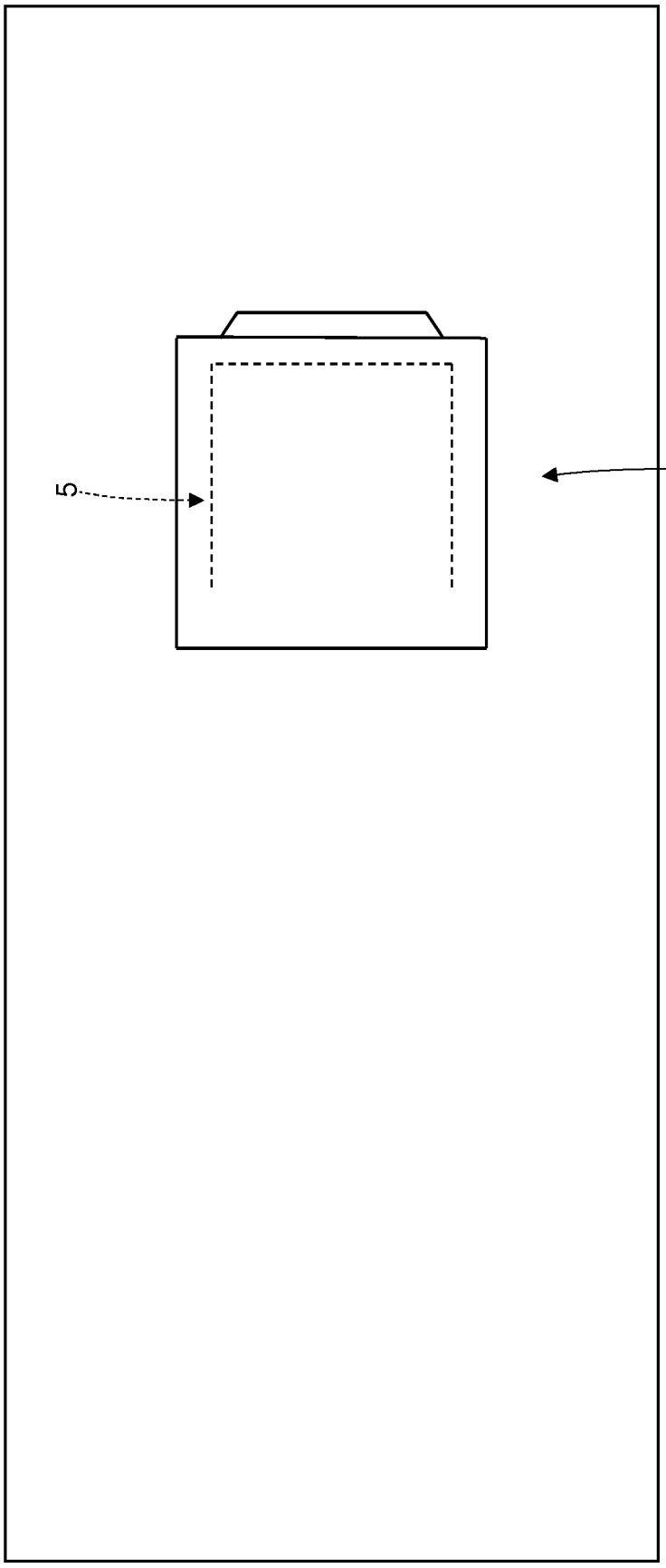


Fig.7

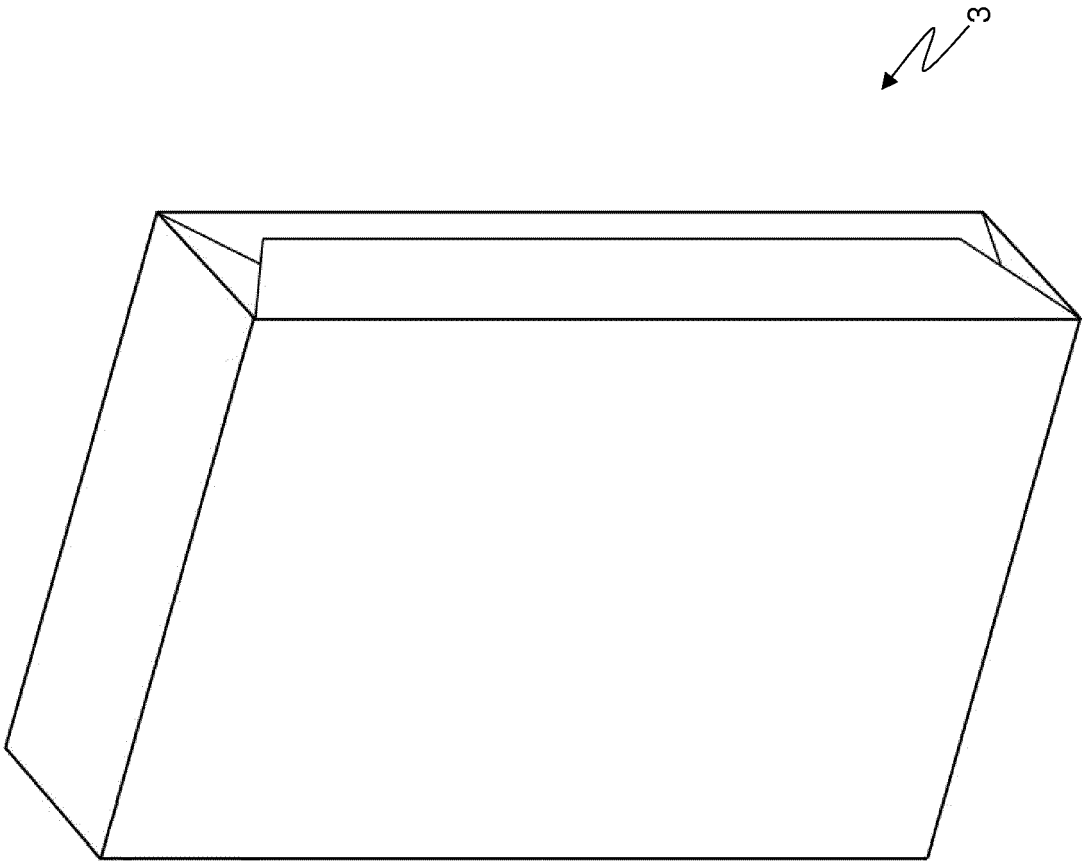


Fig.8

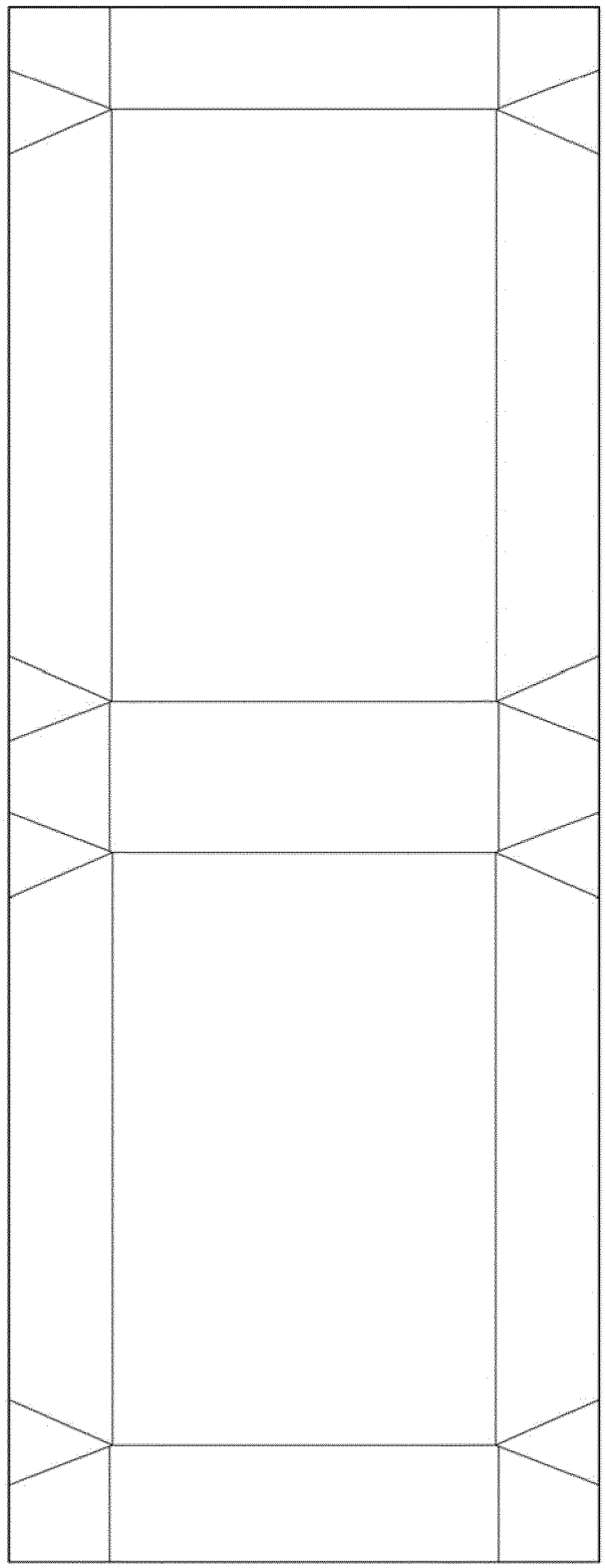


Fig.9

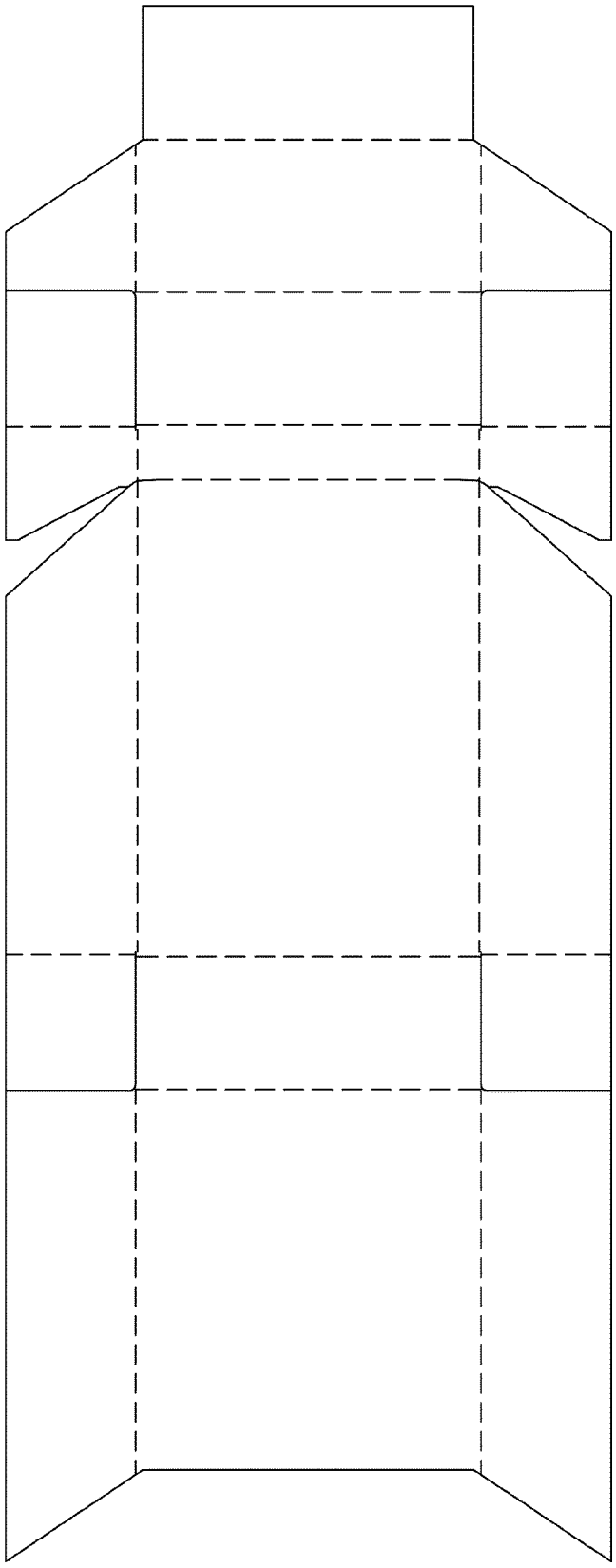


Fig.10

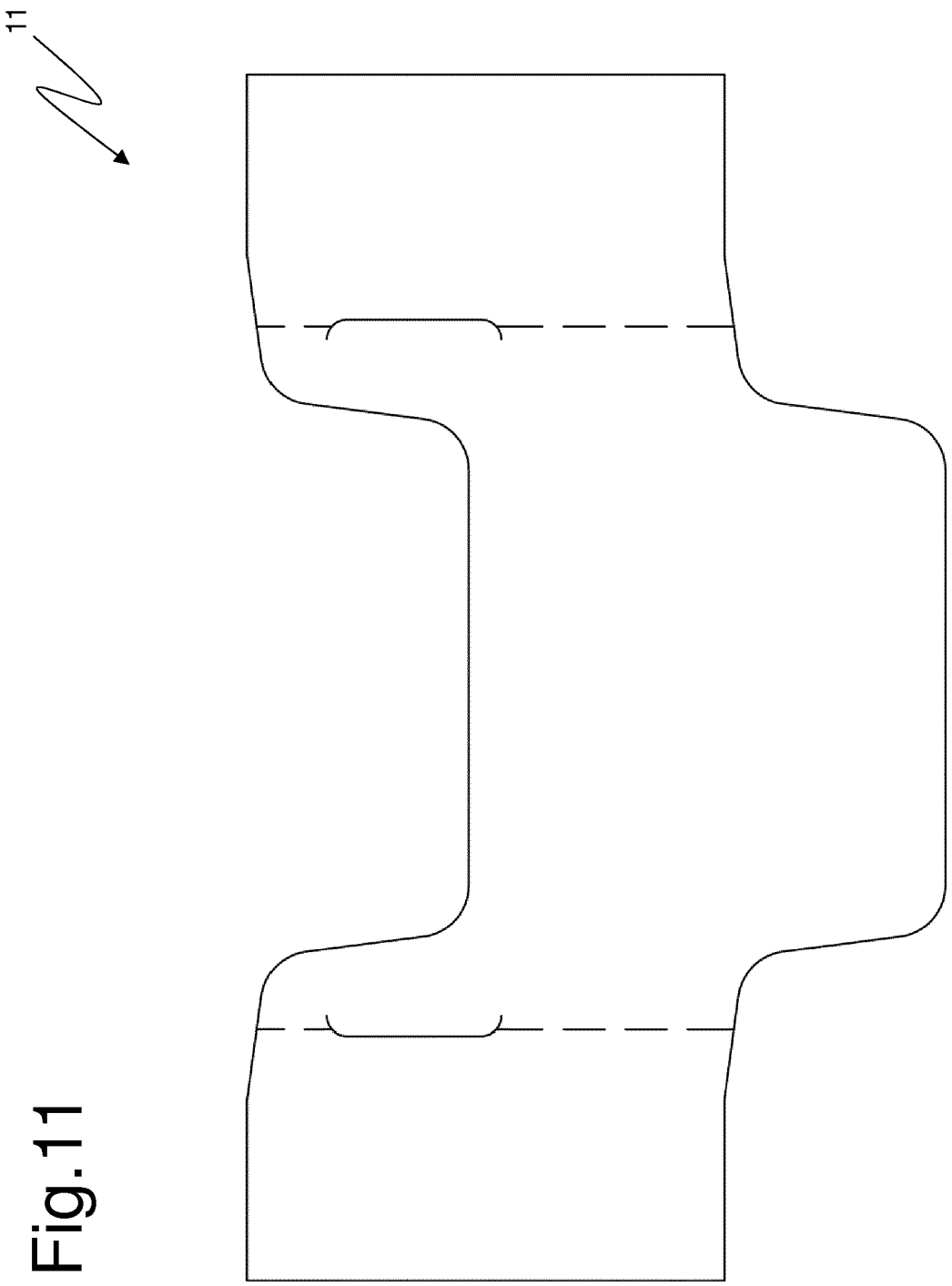


Fig.11

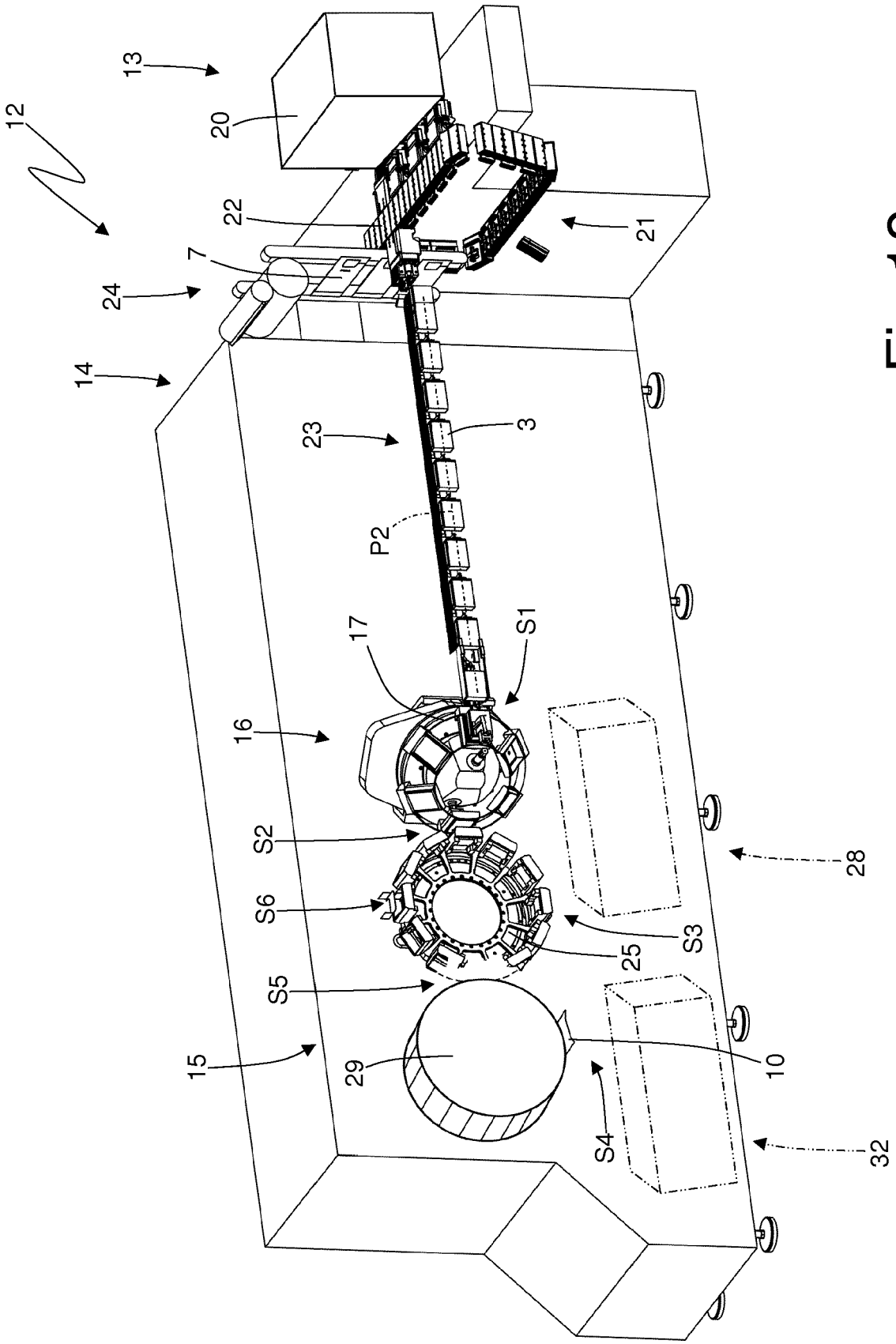


Fig.12

Fig.13

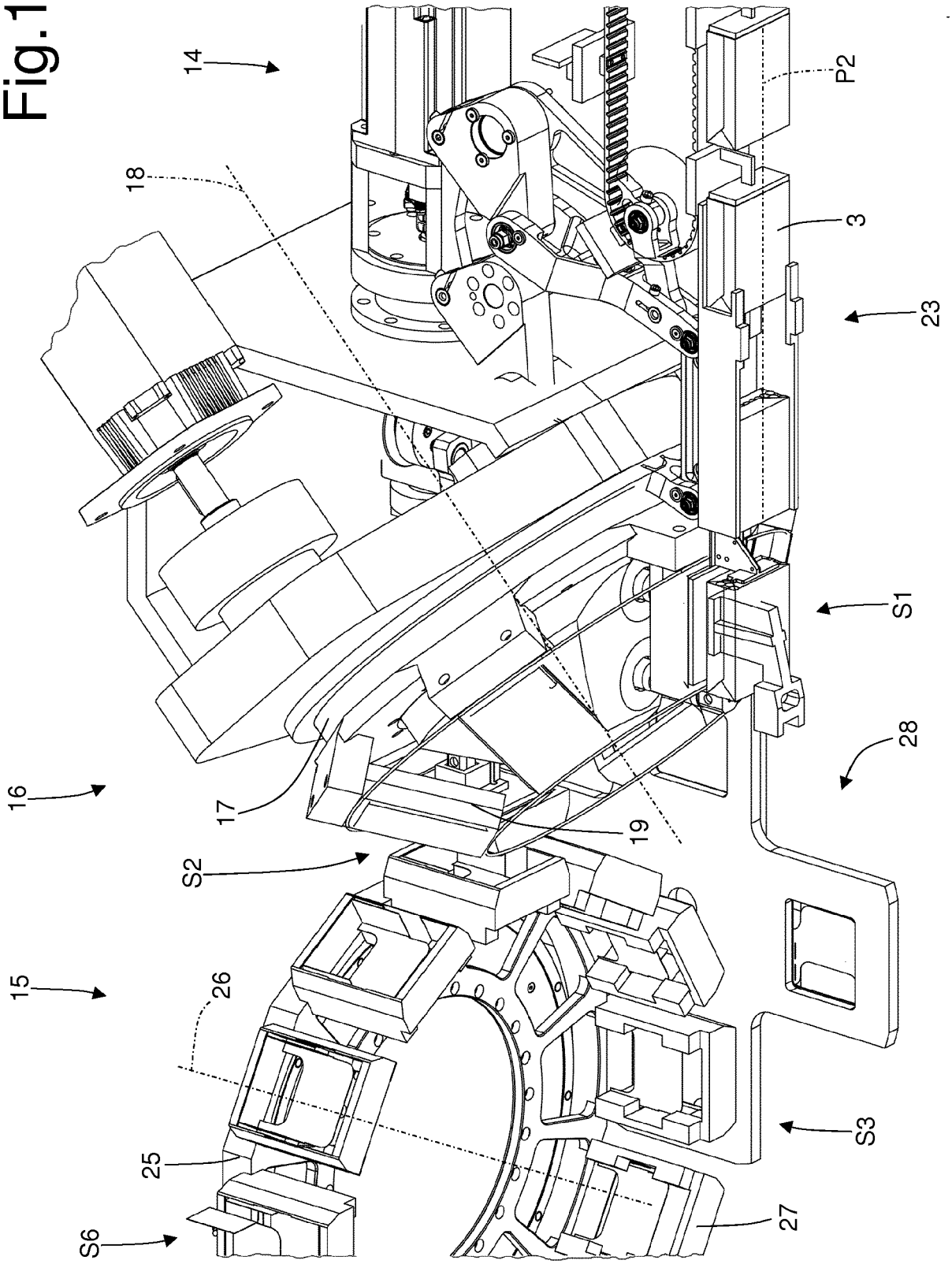
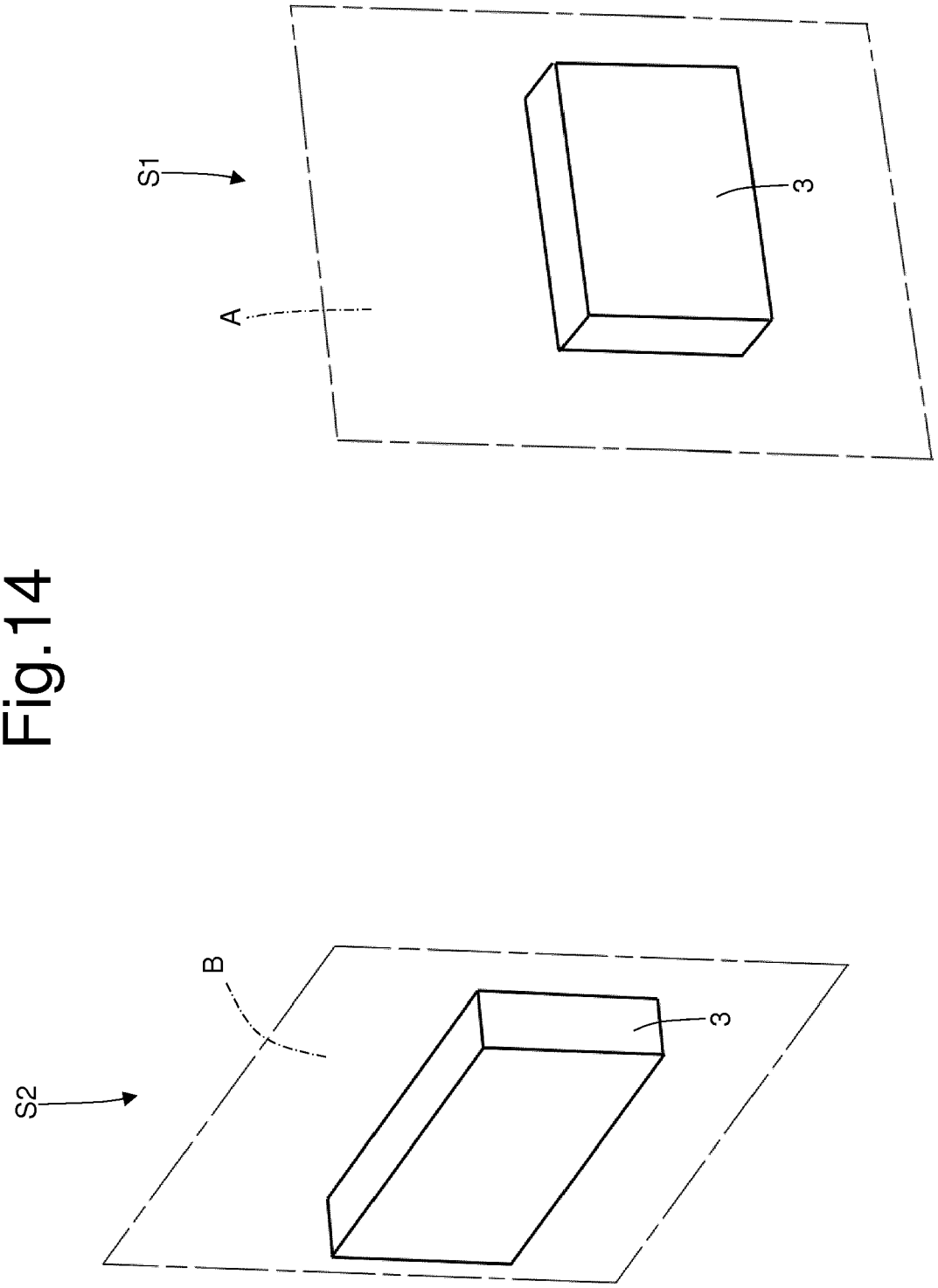


Fig.14



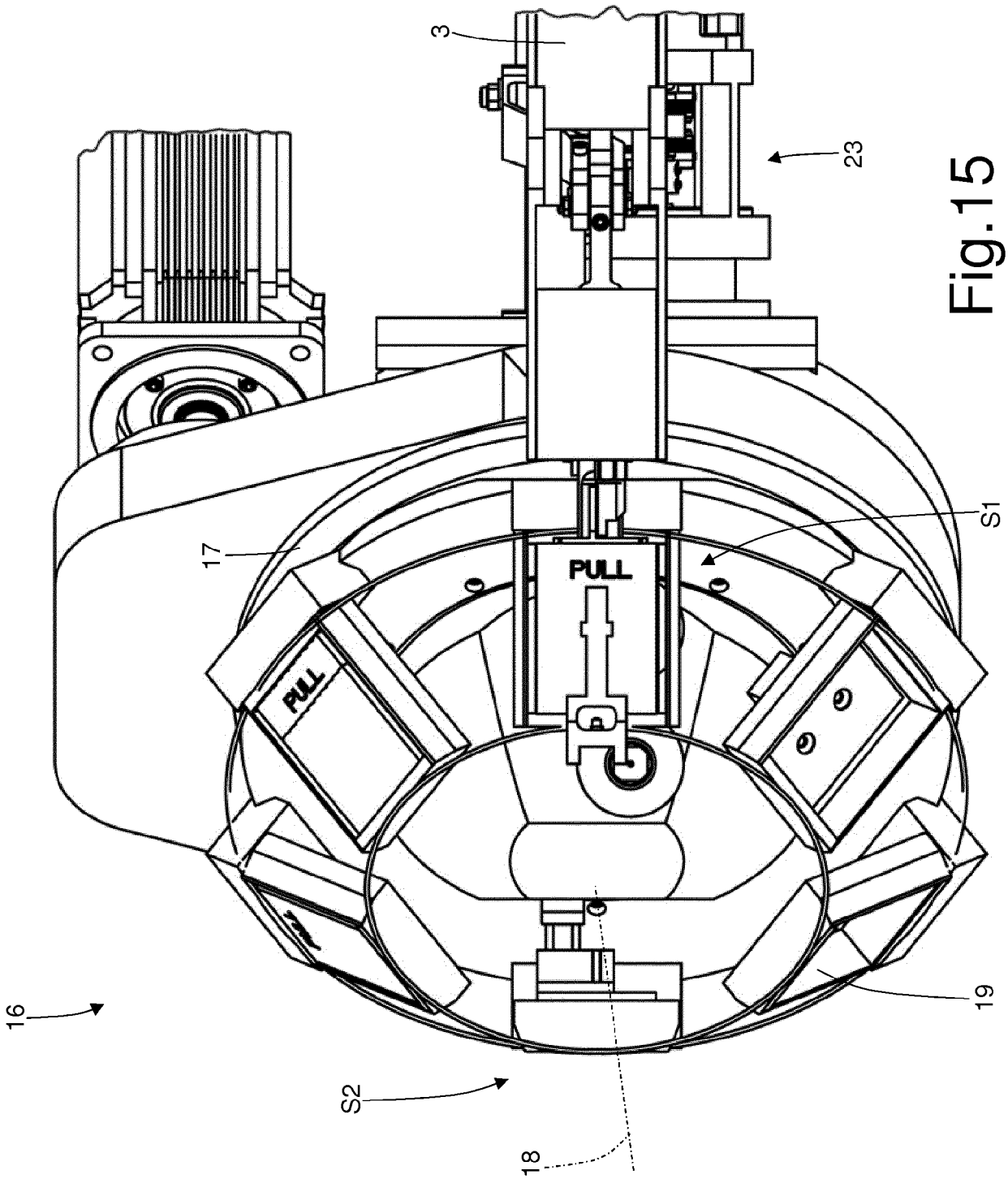


Fig.15

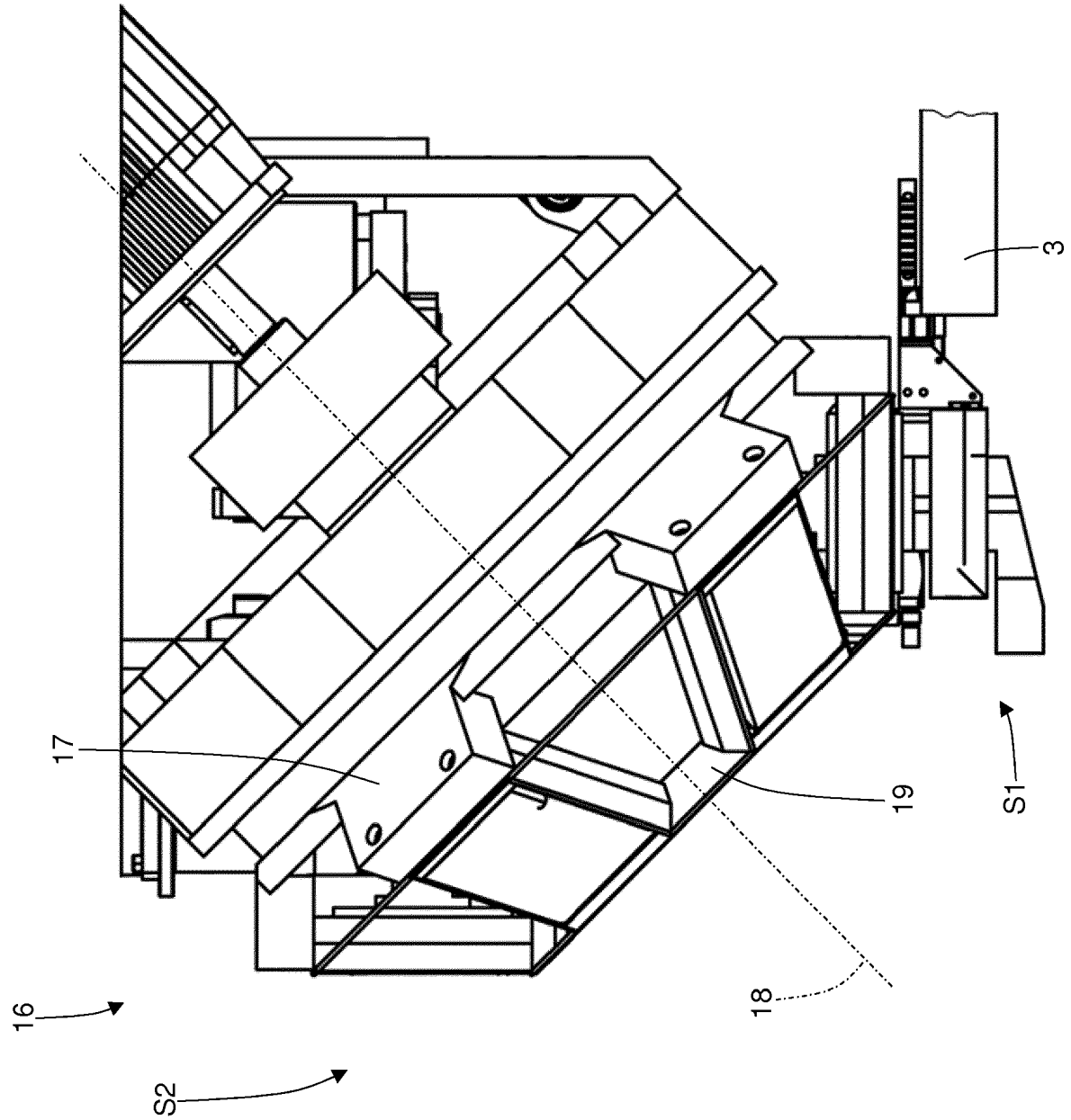


Fig.16

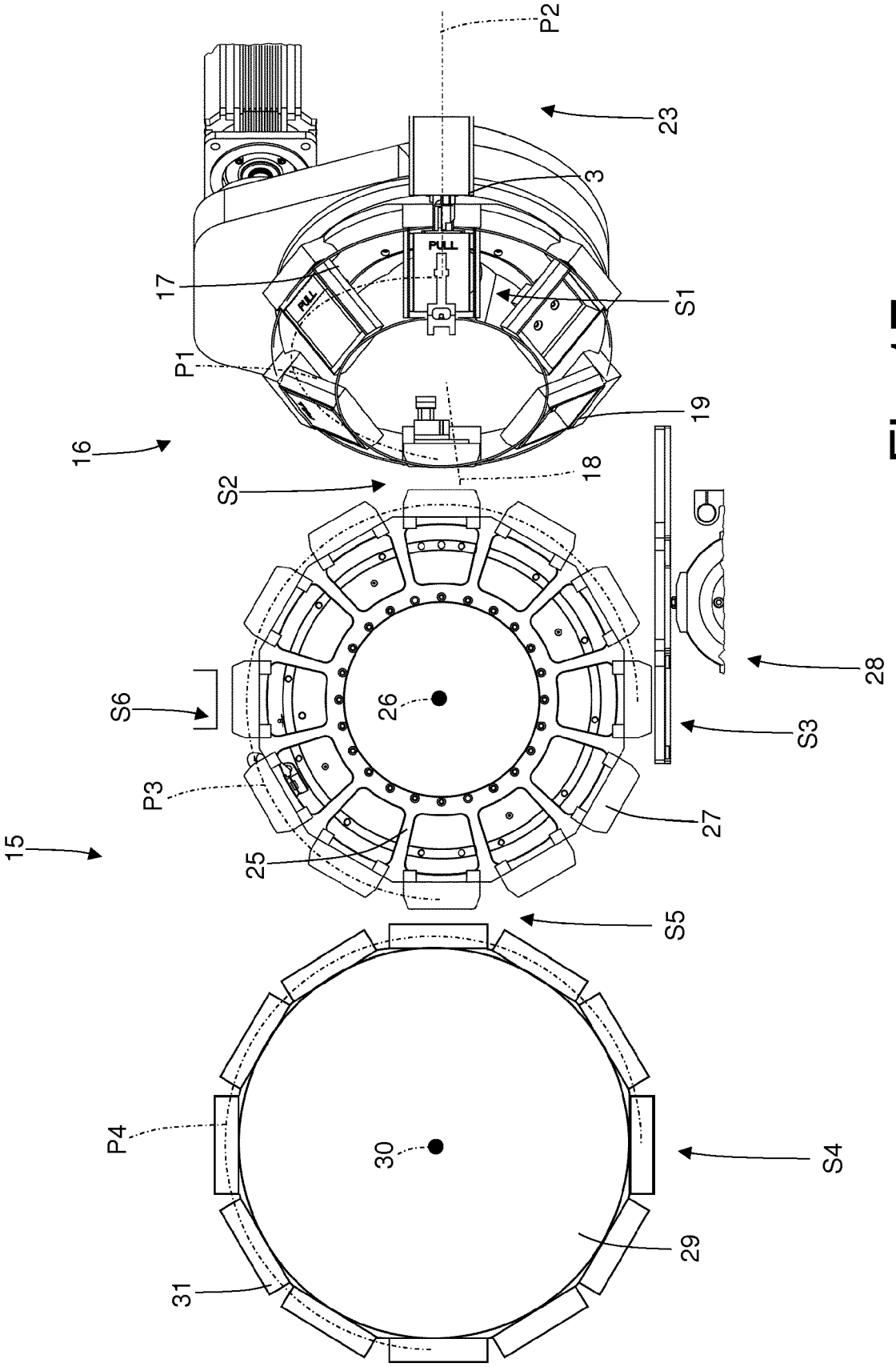
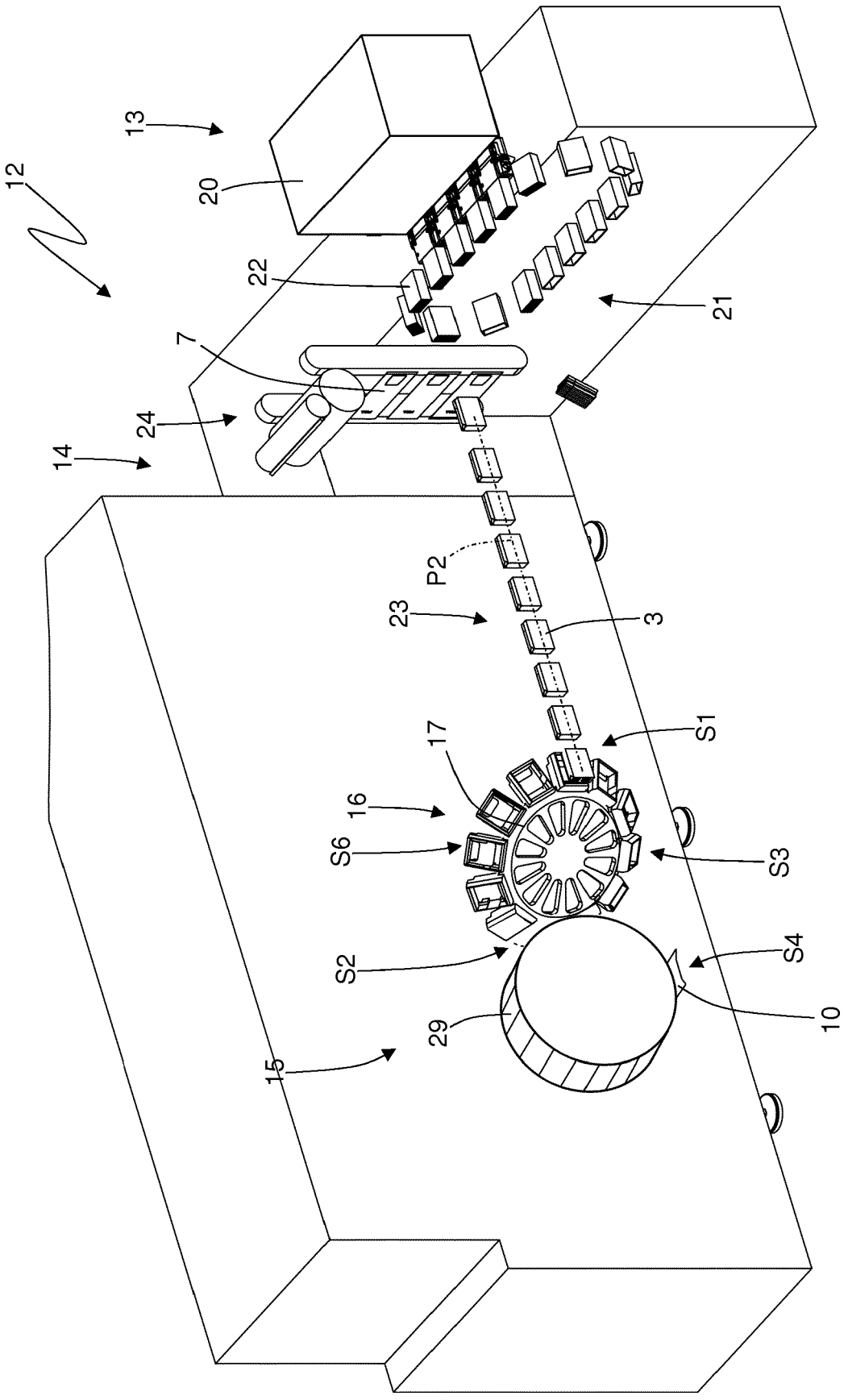


Fig.17

Fig.18



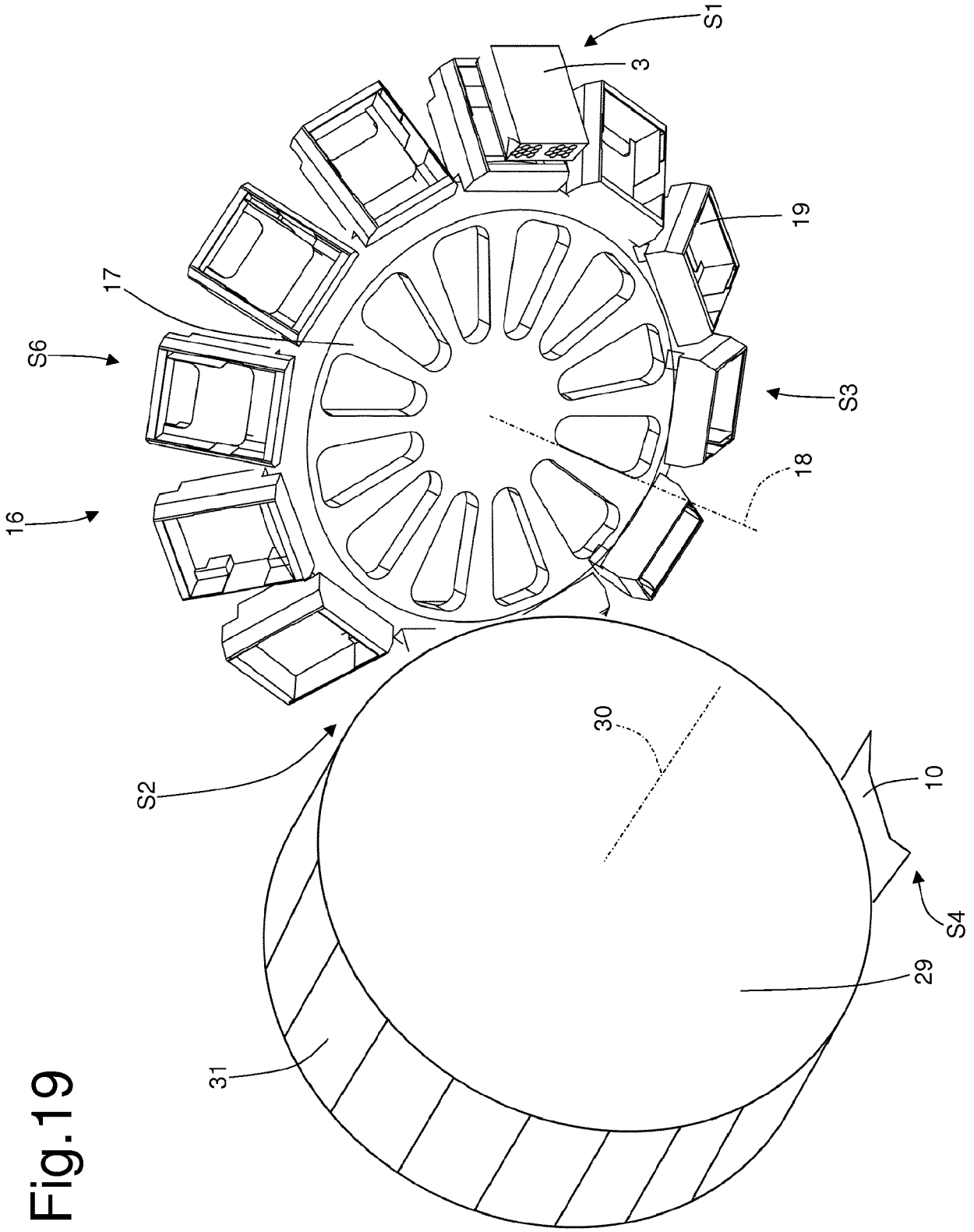


Fig.19

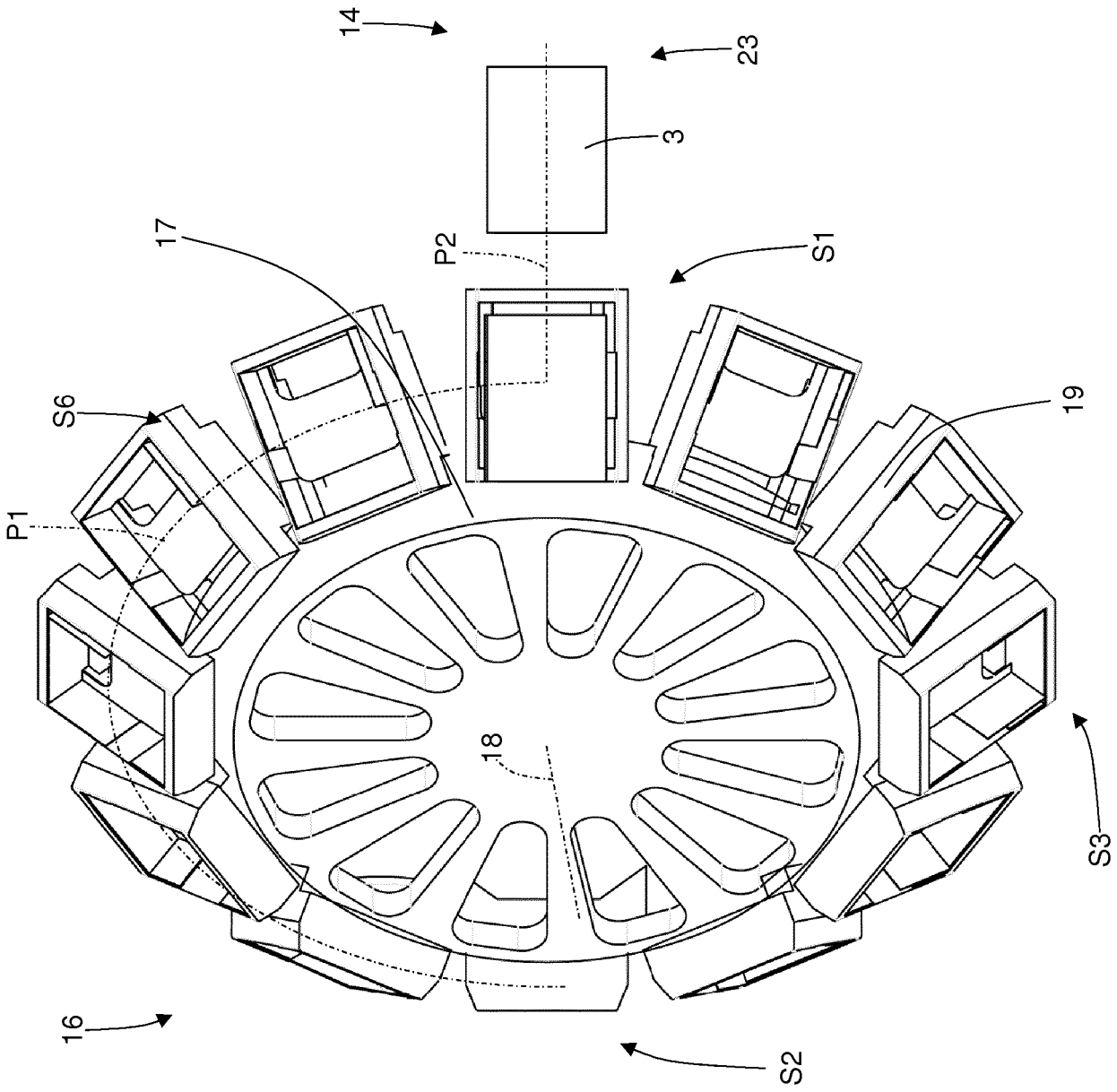


Fig.20

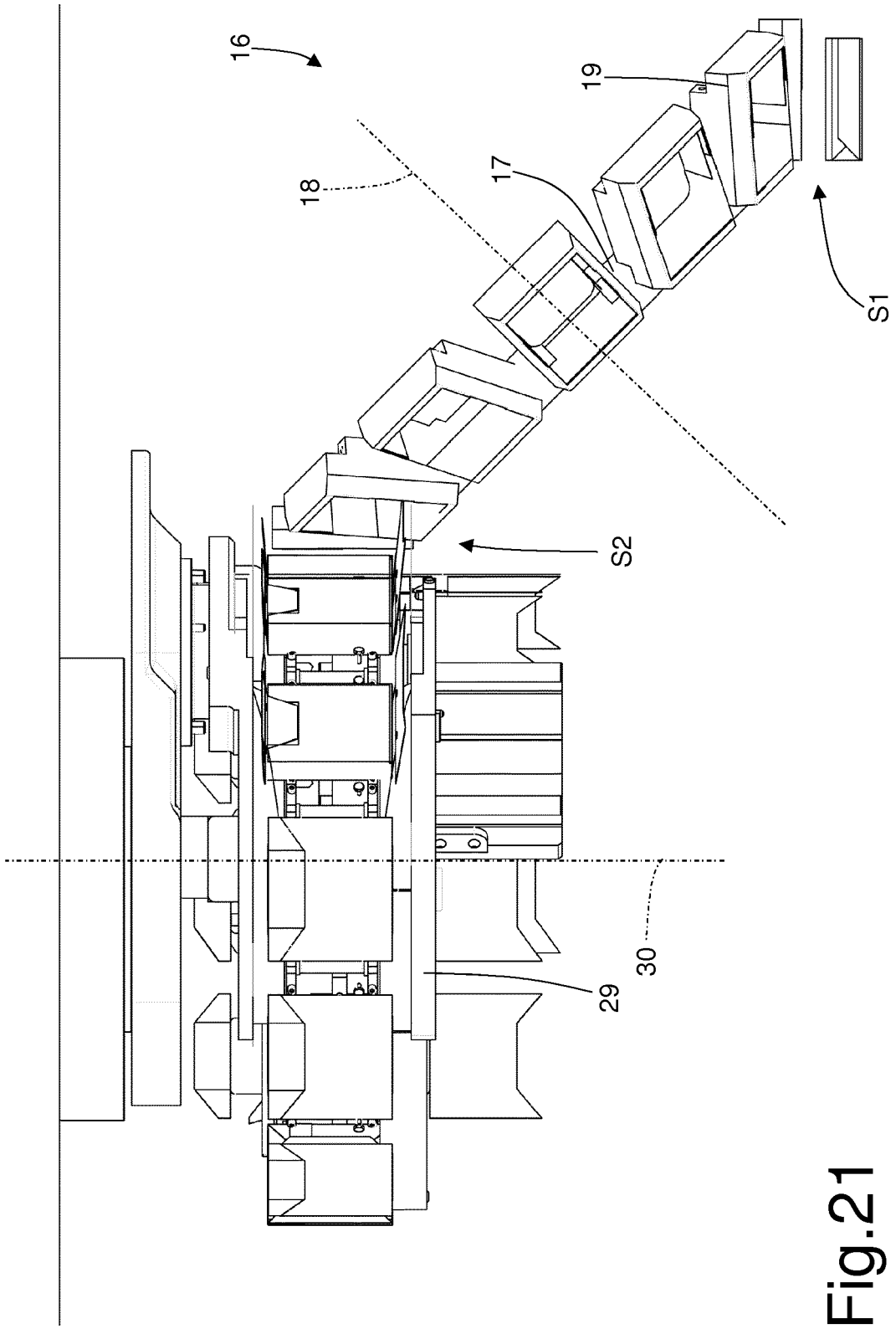


Fig.21

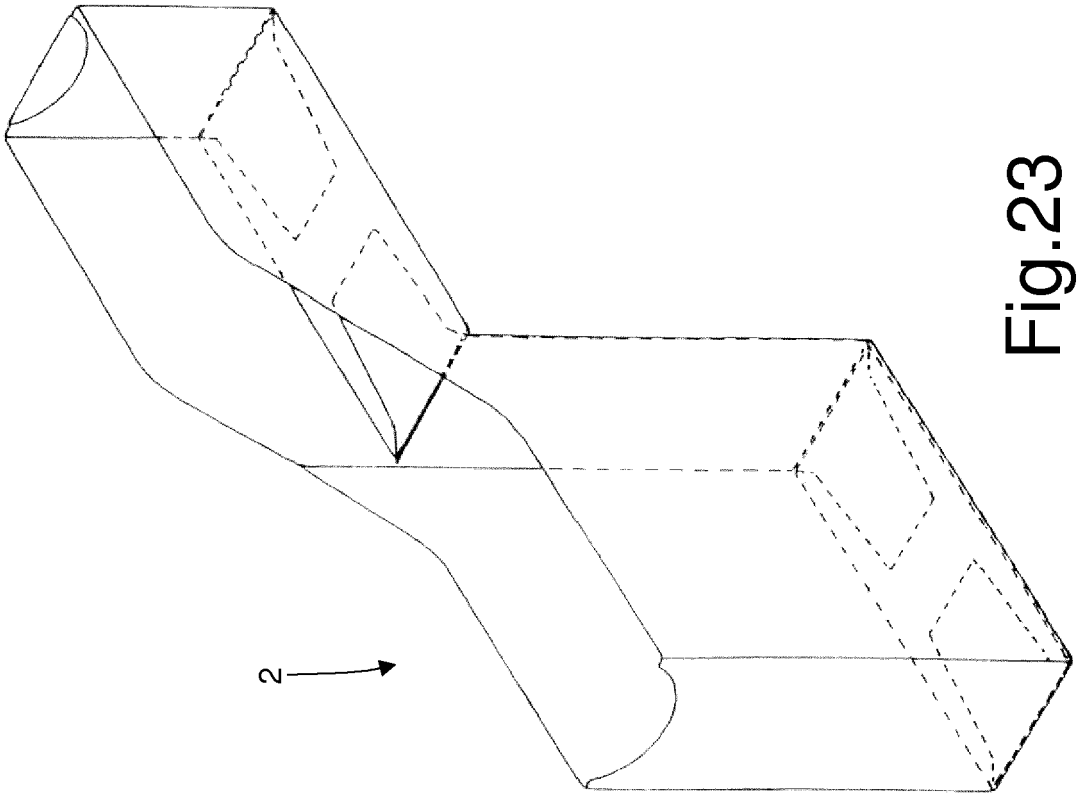


Fig.23

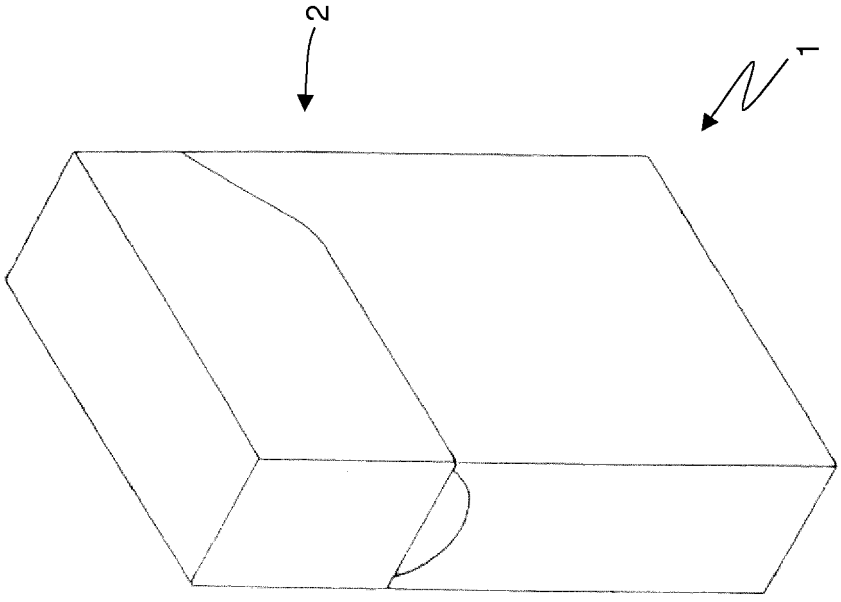
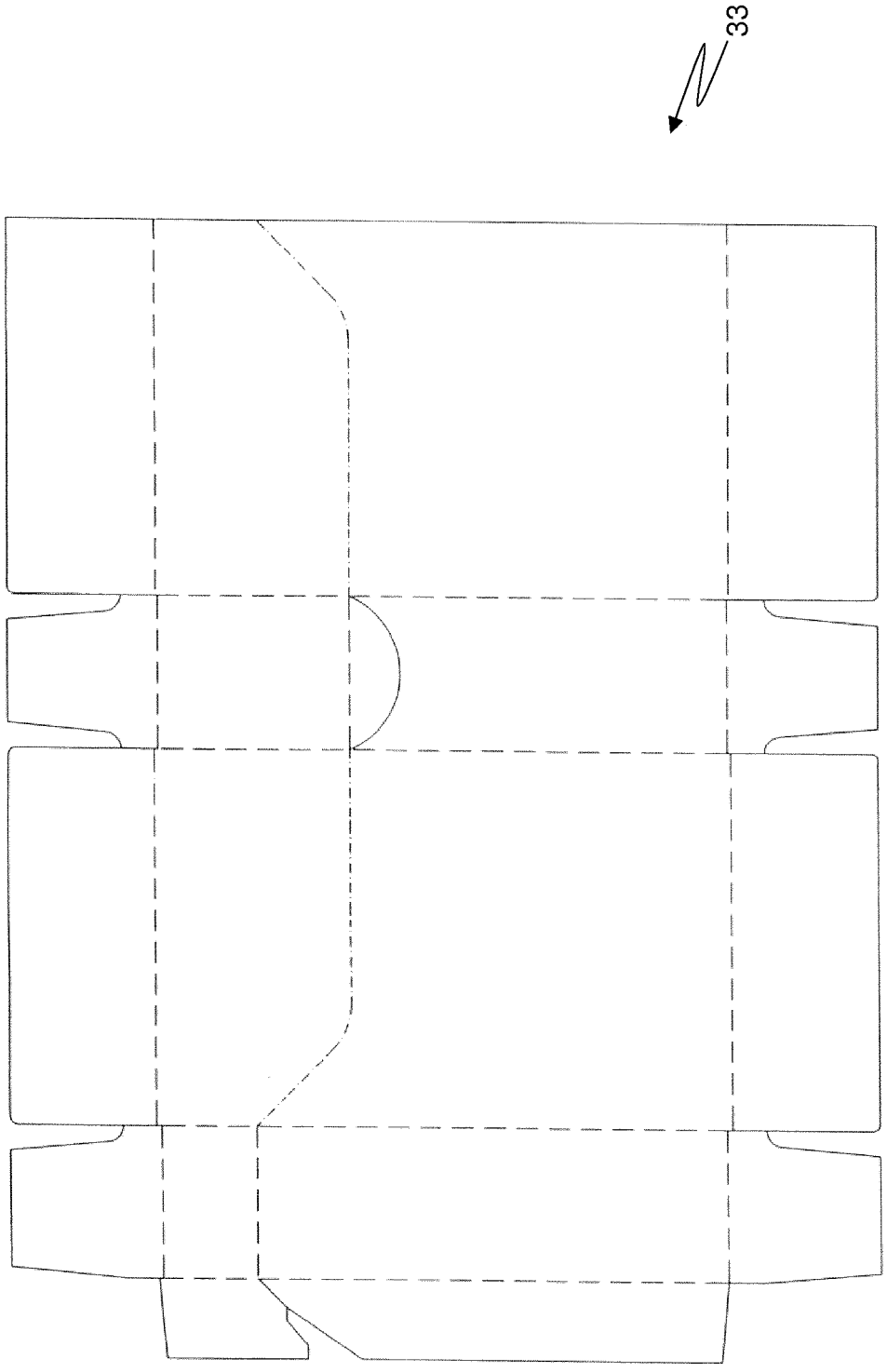


Fig.22

Fig.24



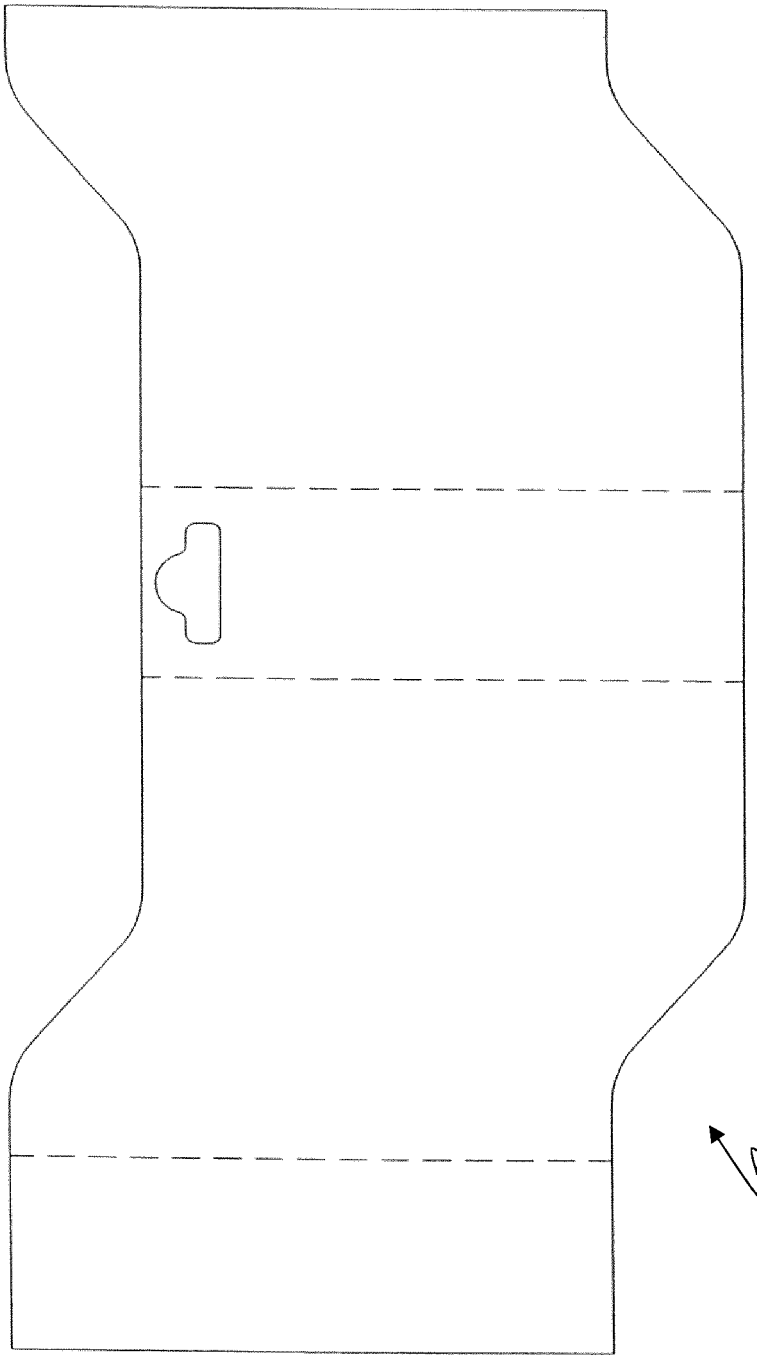


Fig.25

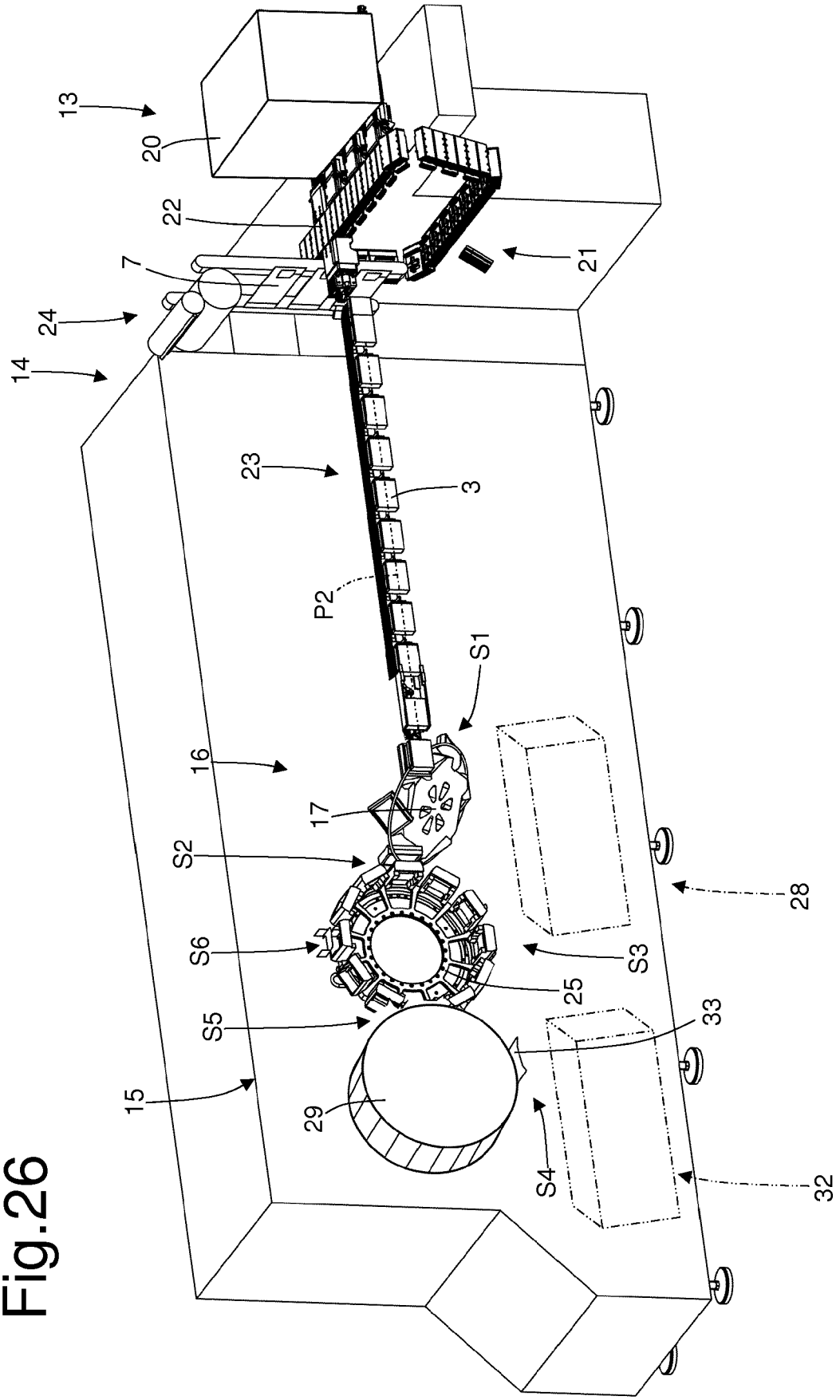


Fig.26

Fig.27

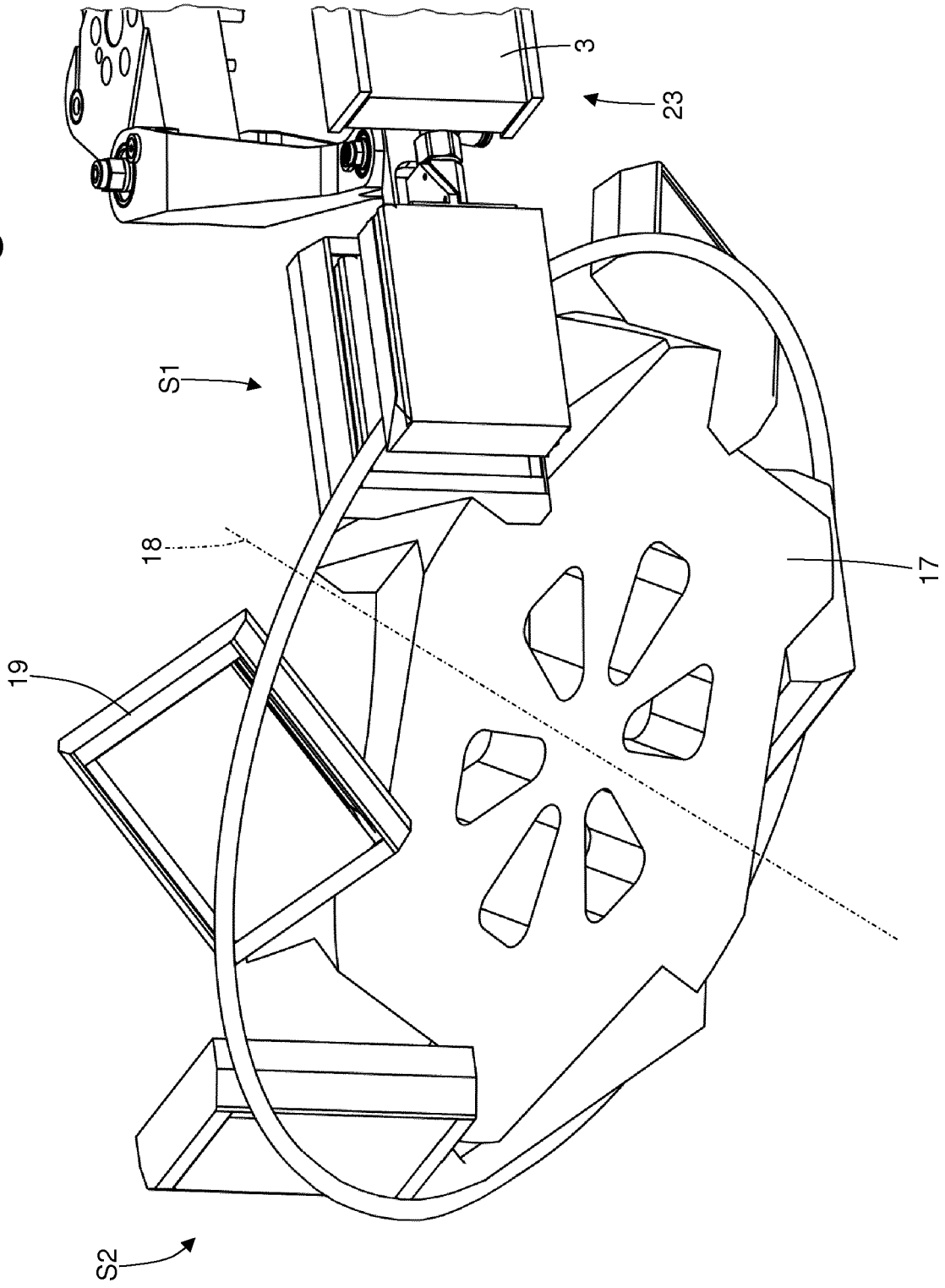


Fig.28

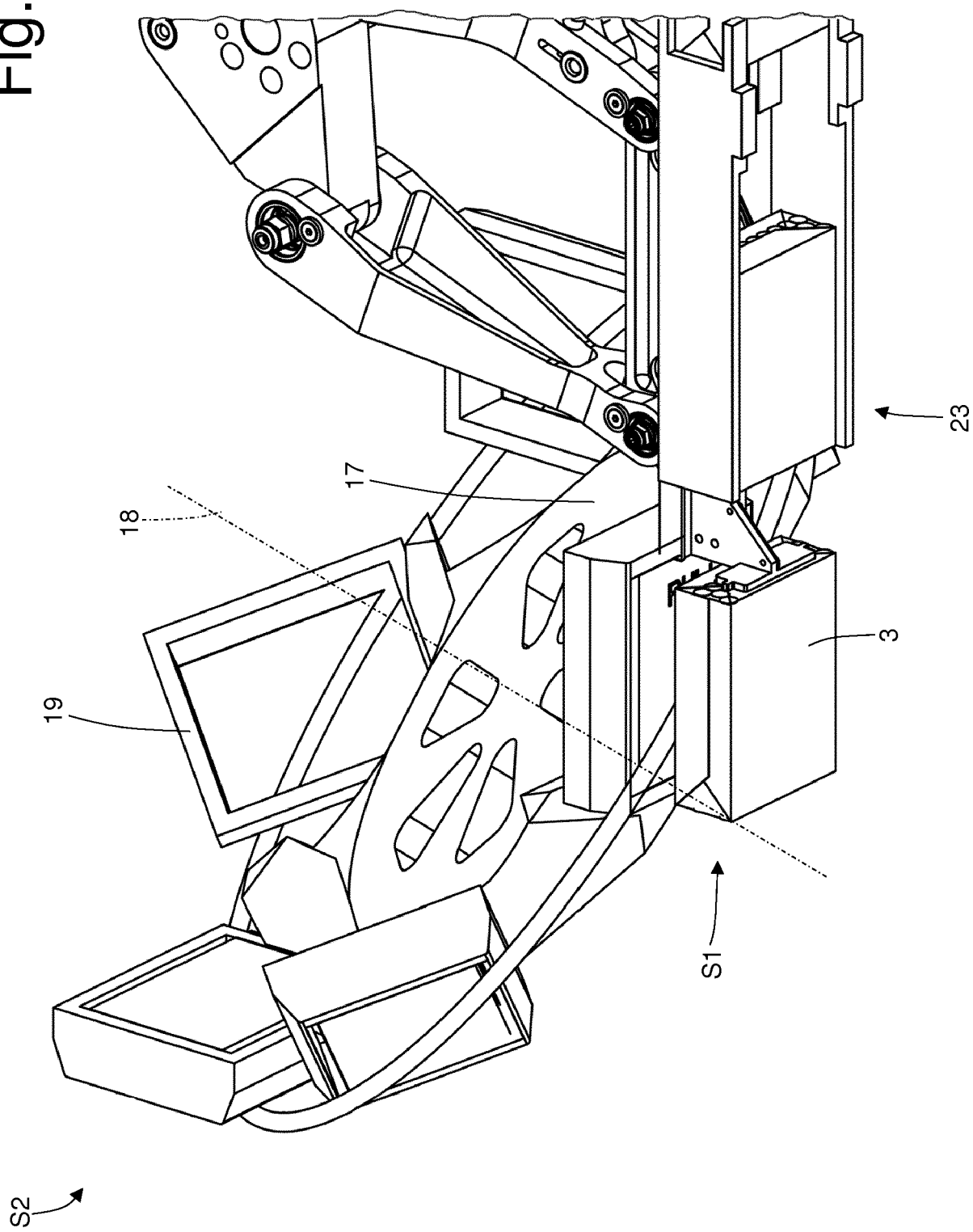


Fig.29

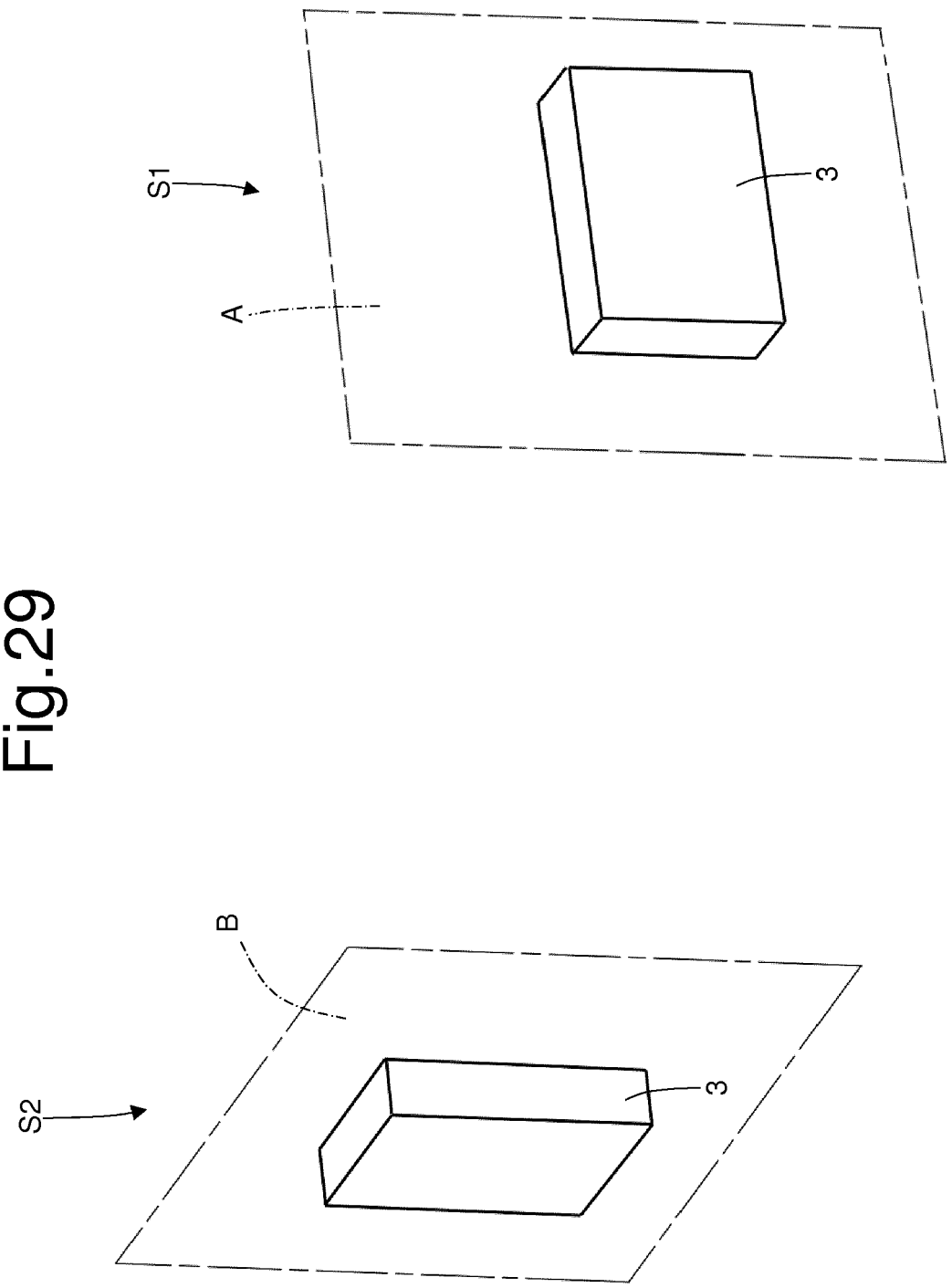


Fig.30

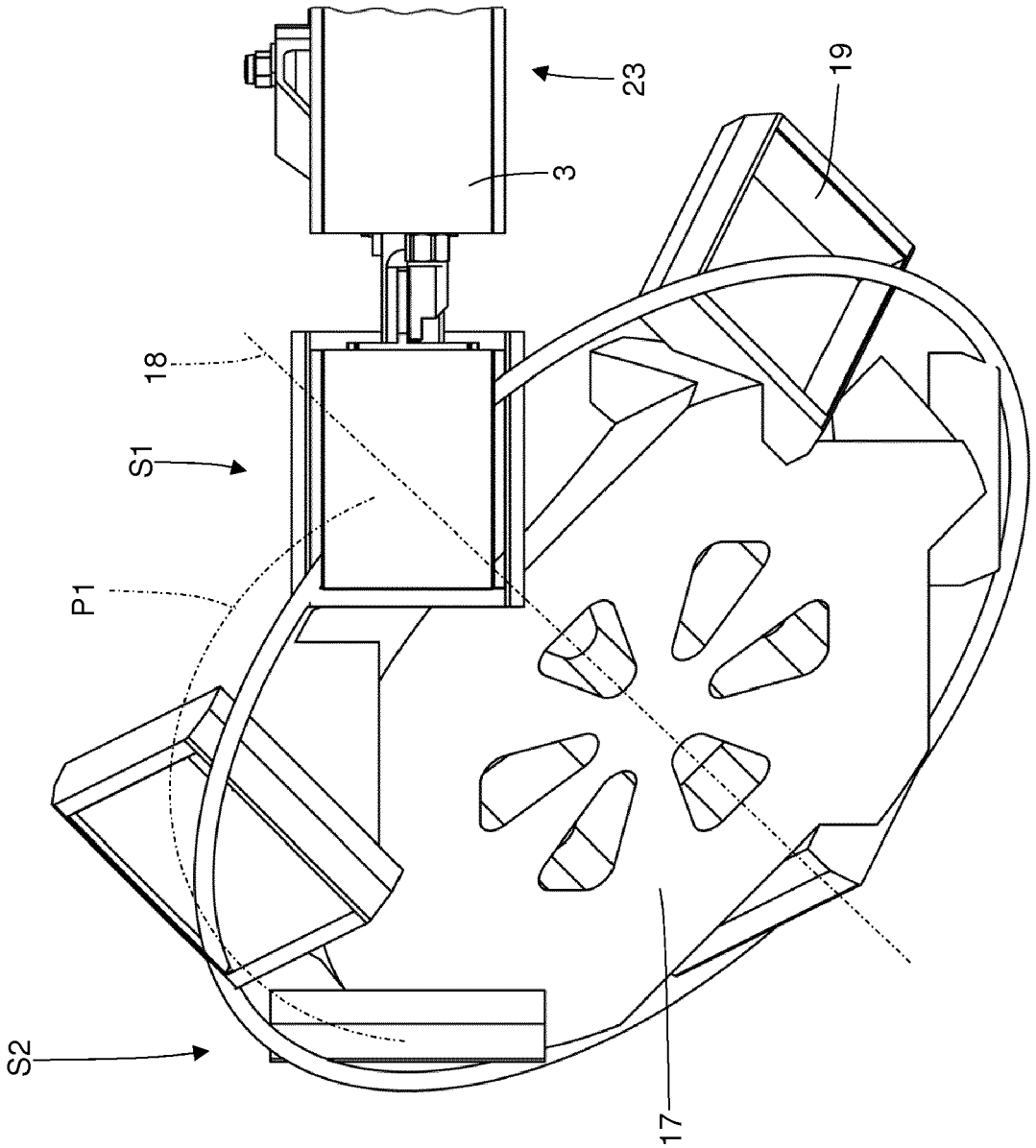
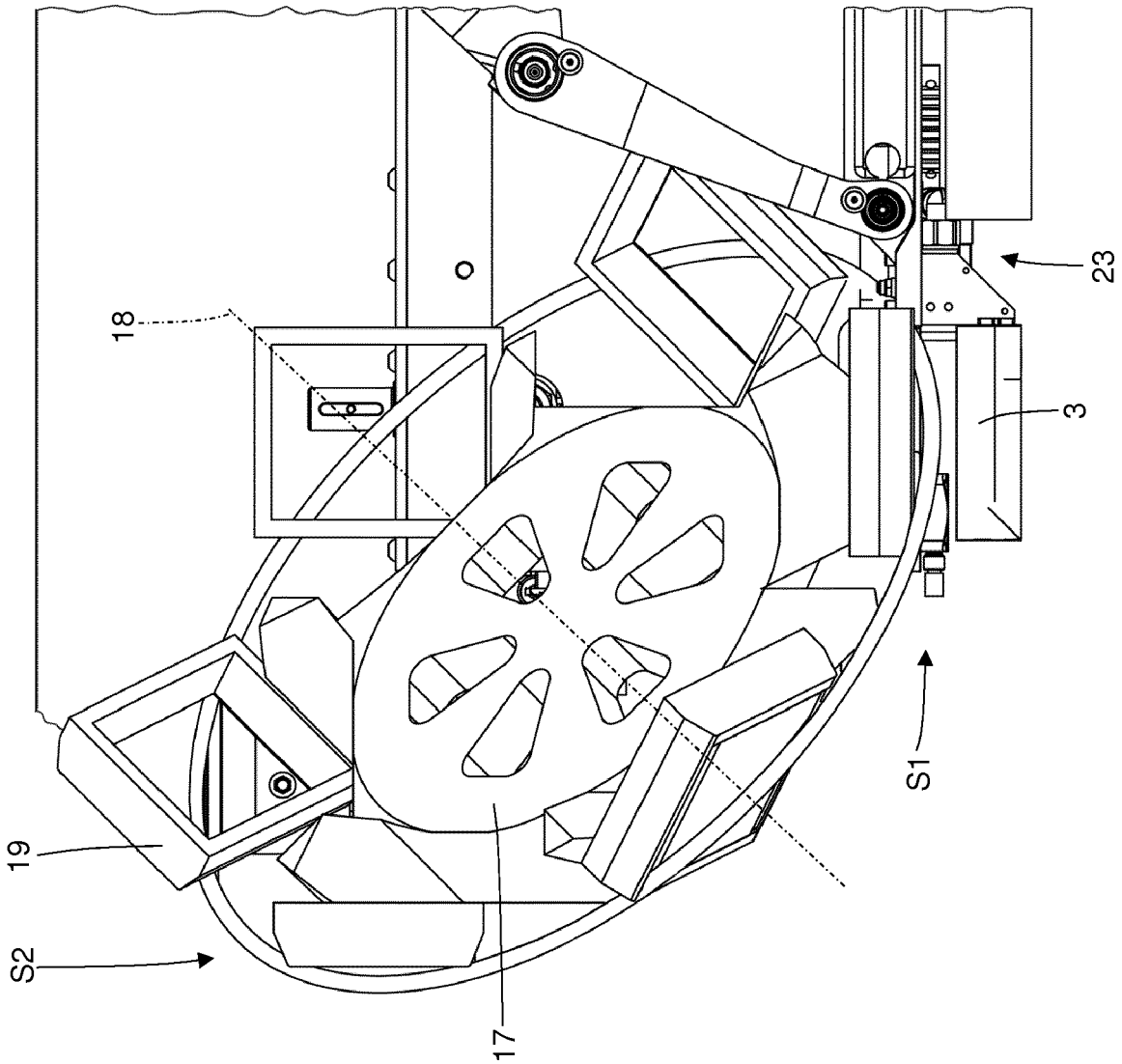


Fig.31



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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 2182

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 540 626 A1 (GD SPA [IT]) 2 January 2013 (2013-01-02) * the whole document * -----	1-14	INV. B65B19/22 B65B35/56
A	US 2009/069102 A1 (KIM CHI HYUN [KR]) 12 March 2009 (2009-03-12) * figures * -----	1-14	

TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 June 2017	Lawder, M

CATEGORY OF CITED DOCUMENTS

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06-06-2017

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REFERENCES CITED IN THE DESCRIPTION

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