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(54) **WRAPPING UNIT AND WRAPPING METHOD TO FOLD A WRAPPING SHEET AROUND A GROUP OF SMOKING ARTICLES**

(57) Wrapping unit (B) and wrapping method to fold a wrapping sheet (21) around a group (14) of smoking articles. There are: a wrapping conveyor (37), which is designed to move the group (14) of smoking articles along a straight wrapping path (P2); a feeding station (S3), which is arranged along the wrapping path (P2); and a feeding device (41), which is designed to place the wrapping sheet (21) in the feeding station (S3) so that the group (14) of smoking articles, while moving along the wrapping path (P2), intercepts the wrapping sheet (21), thus causing the wrapping sheet (21) to be folded in a "U"-shape. The feeding device (41) has: at least one folding spindle (47) provided with a central passage channel (51), through which the group (14) of smoking articles can pass, and with an outer surface (52), which is arranged around the central passage channel (51) and is designed to receive and hold the wrapping sheet (21); a folding device (57), which is separate from and independent of the wrapping conveyor (37) and is designed to fold the wrapping sheet (21) against the outer surface (52) of the folding spindle (47); and a moving conveyor (48), which cyclically moves the folding spindle (47) between a receiving station (S4) in the area of the first folding device (57), where the wrapping sheet (21) is coupled to the folding spindle (47), and the feeding station (S3) in the area of the wrapping path (P2), where the central passage channel (51) of the folding spindle (47) is crossed by the group (14) of smoking articles.

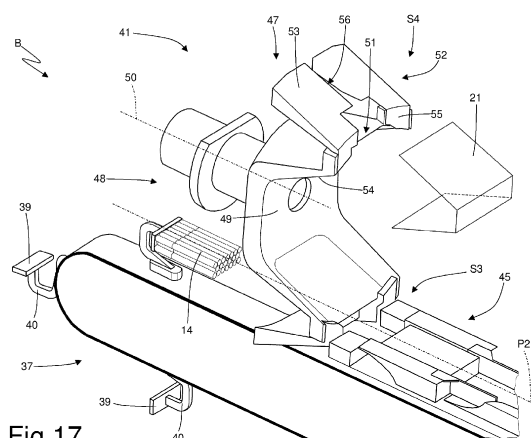


Fig.17

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102019000005946 filed on 17/04/2019.

TECHNICAL FIELD

[0002] The invention relates to a wrapping unit and to a wrapping method to fold a wrap around a group of smoking articles.

[0003] The invention finds advantageous application in the manufacturing of an inner wrap of a rigid cigarette pack with a hinged lid by folding a metal paper wrapping sheet around a group of smoking articles, to which explicit reference will be made in the description below without because of this loosing in generality.

PRIOR ART

[0004] Rigid cigarette packs with a hinged lid currently are the most commonly used cigarette packs in the market since they are easy to be manufactured, simple and practical to be used and offer a good protection to the cigarettes contained on the inside.

[0005] A rigid cigarette pack with a hinged lid comprises a wrap consisting of a group of cigarettes wrapped in a sheet of metal paper and a rigid outer casing housing, on the inside, the wrap. The outer casing consists of a cup-shaped container, which houses the group of cigarettes and has an open upper end, and of a lid, which is also cup-shaped and is hinged to the container so as to rotate, relative to the container, between an open position and a closed position of the open end.

[0006] Patent applications US2012031044A1 and WO2018154611A1 describe a wrapping unit, which folds a wrapping sheet around a group of smoking articles using a folding spindle, which is carried by a rotary drum, in a first feeding station receives the wrapping sheet, which is folded in a "U"-shape around the folding spindle, and in a second feeding station, which is arranged downstream of the first feeding station, receives the group of articles, which is placed inside the folding spindle; subsequently, in an output station, which is arranged downstream of the second feeding station, a wrapping conveyor pulls the group of smoking articles out of the folding spindle so that the group of smoking articles, while coming out of the folding spindle, intercepts the wrapping sheet, thus causing the wrapping sheet to be folded around the group of smoking articles.

DESCRIPTION OF THE INVENTION

[0007] The object of the invention is to provide a wrapping unit and a wrapping method to fold a wrap around a group of smoking articles, said wrapping unit and meth-

od allowing manufacturers to obtain a high-quality wrap (namely, a wrap having extremely precise and square folds of the wrapping sheet), even operating at a high production speed (measured as cigarette packs produced per unit of time).

[0008] According to the invention, there are provided a wrapping unit and wrapping method to fold a wrap around a group of smoking articles according to the appended claims.

[0009] The appended claims describe embodiments of the invention and form an integral part of the description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention will now be described with reference to the accompanying drawings, showing a non-limiting embodiment thereof, wherein:

- figure 1 is a perspective front view, in a closed configuration, of a rigid cigarette pack;
- figure 2 is a perspective rear view of the cigarette pack of figure 1 in a closed configuration;
- figure 3 is a perspective front view of the cigarette pack of figure 1 in an open configuration;
- figure 4 is a perspective front view of a wrap of the pack of figure 1;
- figure 5 is a perspective view of a group of cigarettes contained in the wrap of figure 4;
- figure 6 is a plan view of a wrapping sheet used to manufacture the wrap of figure 4;
- figure 7 is a plan view of a collar of the cigarette package of figure 1;
- figure 8 is a plan view of a blank used to manufacture an outer container provided with a hinged lid of the cigarette pack of figure 1;
- figure 9 is a schematic perspective view - with parts removed for greater clarity - of a packer machine, which produces the cigarette pack of figure 1 and is manufactured according to the invention;
- figure 10 is a schematic front view of part of the packer machine of figure 9;
- figure 11 is a schematic plan view of part of the packer machine of figure 9;
- figure 12 is a schematic side view of part of the packer machine of figure 9;
- figure 13 is a schematic perspective view - with parts removed for greater clarity - of part of the packer machine of figure 9 provided with a folding spindle;
- figures 14, 15 and 16 show the folding sequence carried out to fold the wrapping sheet of figure 6 around the group of cigarettes of figure 5 in order to complete the manufacturing of the wrap of figure 4;
- figure 17 is a schematic perspective view - with parts removed for greater clarity - of the folding spindle of figure 13;
- figures 18-21 show the folding sequence carried out to fold the wrapping sheet of figure 6 around the

group of cigarettes of figure 5 by means of the folding spindle of figure 13 so as to give a tubular shape to the wrap;

- figures 22-24 show a variant of the folding sequence carried out to fold the wrapping sheet of figure 6 around the group of cigarettes of figure 5 by means of the folding spindle of figure 13 so as to give a tubular shape to the wrap; and
- figure 25 shows a schematic perspective view of an alternative embodiment of part of the packer machine of figure 9.

PREFERRED EMBODIMENTS OF THE INVENTION

[0011] In figures 1, 2 and 3, number 1 indicates, as a whole, a rigid cigarette pack. The rigid cigarette pack 1 comprises an outer container 2, which is made of cardboard or stiff card stock and is cup-shaped, and a wrap 3 (which is better shown in figure 4) housed inside the container 2.

[0012] 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 (shown in figure 2), so as to rotate, relative to the outer container 2, between an open position (shown in figure 3) and a closed position (shown in figures 1 and 2) of the open upper end. The outer container 2 substantially has the shape of a rectangular parallelepiped oriented according to a main vertical development direction, is cup-shaped and has the open upper end, a lower wall 6 opposite the open upper end, a front wall 7 and a rear wall 8 (where the hinge 5 is obtained), which are parallel to and opposite one another, and two side walls 9, which are parallel to and opposite one another. Between the front 7 and rear 8 walls and the side walls 9 of the outer container 2 there are defined four longitudinal corners, whereas between the walls 7, 8 and 9 and the bottom wall 6 of the outer container 2 there are defined four transverse corners.

[0013] The lid 4 substantially has the shape of a rectangular parallelepiped, 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 to and opposite 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 to 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 to 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 to and opposite one another (which are parallel to 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). Between the front 11 and rear 12 walls and the side walls 13 of the lid 4 there are defined four longitudinal corners, whereas between the walls 11, 12 and 13 and the upper

wall 10 of the lid 4 there are defined four transverse corners. The longitudinal corners and the transverse corners of the lid 4 are parallel to and aligned with the corresponding longitudinal and transverse corners of the outer container 2, when the lid 4 is in the closed position.

[0014] The wrap 3 encloses a group 14 of cigarettes (partially shown in figure 3 and completely shown in figure 5) with the shape of a parallelepiped. Furthermore, the wrap 3 has, at the top and at the front, a removable portion 15, which is separated from the rest of the wrap 3 by a pre-weakened tearable line 16; when the cigarette 1 pack is opened for the first time, the user grabs and tears the removable portion 15 in order to access the underlying cigarettes of the group 14 of cigarettes.

[0015] According to figures 3 and 7, the cigarette pack 1 further comprises a rigid collar 17, which is connected (through gluing) - folded in a "U"-shape - inside the outer container 2 so as to partially project outwards from the open upper end of the container 2 and engage a corresponding inner surface of the lid 4, when the lid 4 is in the closed position. The collar 17 comprises a front wall 18, which is connected to the front wall 7 of the container 2 and is placed in contact with the front wall 11 of the lid 4, when the lid 4 is in the closed position, and two side walls 19, which are connected to the side walls 9 of the container 2 and are placed in contact with the side walls 13 of the lid 4, when the lid is in the closed position 4. According to the embodiment shown in the accompanying figures, the front wall 18 of the collar 17 is provided with a pair of claws 20, which project on the side so as to engage, through interference, the side walls 13 of the lid 4, when the lid 4 is in the closed position, so as to hold the lid 4 in the closed position. According to a different embodiment which is not shown herein, the front wall 18 of the collar 17 has no claws 20.

[0016] According to figure 6, the wrap 3 is obtained by folding, around the group 14 of cigarettes, a wrapping sheet 21 provided, on a side, with the tearable line 16 delimiting the removable portion 15. According to figure 4, at first, the wrapping sheet 21 is folded in a "U"-shape around the group 14 of cigarettes, thus defining, on the two minor side walls of the group 14 of cigarettes, two open ends, each delimited by a transverse wing 22 (or corner wing 22) and by two longitudinal wings 23 and 24. At first, the transverse wing 22 is folded by 90° against the group 14 of cigarettes, then the longitudinal wing 23 is folded by 90° against the group 14 of cigarettes and on top of the previously folded transverse wing 22 and, finally, the longitudinal wing 24 is folded by 90° against the group 14 of cigarettes and on top of the previously folded transverse wing 22 and longitudinal wing 23 (according to the folding mode known as "soap wrap"); in this way, the wrapping sheet 21 gains a tubular shape having one single open end in the area of the upper wall (where the cigarette filters are arranged) of the group 14 of cigarettes; said open end is delimited by two transverse wings 25 (or corner wings 25) and by two longitudinal wings 26 and 27. At first, the transverse wings 25 are

folded by 90° against the group 14 of cigarettes, then the longitudinal wing 26 is folded by 90° against the group 14 of cigarettes and on top of the previously folded transverse wings 25 and, finally, the longitudinal wing 27 is folded by 90° against the group 14 of cigarettes and on top of the previously folded transverse wings 25 and longitudinal wing 26 (according to the folding mode known as "soap wrap"); in this way, the folding of the wrapping sheet 21 around the group 14 of cigarettes is completed.

[0017] According to a preferred embodiment, the final shape of the wrapping sheet 21 around the group 14 of cigarettes is not stabilized in any way (namely, no glue is applied to the wrapping sheet 21 and no seals are made on the wrapping sheet 21); as a consequence, the final shape of the wrapping sheet 21 around the group 14 of cigarettes is maintained only due to the containing action of the outer container 2.

[0018] According to figure 8, the outer container 2 and the lid 4 are obtained by folding a conventional blank 28, which has two pre-weakened longitudinal folding lines (which define the longitudinal corners of the outer container 2 and of the lid 4) and a plurality of pre-weakened transverse folding lines (which define the transverse corners of the outer container 2 and of the lid 4), which delimit, between the two longitudinal folding lines, a panel 7', which makes up the front wall 7 of the outer container 2, a panel 6', which makes up the lower wall 6 of the outer container 2, a panel 8', which makes up the rear wall 8 of the outer container 2, a panel 12', which makes up the rear wall 12 of the lid 4, a panel 10', which makes up the upper wall 10 of the lid 4, a panel 11', which makes up the front wall 11 of the lid 4, and a panel 11", which makes up the reinforcement flap and is folded by 180° and glued against an inner surface of the panel 11' (namely, against an inner surface of the front wall 11 of the lid 4).

[0019] The blank 28 comprises a pair of wings 9', which are arranged on opposite sides of the panel 7', are connected to the panel 7' along the two longitudinal folding lines, and make up part of the side walls 9 of the outer container 2. The blank 28 comprises a pair of wings 9", which are arranged on opposite sides of the panel 8', are connected to the panel 8' along the two longitudinal folding lines, make up part of the side walls 9 of the outer container 2, and are glued to and overlap the corresponding wings 9'. Each wing 9" comprises a tab, which is folded by 90° relative to the wing 9" so as to be subsequently laid on and glued to the panel 6'.

[0020] The blank 28 comprises a pair of wings 13', which are arranged on opposite sides of the panel 11', are connected to the panel 11' along the two longitudinal folding lines, and make up part of the side walls 13 of the lid 4. The blank 28 comprises a pair of wings 13", which are arranged on opposite sides of the panel 12', are connected to the panel 12' along the two longitudinal folding lines, make up part of the side walls 13 of the lid 4, and are glued to and overlap the corresponding wings 13'. Each wing 13" comprises a tab, which is folded by 90° relative to the wing 13" so as to be subsequently laid on

and glued to the panel 10'.

[0021] In other words, each side wall 9 of the outer container 2 is obtained by overlapping and gluing two wings 9' and 9" and each side wall 13 of the lid 4 is obtained by overlapping and gluing two wings 13' and 13". Furthermore, the front wall 11 of the lid 4 is obtained by overlapping and gluing the panel 11' and the panel 11" (which makes up the reinforcement flap).

[0022] In figure 9, number 29 indicates, as a whole, a packer machine, which is designed to manufacture the pack 1 of cigarettes described above and operates with an intermittent motion (namely, with a motion which involves a cyclic alternation of motion phases and standstill phases).

[0023] The packer machine 29 comprises a frame 30, which rests on the ground by means of a plurality of feet (not shown) and is obtained by joining two bodies 31 and 32 arranged side by side; in particular, the body 31 has a front wall and a side wall, on which the operating members (described below) are arranged, whereas the body 32 (only) has a front wall, on which all operating members (described below) are arranged.

[0024] The packer machine 29 comprises a forming unit A, where the groups 14 of cigarettes are formed one after the other, a wrapping unit B, where a respective wrapping sheet 21 is wrapped around each group 2 of cigarettes so as to create a wrap 3, and a wrapping unit C, where a collar 17 and a blank 28 are wrapped around each wrap 3 so as to create an outer container 2 provided with a lid 4.

[0025] According to figure 10, the forming unit A for forming the groups 14 of cigarettes comprises a hopper 33 provided with three output mouths 34 to simultaneously feed three groups 14 of cigarettes to three respective pockets 35 of a forming conveyor 36 supporting a plurality of pockets 35. The forming conveyor 36 comprises a conveyor belt with an annular shape, which is wound around two end pulleys (one of them being motor-driven), supports the pockets 35 and moves in a stepped manner so as to cyclically move the pockets 35 along a forming path P1. According to figure 13, the forming path P1 develops between an input station S1, where each group 14 of cigarettes is pulled out of an output mouth 34 of the hopper 33 and gets into a corresponding pocket 35, and a transfer station S2, in which each group 14 of cigarettes is pulled out of the corresponding pocket 35.

[0026] According to a preferred embodiment, along the forming conveyor 36 there are a control station, where the completeness of each group 14 of cigarettes and the correct filling of the tips of the cigarettes of each group 14 of cigarettes are optically controlled, and a following reject station, where a possible faulty group 14 of cigarettes signalled by the control station is rejected (for example by means of a mechanical or pneumatic expulsion from the respective pocket 35).

[0027] According to figure 13, the wrapping unit B comprises a wrapping conveyor 37, which is designed to move each group 14 of cigarettes along a straight and

horizontal wrapping path P2. In particular, the wrapping path P2 extends from the transfer station S2, where the wrapping conveyor 37 pulls each group 14 of cigarettes out of the corresponding pocket 35 of the forming conveyor 36, goes through a feeding station S3, where each group 14 of cigarettes is coupled to a corresponding wrapping sheet 21, which is folded in a "U"-shape around the group 14 of cigarettes, and ends in a transfer station S5, where each wrap 3 (consisting of a wrapping sheet 21 folded around a group 14 of cigarettes) leaves the wrapping conveyor 37.

[0028] According to figure 17, the wrapping conveyor 37 comprises a conveyor belt 38 with an annular shape, which is wound around two end pulleys (one of them being motor-driven) and supports a plurality of pushing devices 39, each connected to the conveyor belt 38 by means of a support column 40 (which is narrow, namely narrower than the pushing device 39) and designed to engage a rear wall of a corresponding group 14 of cigarettes so as to push the group 14 of cigarettes along the wrapping path P2. In other words, the wrapping conveyor 37 comprises a horizontal channel, which is delimited at least at the bottom and on the sides (preferably also at the top in its initial part), is arranged along the wrapping path P2 and contains, on the inside, each group 14 of cigarettes, while the group 14 of cigarettes moves along the wrapping path P2 because it is pushed, at the back, by a corresponding pushing device 39.

[0029] Along the wrapping path P2 (and, hence, in the area of the wrapping conveyor 37) there is the feeding station S3, in which each wrapping sheet 21 is placed so as to be intercepted by a corresponding group 14 of cigarettes, around which the wrapping sheet 21 is folded in a "U"-shape; in other words, each group 14 of cigarettes, when moving along the wrapping path P2, intercepts a corresponding wrapping sheet 21 placed in the feeding station S3, thus determining the "U"-shaped folding of the wrapping sheet 21. The packer machine 29 comprises a feeding device 41, which cyclically feeds the wrapping sheets 21 in the feeding station S3, namely places each wrapping sheet 21 in the feeding station S3 in such a way that the wrapping sheet 21 is intercepted by a corresponding group 14 of cigarettes moving along the wrapping path P2. According to figure 9, the feeding device 41 comprises an unwinding station, where a wrapping material band 42 is unwound from a reel 43 and is fed (passing beside the hopper 33) towards a known cutting member 44, which is arranged above the feeding station S3 and cyclically makes a transverse cut in the wrapping material band 42 so as to separate single collars 17 from the wrapping material band 42. The feeding device 41 could also comprise a processing member (for example an embossing element), which is arranged between the unwinding station and the cutting member 44 and processes (for example embosses) the wrapping material band 42.

[0030] According to figure 13, the wrapping unit B comprises a folding device 45, which is arranged along the

wrapping path P2 downstream of the feeding station S3 and is designed to fold two open side ends of each wrapping sheet 21 folded in a "U"-shape around a corresponding group 14 of cigarettes so as to obtain a tubular wrap having an open rear end (shown in figure 14). The folding device 45 preferably only comprises folding profiles (namely, folding spirals), which are fixed (i.e. completely free from moving parts) and are arranged on opposite sides of the wrapping path P2. With reference to figure 14, on each side of the wrapping sheet 21 folded in a "U"-shape around a corresponding group 14 of cigarettes, the folding device 45 folds, at first, the transverse wing 22, then it folds the longitudinal wings 23 and finally it folds the longitudinal wing 24. At the end of the action of the folding device 45, namely immediately downstream of the folding device 45, a wrapping sheet 21 has the tubular shape shown in figure 14, which has one single open end delimited by two transverse wings 25 (or corner wings 25) and by two longitudinal wings 26 and 27.

[0031] According to figure 13, the wrapping unit B comprises a folding device 46, which is arranged along the wrapping path P2 downstream of the folding device 45 and is designed to complete a folding of each wrapping sheet 21 around the corresponding group 14 of cigarettes (hence, ending the manufacturing of the wrap 3) in order to close the open rear end (namely, the one that was previously left open by the folding device 45). The folding device 46 folds, at first, the transverse wings 25 by means of a movable transverse folding element (namely, provided with moving parts) according to figure 15, then it folds the longitudinal wing 26 by means of a first movable longitudinal folding element (namely, provided with moving parts) and, finally, it folds the longitudinal wing 27 by means of a second movable longitudinal folding element (namely, provided with moving parts) according to figure 16.

[0032] According to figures 17-21, the feeding device 41 comprises two folding spindles 47, which are supported by a moving conveyor 48, which cyclically moves each folding spindle 47 between a receiving station S4, where each wrapping sheet 21 is coupled to the folding spindle 47, and the feeding station S3 in the area of the wrapping path P2, where the wrapping sheet 21 is coupled to a group 14 of cigarettes, which, while moving along the wrapping path P2, intercepts the wrapping sheet 21, which is folded in a "U"-shape around the group 14 of cigarettes.

[0033] In the embodiment shown in the accompanying drawings, the moving conveyor 48 comprises a moving drum 49, which is mounted so as to rotate (with an intermittent motion, namely in a "stepped" manner) around a horizontal rotation axis 50, which is parallel to the wrapping path P2; the two folding spindles 47 are arranged at 180° relative to one another, namely, they are symmetrically arranged around the rotation axis 50) and, hence, with every cycle the moving drum 49 makes a 180° rotation. According to a different embodiment, the moving conveyor 48 causes the two spindles 47 (or, more

in general, said at least one spindle 47) to make a mere translation movement (or, if necessary, a rotation-translation movement) between the receiving station S4 and the feeding station S3 instead of a mere rotation movement (the mere translation movement typically takes place on a plane that is perpendicular to the wrapping path P2 along which the groups 14 of cigarettes move).

[0034] According to other embodiments which are not shown herein, the moving drum 49 (namely, the moving conveyor 48) supports a different number of folding spindles 47, for example one single folding spindle 47 or three, four, five or six spindles 47. A preferred embodiment entails the presence of four folding spindles 47 arranged at 90° relative to one another (hence, with every cycle the moving drum 49 makes a 90° rotation); in this embodiment, between the receiving station S4, where each wrapping drum 21 is coupled to the folding spindle 47, and the feeding station S3, where each wrapping drum 21 is coupled to a group 14 of cigarettes, there could be a reject station, where a possible faulty wrapping sheet 21 (identified by an optical control device) is rejected, namely separated from the corresponding folding spindle 47 and fed to a waste collecting container.

[0035] Each folding spindle 47 has a central passage channel 51, through which a corresponding group 14 of cigarettes passes in the feeding station S3; in other words, in the feeding station S3, the central passage channel 51 of each folding spindle 47 is aligned with the wrapping path P2 and is crossed by a corresponding group 14 of cigarettes, which moves along the wrapping path P2 pushed by the wrapping conveyor 37. Furthermore, each folding spindle 47 has an outer surface 52, which is arranged around the central passage channel 51 and is designed to receive and hold the wrapping sheet 21; in other words, in each folding spindle 47, the central passage channel 51 goes through the outer surface 52. In particular, the outer surface 52 of each folding spindle 47 is "U"-shaped and consists of an outer wall 53, an inner wall 54, which is integral to a central hub of the moving drum 49, and a joining wall 55, which is interposed between the outer wall 53 and the inner wall 54 and is perpendicular to the wrapping path P2. In each folding spindle 47, the two walls 53 and 54 are "open" relative to the joining wall 55, namely the two walls 53 and 54 form, with the joining wall 55, an obtuse angle (hence, greater than 90°) preferably ranging from 95° to 140° (in the embodiment shown in the accompanying figures, it approximately measures 105°).

[0036] The outer surface 52 of each folding spindle 47 has a through slit 56, which is oriented parallel to the rotation axis 50 (and, hence, parallel to the wrapping path P2) and through which the support column 40 of each pushing device 39 is suited to pass when the folding spindle 47 is in the feeding station S3.

[0037] According to a preferred, though non-binding embodiment, each folding spindle 47 comprises sucking means to hold the wrapping sheet 21 in contact with the outer surface 52 between the receiving station S4 and

the feeding station S3; in other words, a plurality of small holes open in the outer surface 52 and are connected to a suction source, thus generating a suck that holds, through suction, the wrapping drum 21 in contact with the outer surface 52.

[0038] The feeding device 41 comprises a folding device 57 (schematically shown in figures 18-21), which is arranged in the area of the receiving station S4, is separate from and independent of the wrapping conveyor 37 and is designed to fold each wrapping drum 21 coming from the cutting member 44 in a "U"-shape against the outer surface 52 of the folding spindle 47. In particular, the folding device 57 comprises a folding body 58, which reproduces in negative the shape of the folding spindle 47, and an operating device 59 (typically a linear electric motor), which is designed to cyclically translate the folding body 58 between a rest position (shown in figures 18, 20 and 21), in which the folding body 58 is separate from the folding spindle 47, which is in the receiving station S4, and a work position (shown in figure 19), in which the folding body 58 embraces the folding spindle 47, which is in the receiving station S4, with the interposition of the wrapping sheet 21. In other words, the cutting member 44 of the feeding device 41 places the wrapping sheet 21 flat (namely, without folds) in the receiving station S4 and between a folding spindle 47 and the folding device 57; subsequently, the folding body 58 of the folding device 57 is pushed against the folding spindle 47 so as to fold the wrapping sheet 21 against the folding spindle 47 (with a mechanism similar to a punch and a die).

[0039] The wrapping path P2 starts in the transfer station S2 (where the groups 14 of cigarettes enter the wrapping conveyor 37) and ends in the transfer station S5 (where the wraps 3 leave the wrapping conveyor 37). According to figure 10, the packer machine 29 comprises a transfer conveyor 60, which receives the wraps 3 in the transfer station S5 from the wrapping conveyor 37 and moves the wraps 3 along a straight transfer path P3, which is perpendicular to the wrapping path P2, up to a transfer station S6 (where the wraps 3 leave the transfer conveyor 60). The transfer conveyor 60 comprises a conveyor belt with an annular shape, which is wound around two end pulleys (one of them being motor-driven), supports a plurality of pockets 61, each designed to house a corresponding wrap 3, and moves in a stepped manner so as to cyclically move the pockets 61 along a transfer path P3 from the transfer station S5 to the transfer station S6.

[0040] According to figure 10, the packer machine 29 comprises a wrapping drum 62, which is arranged downstream of the transfer conveyor 60 (hence, also downstream of the wrapping conveyor 37), supports a plurality of pockets 63, each designed to contain the wrap 3 and the collar 17, and is mounted so as to rotate (with an intermittent motion, namely in a "stepped" manner) around a horizontal rotation axis 64, which is parallel to the wrapping path P2, in order to move each pocket 63 along a circular wrapping path P4, which is perpendicular

to the wrapping path P2. Each pocket 63 of the wrapping drum 62 receives a collar 17 in a feeding station S7 arranged upstream of the transfer station S6 along the wrapping path P4, receives a wrap 3 (which is coupled to the previously fed collar 17) in the transfer station S6, receives a blank 28 in a feeding station S8 arranged downstream of the transfer station S6 along the wrapping path P4, and releases the assembly consisting of the wrap 3, the collar 17 and the blank 28 in a transfer station S9 arranged downstream of the feeding station S8 along the wrapping path P4. In the feeding station S7, each collar 17 is laid on the outer surface of the wrapping drum 62 in the area of a pocket 63 and is held in this position through suction; in the transfer station S5, a wrap 3 enters the corresponding pocket 63 and is coupled to the previously fed collar 17, thus determining the "U"-folding of the collar 17. In the feeding station S8, each blank 28 is laid on the outer surface of the wrapping drum 62 in the area of a pocket 63 and is held in this position through suction; in the transfer station S9, a wrap 3, by coming out of the corresponding pocket 63 together with the collar 17, is coupled to the previously fed blank 28.

[0041] Owing to the above, it is evident that the transfer conveyor 60 is interposed between the wrapping conveyor 37 and the wrapping drum 62 and transfers each wrap 3 from the wrapping conveyor 37 to the wrapping drum 62 along the transfer path P3, which is perpendicular to the wrapping path P2 and perpendicular to the rotation axis 64 of the wrapping drum 62.

[0042] According to figure 10, the packer machine 29 comprises a pushing device 65, which is placed in the transfer station S6 and cyclically moves from the bottom to the top in order to pull a wrap 3 out of a pocket 61 of the transfer conveyor 60 and, then, insert the wrap 3 into a pocket 63 of the wrapping drum 62.

[0043] According to figure 9, the packer machine 29 comprises a feeding device 66, which cyclically feeds the collars 17 in the feeding station S7, namely places each collar 17 in front of a pocket 63. The feeding device 66 comprises an unwinding station 67, where a wrapping material band 68 is unwound from a reel (not shown) and is fed (passing behind the transfer conveyor 60) towards a known cutting member 69, which is arranged beside the feeding station S3 and cyclically makes a transverse cut in the wrapping material band 68 so as to separate single collars 17 from the wrapping material band 68.

[0044] According to figure 9, the packer machine 29 comprises a feeding device 70, which cyclically feeds the blanks 28 in the feeding station S8, namely places each blank 28 in front of a pocket 63. The feeding device 70 comprises a moving conveyor 71, which moves a plurality of stacks of blanks 28 towards a hopper (not shown); furthermore, the feeding device 70 comprises a feeding drum 72, which supports a plurality of sucking holding heads (not shown), each designed to hold a corresponding blank 28, and is mounted so as to rotate (with an intermittent motion, namely in a "stepped" manner) around a horizontal rotation axis 73, which is parallel to

the rotation axis 64, in order to move each sucking holding head along a circular feeding path, which is parallel to the wrapping path P4. The rotation of the feeding drum 72 cyclically moves each sucking holding head from a pick-up station S10, where the sucking holding head picks up a blank 28 from the bottom of the hopper, to the feeding station S8, where the sucking holding head releases the blank 28 to the wrapping drum 62.

[0045] According to figure 10, the packer machine 29 comprises a wrapping drum 74, which is arranged downstream of the wrapping drum 62, supports a plurality of pockets 75, each designed to contain a wrap 3, a collar 17 and a blank 28, and is mounted so as to rotate (with an intermittent motion, namely in a "stepped" manner) around a horizontal rotation axis 76, which is parallel to the rotation axis 64 (and, hence, perpendicular to the wrapping path P2), in order to move each pocket 75 along a circular wrapping path P5, which is parallel to the wrapping path P4 (and, hence, perpendicular to the wrapping path P2). Each pocket 75 of the wrapping drum 72 receives a wrap 3, a collar 17 and a blank 28 in the transfer station S9, folds the blank 28 downstream of the transfer station S9 and releases an almost complete cigarette pack 1 (the sole folding of the wings 9" and 13" missing) in a transfer station S11 arranged downstream of the transfer station S9 along the wrapping path P5. In the transfer station S11, the folding of each blank 28 is completed (hence, completing the formation of the corresponding cigarette pack 1) by folding the wings 9" and 13" immediately downstream of the wrapping drum 74. After having completed the formation of each cigarette pack 1, the cigarette pack 1 is released to a drying conveyor belt 77 (shown in figure 9), which moves the cigarette packs 1 one after the other along a straight drying path P6, which is perpendicular to the rotation axis 76, towards an output of the packer machine 29.

[0046] In the embodiment shown in figures 18-21, the folding device 57 comprises the sole folding body 58, which is translated by the operating device 59 between the rest position (shown in figures 18, 20 and 21), in which the folding body 58 is separate from the folding spindle 47, which is in the receiving station S4, and the work position (shown in figure 19), in which the folding body 58 embraces the folding spindle 47, which is in the receiving station S4, with the interposition of the wrapping sheet 21.

[0047] In the variant shown in figures 22-24, the folding device 57 also comprises, besides the folding body 58 translated by the operating device 59, a stretching body 78, which reproduces in negative the initial shape (in the area of the joining wall 55 of the outer surface 52 of the folding spindle 47) of the folding spindle 47 and is translated by a corresponding operating body 79 (typically a linear electric motor) between a rest position (shown in figure 22), in which the stretching body 78 is separate from the folding spindle 47, which is in the receiving station S4, and a work position (shown in figures 23 and 24), in which the stretching body 78 embraces the folding

spindle 47, which is in the receiving station S4, with the interposition of the wrapping sheet 21. The operating device 79 translating the stretching body 78 is at least functionally independent of the operating device 59 translating the folding element 58 so as to allow the stretching body 78 to translate independently of the folding body 58; obviously, the two operating devices 59 and 79 can also share common parts. According to a preferred embodiment, the folding body 58 has a complementary shape relative to the stretching body 78 so that the stretching body 78 can be contained inside the folding body 58 and, hence, so that, in the work position (shown in figure 24), the folding body 58 and the stretching body 78 can be both in contact with the folding spindle 47 in the same moment.

[0048] In use, at first (according to figure 22), a flat wrapping sheet 21 is placed in the receiving station S4 in front of a corresponding folding spindle 47, while both bodies 58 and 77 of the folding device 57 are (relatively) far from the folding spindle 47 so as to allow the wrapping sheet 21 to come down. Subsequently (according to figure 23), the operating device 79 moves the sole stretching body 78 to the work position, in which the stretching body 78 embraces the folding spindle 47 so as to determine a very precise folding of the wrapping sheet 21 only around the two corners of the joining wall 55 of the outer surface 52 of the folding spindle 47. Finally (according to figure 24), the operating device 59 moves the sole folding body 58 to the work position, in which the folding body 58 embraces the folding spindle 47 so as to complete the folding of the wrapping sheet 21 around the folding spindle 47. In other words, the stretching body 78 folds (in a very precise manner) the wrapping sheet 21 only around the two corners of the joining wall 55 of the outer surface 52 of the folding spindle 47, while the rest of the wrapping sheet 21 remains detached and at a certain distance from the walls 53 and 54 of the outer surface 52 of the folding spindle 47; subsequently, the folding body 58 completes the folding of the wrapping sheet 21 against the walls 53 and 54 of the outer surface 52 of the folding spindle 47. In this way, the folding of the wrapping sheet 21 around the folding spindle 47 is divided into two distinct steps carried out by two distinct bodies 58 and 77, each optimized to perform its (limited) function in the best possible way; namely, the two bodies 58 and 77 are particularly effective and efficient, for they are especially designed to fulfil one single task in the best possible way.

[0049] In the embodiment shown in figures 9 and 10, in the transfer station S6 there is the pushing device 65, which cyclically moves from the bottom to the top in order to pull a wrap 3 out of a pocket 61 of the transfer conveyor 60 and, then, insert the wrap 3 into a pocket 63 of the wrapping drum 62; namely, in the embodiment shown in figures 9 and 10, a wrap 3 is directly transferred from a pocket 61 of the transfer conveyor 60 to a pocket 63 of the wrapping drum 62. According to a different embodiment shown in figure 25, a transfer drum 80 is provided, which is interposed between the transfer conveyor 60

and the wrapping drum 62, supports a plurality of pockets 81, each designed to contain at least the wrap 3, and is mounted so as to rotate (with an intermittent motion, namely in a "stepped" manner) around a vertical rotation axis 82 (which, hence, is perpendicular to the rotation axis 64 of the wrapping drum 62) in order to move each pocket 81 along a circular transfer path between a transfer station S12, where the pocket 81 receives a wrap 3 from the transfer conveyor 60, and the transfer station S6, where the pocket 81 releases the wrap 3 to the wrapping drum 62; namely, in the transfer station S6, the pushing device 65 cyclically moves from the bottom to the top in order to pull a wrap 3 out of a pocket 81 of the transfer drum 80 and, then, insert the wrap 3 into a pocket 81 of the wrapping drum 62.

[0050] According to a possible embodiment which is not shown herein, even in the presence of the transfer drum 80, the collars 17 are fed to the pockets 63 of the wrapping drum 62 in the feeding station S7 arranged upstream of the transfer station S6 along the wrapping path P4 (namely, the feeding station S7 remains coupled to the wrapping drum 62); according to an alternative embodiment shown in figure 25, the feeding station S7 for the collars 17 is moved to a place in the area of the transfer drum 80 and, therefore, a pocket 81 of the transfer drum 80 receives, at first, a collar 17 in the feeding station S7, then it receives a wrap 3 from the transfer conveyor 60 in the transfer station S12 and, finally, it releases the wrap 3 and the collar 17 together to the wrapping drum 62 in the transfer station S6. Namely, in the presence of the transfer drum 80, each wrap 3 is indirectly transferred (because of the interposition of the transfer drum 80) from a pocket 61 of the transfer conveyor 60 to a pocket 63 of the wrapping drum 62. The presence of the transfer drum 80 allows, among other things, for a different orientation of the wraps 3 between the transfer conveyor 60 and the wrapping drum 62; namely, the transfer drum 80 can exclusively be used to give a different orientation to the wraps 3, leaving the feeding of the collars 17 to the pockets 63 of the wrapping drum 62 in the feeding station S7. The different orientation of the wraps 3, which is caused by the transfer drum 80, allows manufacturers to use, for the blank 28, the same order in the sequence of folds of the wrapping sheet 21.

[0051] According to a different embodiment which is not shown herein, the transfer drum 80, instead of being arranged at the end of the transfer conveyor 60 according to figure 25 (namely, between the transfer conveyor 60 and the wrapping drum 62), is arranged at the beginning of the transfer conveyor 60 (namely, between the wrapping conveyor 37 and the transfer conveyor 60).

[0052] Owing to the above, it is clear that there is the transfer station S2, which is arranged along the wrapping path P2 upstream of and at a certain distance - other than zero - from the feeding station S3 and where the wrapping conveyor 37 receives each group 14 of cigarettes; namely, the wrapping path P2 starts in the transfer station S2, which is arranged upstream of and at a certain

distance - other than zero - from the feeding station S3, and, therefore, the feeding station S3 is arranged in the area of an intermediate portion (not at the beginning and not at the end) of the wrapping path P2. Furthermore, each folding spindle 47 is only configured to be crossed, from side to side, by a group 14 of cigarettes moving along the straight wrapping path P2 and each folding spindle 47 is not configured to contain a group 14 of cigarettes while the folding spindle 47 moves between the receiving station S4 and the feeding station S3; namely, each folding spindle 47 is not a "container", which can contain a group 14 of cigarettes while the folding spindle 47 moves between the receiving station S4 and the feeding station S3; on the contrary, each folding spindle 47 is a mere support for a wrapping sheet 21, which is crossed by a group 14 of cigarettes moving along the wrapping path P2, while the folding spindle 47 is standing still in the feeding station S3. In other words, each folding spindle 47 cannot move a group 14 of cigarettes, but can only be crossed, from side to side, by a group 14 of cigarettes moving along the wrapping path P2, while the folding spindle 47 is standing still in the feeding station S3.

[0053] Finally, the moving conveyor 48 moves each folding spindle 47 in the feeding station S3 only when the folding spindle 47 is coupled to the wrapping sheet 21 and, at the same time, is without the group 14 of cigarettes and separate from the group 14 of cigarettes, so that the group 14 of cigarettes is coupled to the folding spindle 47, crossing it, only when the folding spindle 47 is standing still in the feeding station S3; this means that each folding spindle 47 is coupled to a group 14 of cigarettes (i.e. is crossed, from side to side, by the group 14 of cigarettes without the group 14 of cigarettes stopping inside the folding spindle 47) only and exclusively when the folding spindle 47 is standing still in the feeding unit S3, and each folding spindle 47 is not coupled in any way to a group 14 of cigarettes (i.e. remains far and separate from the group 14 of cigarettes) when the folding spindle 47 is not standing still in the feeding station S3.

[0054] According to a preferred, though non-binding embodiment, the movements of the different components (wrapping drums, feeding conveyors, pushers, movable folding elements...) of the packer machine 29 are carried out by means of respective electric motors, which are independent of one another and are synchronized (namely operated in phase) in a virtual manner (namely, not by means of a physical connection, but by means of a control connection). An electric motor (for example, the electric machine controlling the rotation of the wrapping drum 62) is usually used as a reference ("master") and all the other electric motors ("slaves") pursue the position of the reference electric motor ("master"). In order to obtain the linear movements (namely, those movements that involve a displacement along a straight trajectory), a rotary electric motor is generally used, which causes the rotation of a pinion meshing with a rack; namely, a "pinion-rack" mechanism is used to turn the

rotary movement generated by the electric motor into a linear movement.

[0055] The embodiments described herein can be combined with one another, without for this reason going beyond the scope of protection of the invention.

[0056] The packer machine 29 described above has numerous advantages.

[0057] First of all, the wrapping unit B of the packer machine 29 described above allows manufacturers to produce wraps 3 for cigarette packs 1 with a high production quality (namely, having extremely precise and square folds of the wrapping sheet 21), even operating at a high production speed (namely, with a large number of wraps 3 produced per unit of time). This result is also due to the fact that each wrapping sheet 21 is folded, at first, against metal elements (namely, between the folding spindle 47 and the folding body 58 of the folding device 57), which allow manufacturers to obtain precise and square folds.

[0058] Furthermore, the packer machine 29 described above allows manufacturers to change the format of the cigarette packs 1 in a relatively simple and quick fashion.

[0059] Finally, the packer machine 29 described above is compact and allows ideal access to all the components thereof; indeed, an operator standing in front of the packer machine 29 is capable of reaching the active parts of the packer machine 29 with his/her own hands in a simple, quick and ergonomic fashion. In particular, an operator standing in front of the packer machine 29 can easily reach, with the hands, the hopper 33, the forming conveyor 36, the wrapping conveyor 37, the transfer conveyor 60 and the wrapping drums 62 and 72.

[0060] The embodiment shown in the accompanying figures relates to the production of a cigarette pack, but the invention can also be applied, without significant changes, to the production of any other type of pack for smoking articles (for example, a pack for cigars, a pack for electronic cigarettes with liquid vaporisation, a pack for new-generation cigarettes without tobacco combustion...).

Claims

1. A wrapping unit (B) to fold a wrapping sheet (21) around a group (14) of smoking articles; the wrapping unit (B) comprises:

a wrapping conveyor (37), which is designed to move the group (14) of smoking articles along a straight wrapping path (P2);
a feeding station (S3), which is arranged along the wrapping path (P2); and
a feeding device (41), which is designed to place the wrapping sheet (21) in the feeding station (S3) so that the group (14) of smoking articles, while moving along the wrapping path (P2), intercepts the wrapping sheet (21), thus causing

the wrapping sheet (21) to be folded in a "U"-shape around the group (14) of smoking articles; wherein the feeding device (41) comprises:

at least one folding spindle (47) provided with a central passage channel (51), through which the group (14) of smoking articles can pass, and with an outer surface (52), which is arranged around the central passage channel (51) and is designed to receive and hold the wrapping sheet (21); a first folding device (57), which is separate from and independent of the wrapping conveyor (37) and is designed to fold the wrapping sheet (21) against the outer surface (52) of the folding spindle (47); and a moving conveyor (48), which cyclically moves the folding spindle (47) between a receiving station (S4) in the area of the first folding device (57), where the wrapping sheet (21) is coupled to the folding spindle (47), and the feeding station (S3) in the area of the wrapping path (P2), where the central passage channel (51) of the folding spindle (47) is crossed by the group (14) of smoking articles; the wrapping unit (B) is **characterized in that:**

a transfer station (S2) is provided, which is arranged along the wrapping path (P2) upstream of and at a certain distance - other than zero - from the feeding station (S3) and where the wrapping conveyor (37) receives the group (14) of smoking articles; the folding spindle (47) is only configured to be crossed, from side to side, by the group (14) of smoking articles moving along the straight wrapping path (P2) and the folding spindle (47) is not configured to contain the group (14) of smoking articles while the folding spindle (47) moves between the receiving station (S4) and the feeding station (S3); and the moving conveyor (48) moves the folding spindle (47) in the feeding station (S3) only when the folding spindle (47) is coupled to the wrapping sheet (21) and, at the same time, is without the group (14) of smoking articles and separate from the group (14) of smoking articles, so that the group (14) of smoking articles is coupled to the folding spindle (47), crossing it, only when the folding spindle (47) is standing still in the feeding station (S3).

2. The wrapping unit (B) according to claim 1, wherein the moving conveyor (48) comprises a moving drum (49), which is mounted so as to rotate around a rotation axis (50), which is parallel to the wrapping path (P2).
3. The wrapping unit (B) according to claim 2, wherein the outer surface (52) of the folding spindle (47) is "U"-shaped and consists of an outer wall (53), an inner wall (54), which is integral to a central hub of the moving drum (49), and a joining wall (55), which is interposed between the outer wall (53) and the inner wall (54) and is perpendicular to the wrapping path (P2).
4. The wrapping unit (B) according to claim 2 or 3, wherein the moving drum (49) supports four folding spindles (47) arranged at 90° relative to one another.
5. The wrapping unit (B) according to one of the claims from 1 to 4, wherein the folding spindle (47) comprises sucking means to hold the wrapping sheet (21) between the receiving station (S4) and the feeding station (S3).
6. The wrapping unit (B) according to one of the claims from 1 to 5, wherein:

the wrapping conveyor (37) comprises a conveyor belt (38), which is arranged along the wrapping path (P2), and a pushing device (39), which is connected to the conveyor belt (38) by means of a support column (40) and is designed to engage a rear wall of the group (14) of smoking articles so as to push the group (14) of smoking articles along the wrapping path (P2); and the outer surface (52) of the folding spindle (47) has a through slit (56), through which the support column (40) of the pushing device (39) passes.

7. The wrapping unit (B) according to one of the claims from 1 to 6, wherein:

the outer surface (52) of the folding spindle (47) is "U"-shaped and consists of an outer wall (53), an inner wall (54), and a joining wall (55), which is interposed between the outer wall (53) and the inner wall (54) and is perpendicular to the wrapping path (P2); and the outer wall (53) and the inner wall (54) each form, with the joining wall (55), a same obtuse angle, preferably ranging from 95° to 115°.
8. The wrapping unit (B) according to one of the claims from 1 to 7 and comprising a feeding device (41), which places the wrapping sheet (21) flat in the receiving station (S4) and between the folding spindle (47) and the first folding device (57).

9. The wrapping unit (B) according to claim 8, wherein the folding device (57) comprises:

a folding body (58), which reproduces in negative the shape of the folding spindle (47) so as to completely fold the wrapping sheet (21) around the folding spindle (47); and
 a first operating device (59), which is designed to cyclically translate the folding body (58) between a rest position, in which the folding body (58) is separate from the folding spindle (47), and a work position, in which the folding body (58) embraces the folding spindle (47) with the interposition of the wrapping sheet (21).

10. The wrapping unit (B) according to claim 9, wherein the folding device (57) comprises:

a stretching body (78), which reproduces in negative the initial shape of the folding spindle (47) so as to fold the wrapping sheet (21) only around two corners of a joining wall (55) of an outer surface (52) of the folding spindle (47); and
 a second operating device (79), which is completely independent of the first operating device (59) and is designed to cyclically translate the stretching body (78) between a rest position, in which the stretching body (78) is separate from the folding spindle (47), and a work position, in which the stretching body (78) embraces the folding spindle (47) with the interposition of the wrapping sheet (21).

11. The wrapping unit (B) according to claim 10, wherein, at first, the second operating device (79) couples the stretching body (78) to the folding spindle (47) in order to start folding the wrapping sheet (21) against the folding spindle (47) and, only subsequently, the first operating device (59) couples the folding body (58) to the folding spindle (47) in order to finish folding the wrapping sheet (21) against the folding spindle (47).

12. The wrapping unit (B) according to claim 10 or 11, wherein the folding body (58) has a shape that is complementary to the one of the stretching body (78), so that, in the work position, the folding body (58) and the stretching body (78) can be both in contact with the folding spindle (47) in the same moment.

13. The wrapping unit (B) according to one of the claims from 1 to 12 and comprising:

a second folding device (45), which is arranged along the wrapping path (P2) downstream of the feeding station (S3) and is designed to fold two open side ends of the "U"-folded wrapping sheet (21) so as to obtain a tubular wrap having an

open rear end; and

a third folding device (46), which is arranged along the wrapping path (P2) downstream of the second folding device (45) and is designed to finish folding the wrapping sheet (21) around the group (14) of smoking articles in order to close the open rear end.

14. The wrapping unit (B) according to one of the claims from 1 to 13 and comprising:

a pocket (35), which is designed to contain the group (14) of smoking articles;
 a hopper (33), which is provided with an output mouth (34), from which the group (14) of smoking articles can be extracted; and
 a forming conveyor (36), which moves a pocket (35) along a forming path (P1), which is perpendicular to the wrapping path (P2), through an input station (S1), where the group (14) of smoking articles is pulled out of the output mouth (34) of the hopper (33) and gets into the pocket (35), and through the transfer station (S2) in the area of the wrapping path (P2), where the wrapping conveyor (37) pulls the group (14) of smoking articles out of the pocket (35).

15. A wrapping method to fold a wrap (21) around a group (14) of smoking articles; the wrapping method comprises the steps of:

moving, by means of a wrapping conveyor (37), the group (14) of smoking articles along a straight wrapping path (P2); and
 placing, by means of a feeding device (41), the wrapping sheet (21) in a feeding station (S3) along the wrapping path (P2) so that the group (14) of smoking articles, while moving along the wrapping path (P2), intercepts the wrapping sheet (21), thus causing the wrapping sheet (21) to be folded in a "U"-shape around the group (14) of smoking articles;
 wherein the feeding device (41) comprises:

at least one folding spindle (47) provided with a central passage channel (51), through which the group (14) of smoking articles can pass, and with an outer surface (52), which is arranged around the central passage channel (51) and is designed to receive and hold the wrapping sheet (21);
 a folding device (57), which is separate from and independent of the wrapping conveyor (37) and is designed to fold the wrapping sheet (21) against the outer surface (52) of the folding spindle (47); and
 a moving conveyor (48), which cyclically moves the folding spindle (47) between a

receiving station (S4) in the area of the folding device (57), where the wrapping sheet (21) is coupled to the folding spindle (47), and a feeding station (S3) in the area of the wrapping path (P2), where the central passage channel (51) of the folding spindle (47) is crossed by the group (14) of smoking articles;
the wrapping method is **characterized in that:**

a transfer station (S2) is provided, which is arranged along the wrapping path (P2) upstream of and at a certain distance - other than zero - from the feeding station (S3) and where the wrapping conveyor (37) receives the group (14) of smoking articles;
the folding spindle (47) is only configured to be crossed, from side to side, by the group (14) of smoking articles moving along the straight wrapping path (P2) and the folding spindle (47) is not configured to contain the group (14) of smoking articles while the folding spindle (47) moves between the receiving station (S4) and the feeding station (S3); and
the moving conveyor (48) moves the folding spindle (47) in the feeding station (S3) only when the folding spindle (47) is coupled to the wrapping sheet (21) and, at the same time, is without the group (14) of smoking articles and separate from the group (14) of smoking articles, so that the group (14) of smoking articles is coupled to the folding spindle (47), crossing it, only when the folding spindle (47) is standing still in the feeding station (S3).

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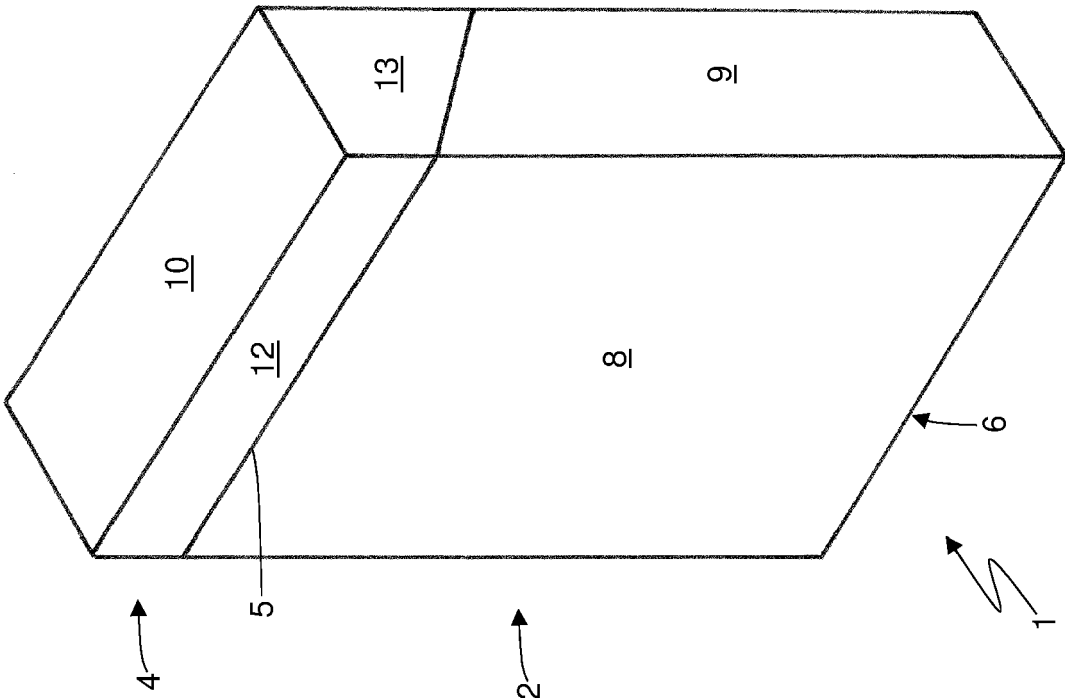


Fig. 2

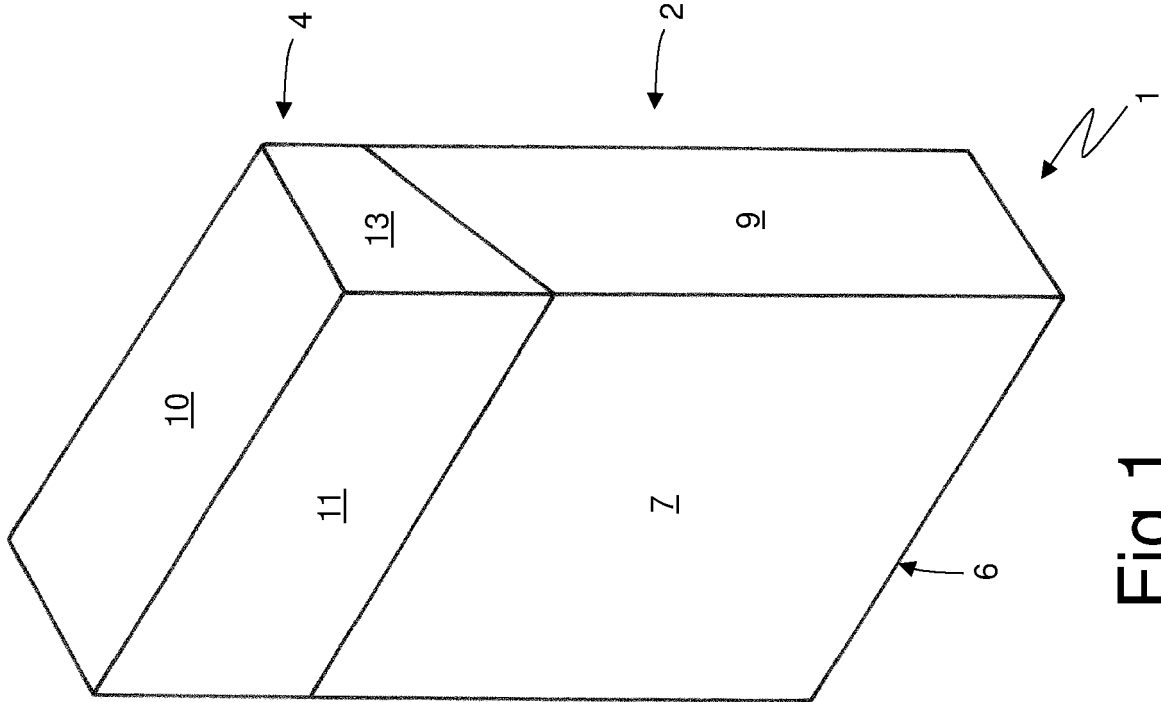


Fig. 1

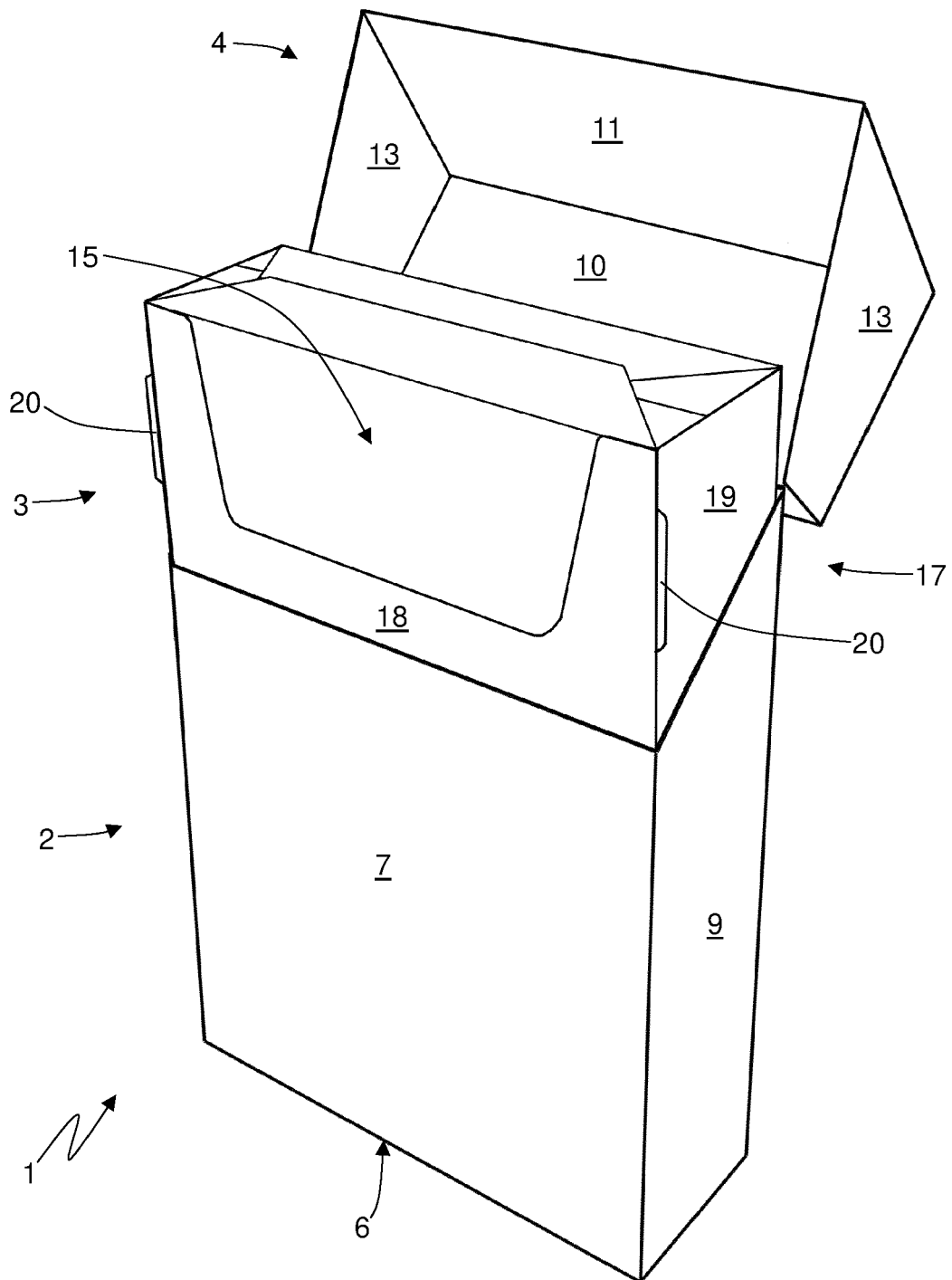


Fig.3

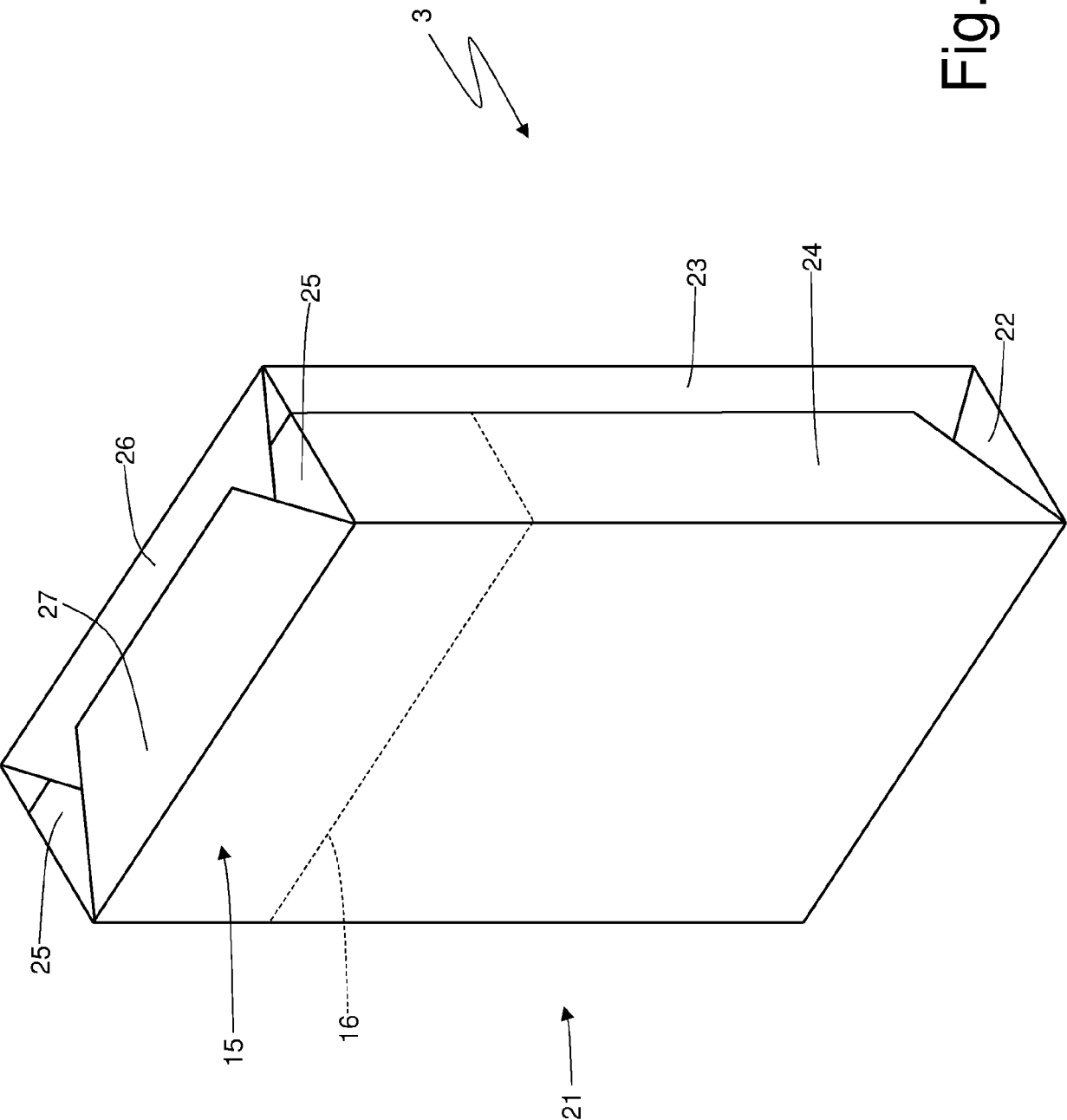
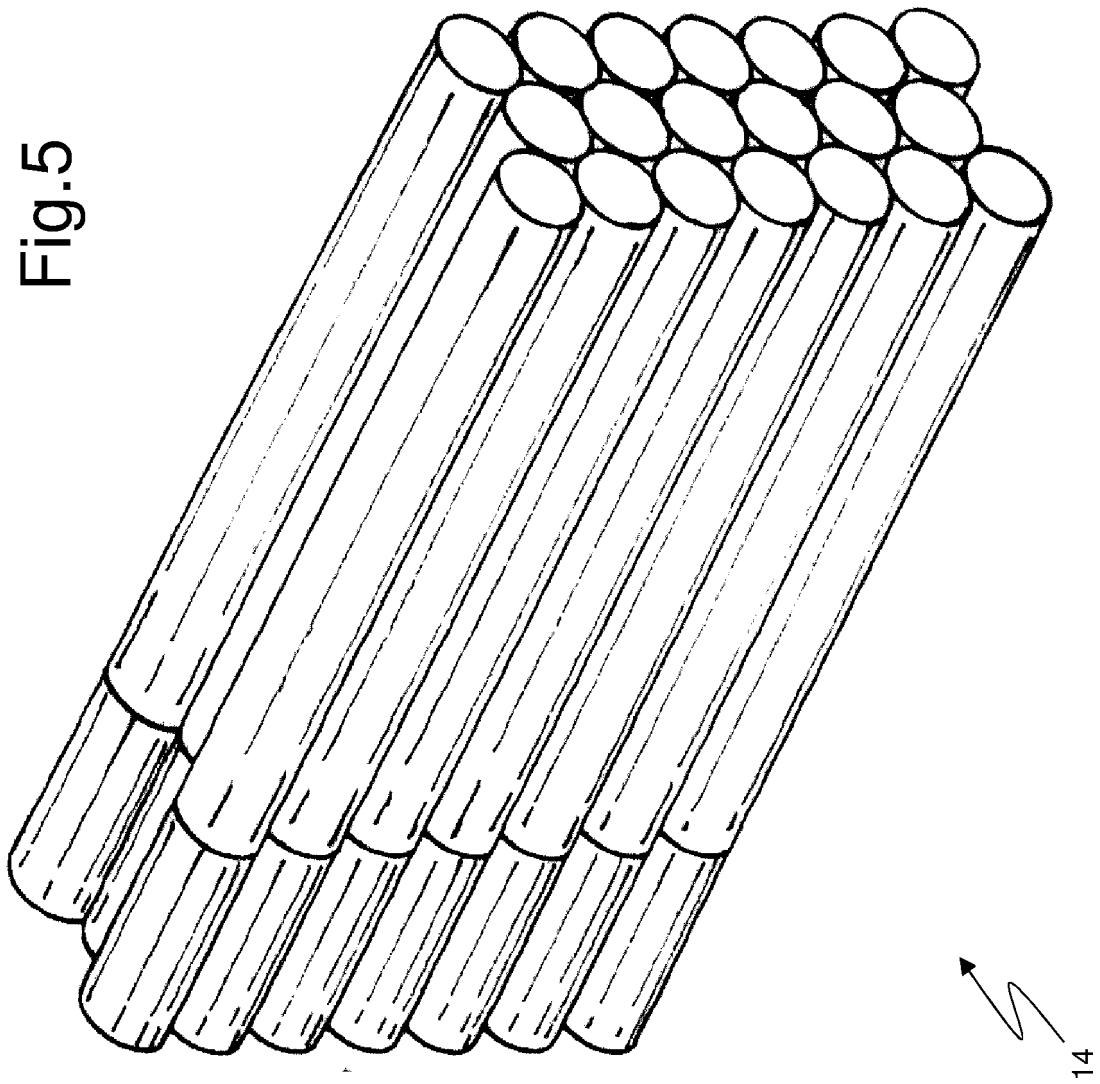


Fig.4



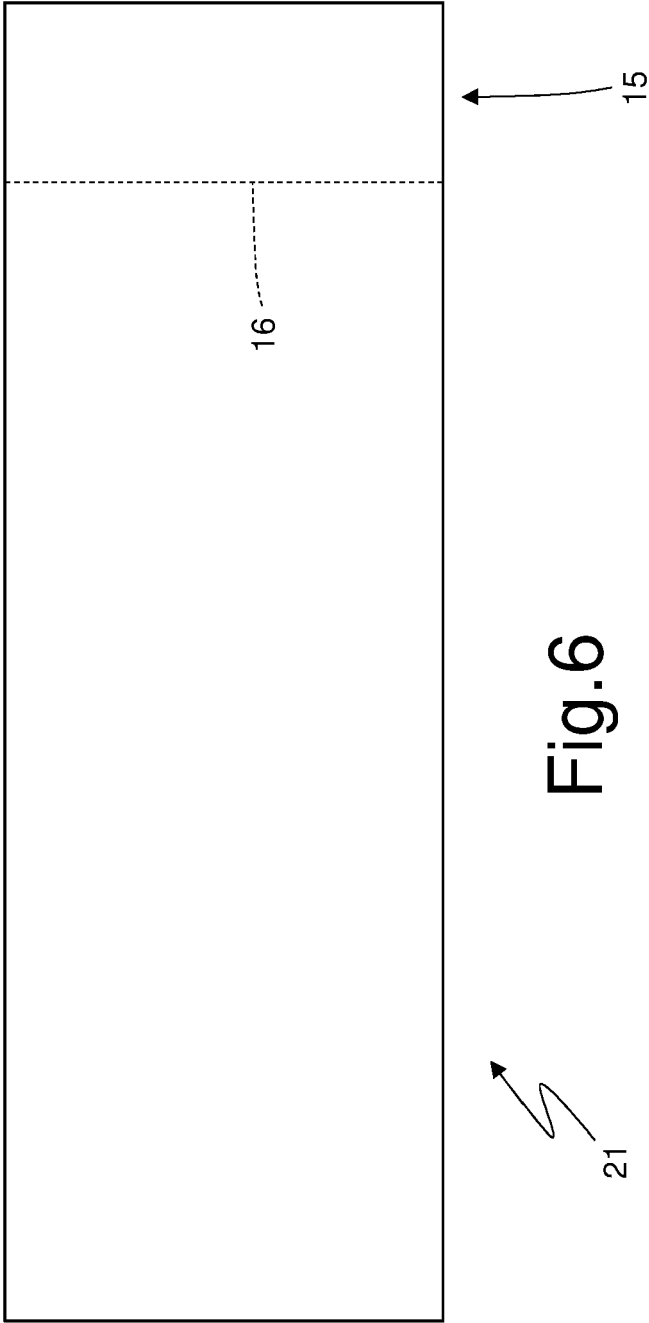


Fig. 6

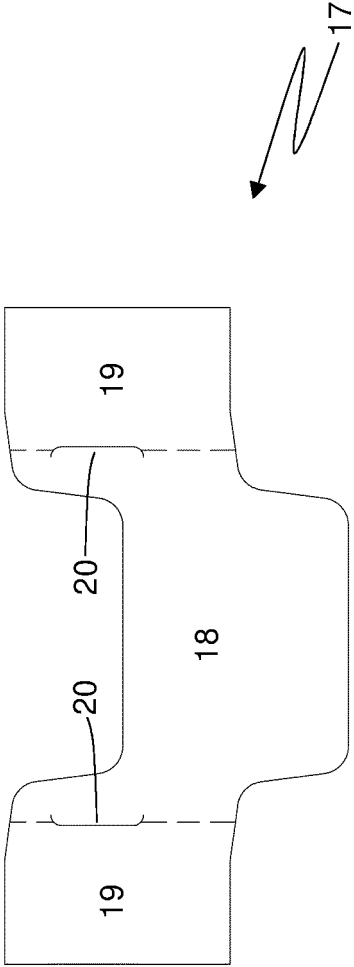


Fig. 7

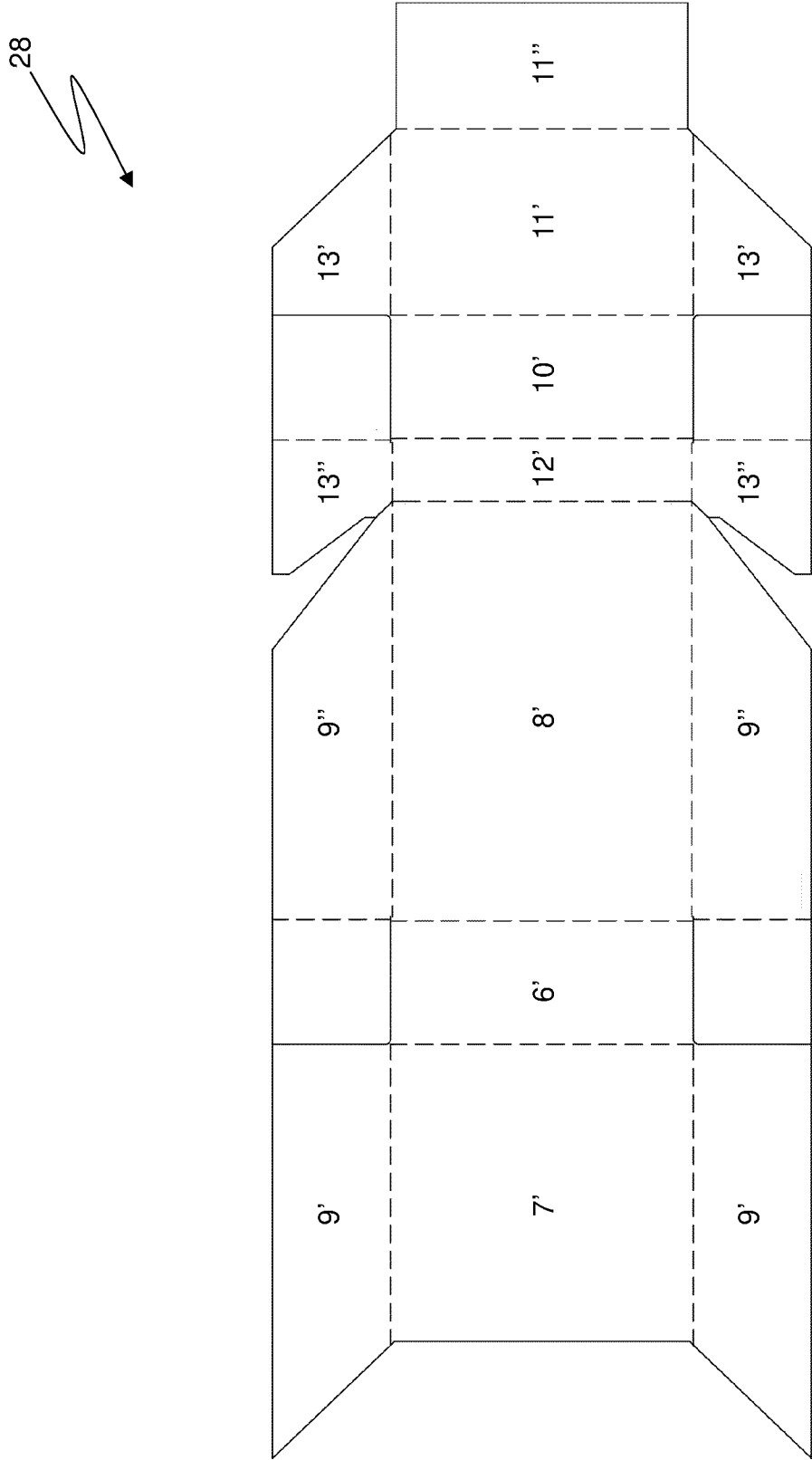


Fig.8

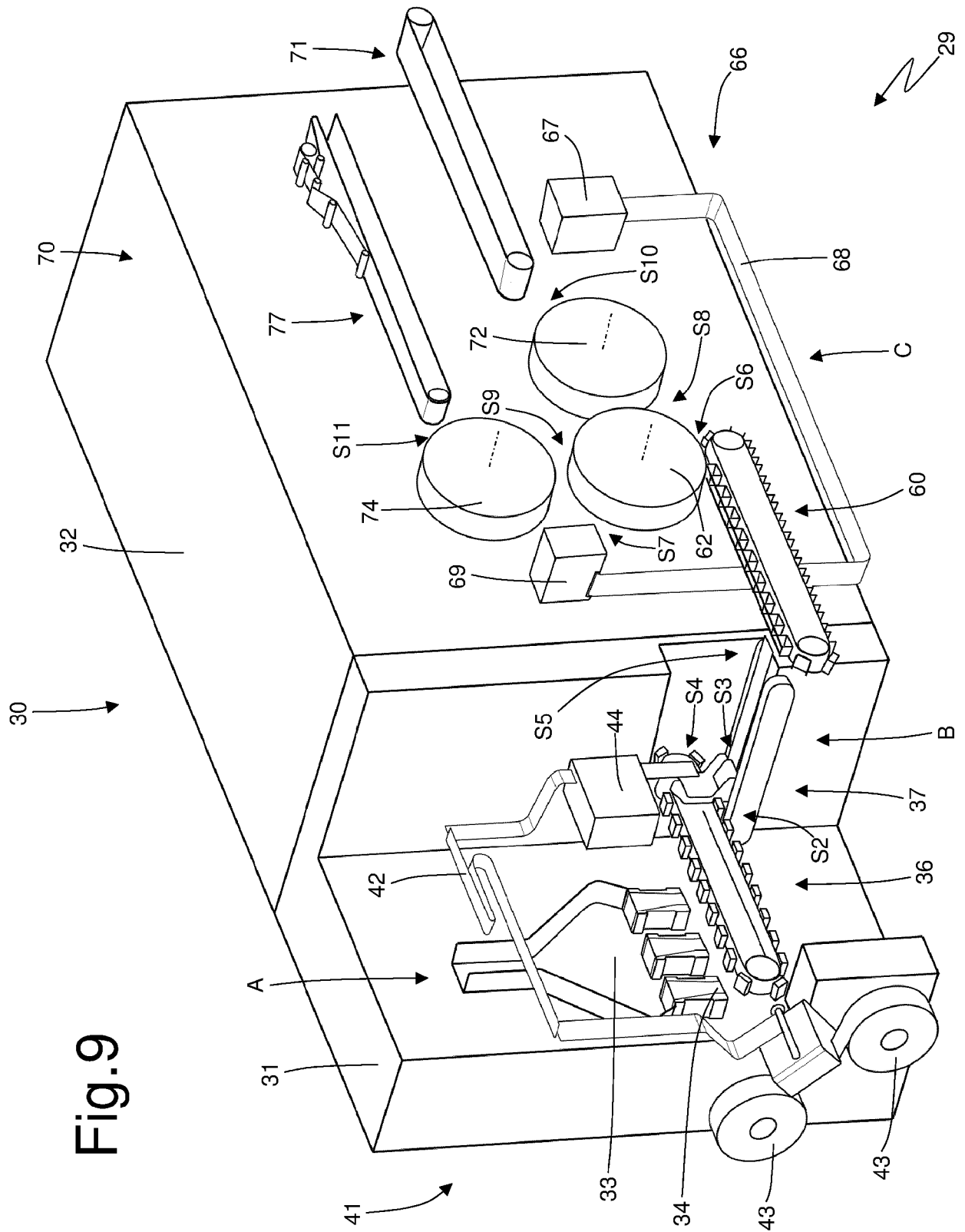


Fig. 9

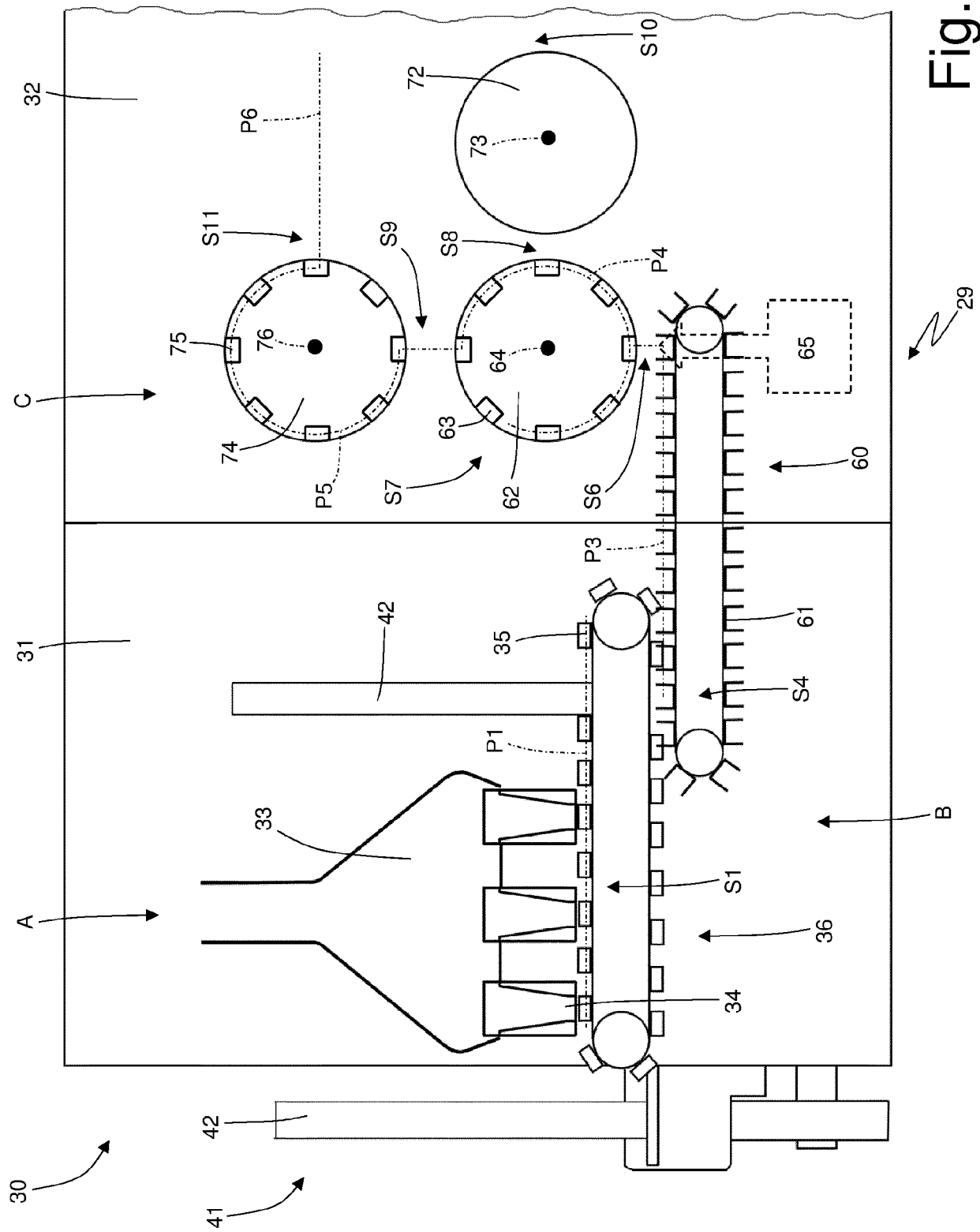


Fig. 10

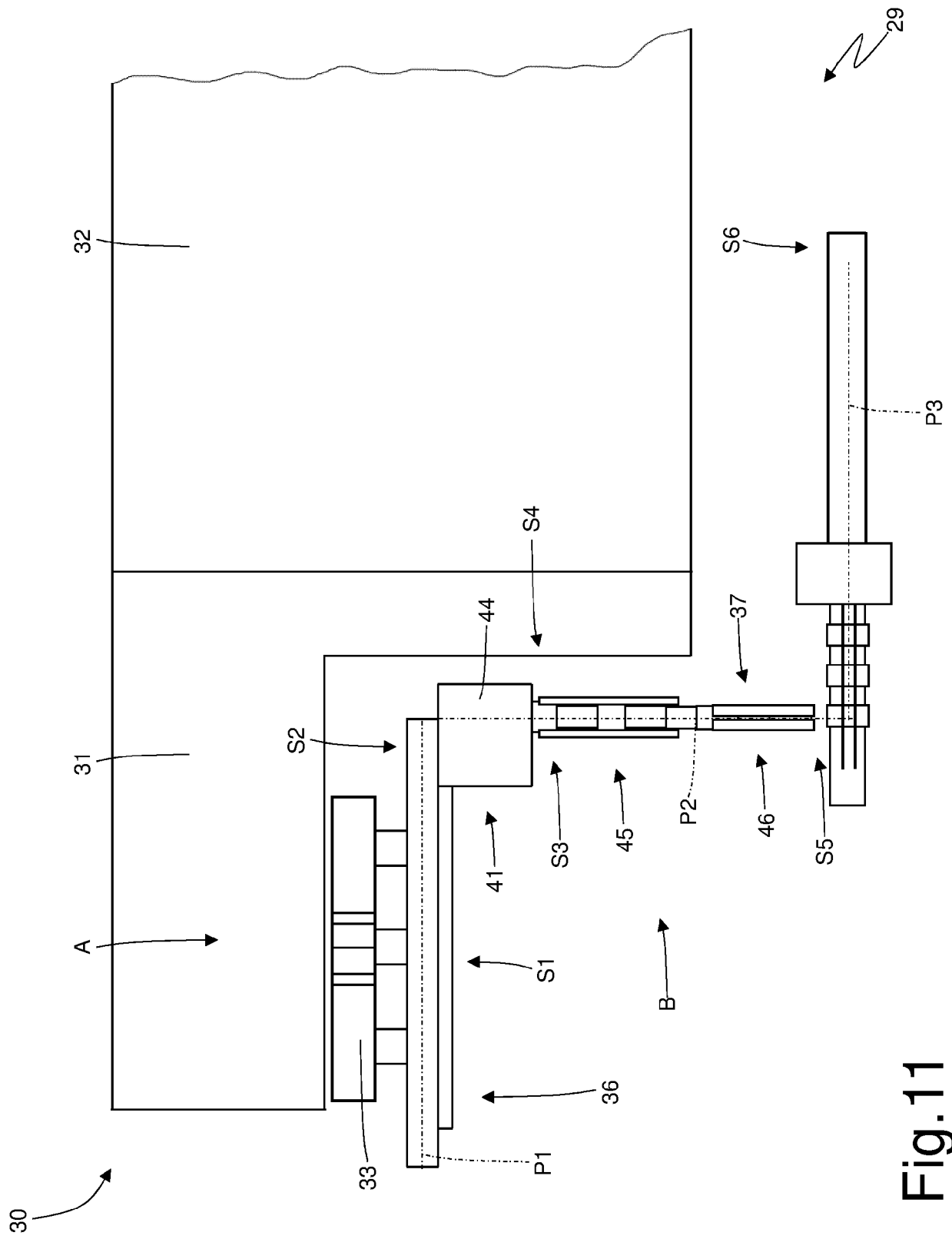


Fig. 11

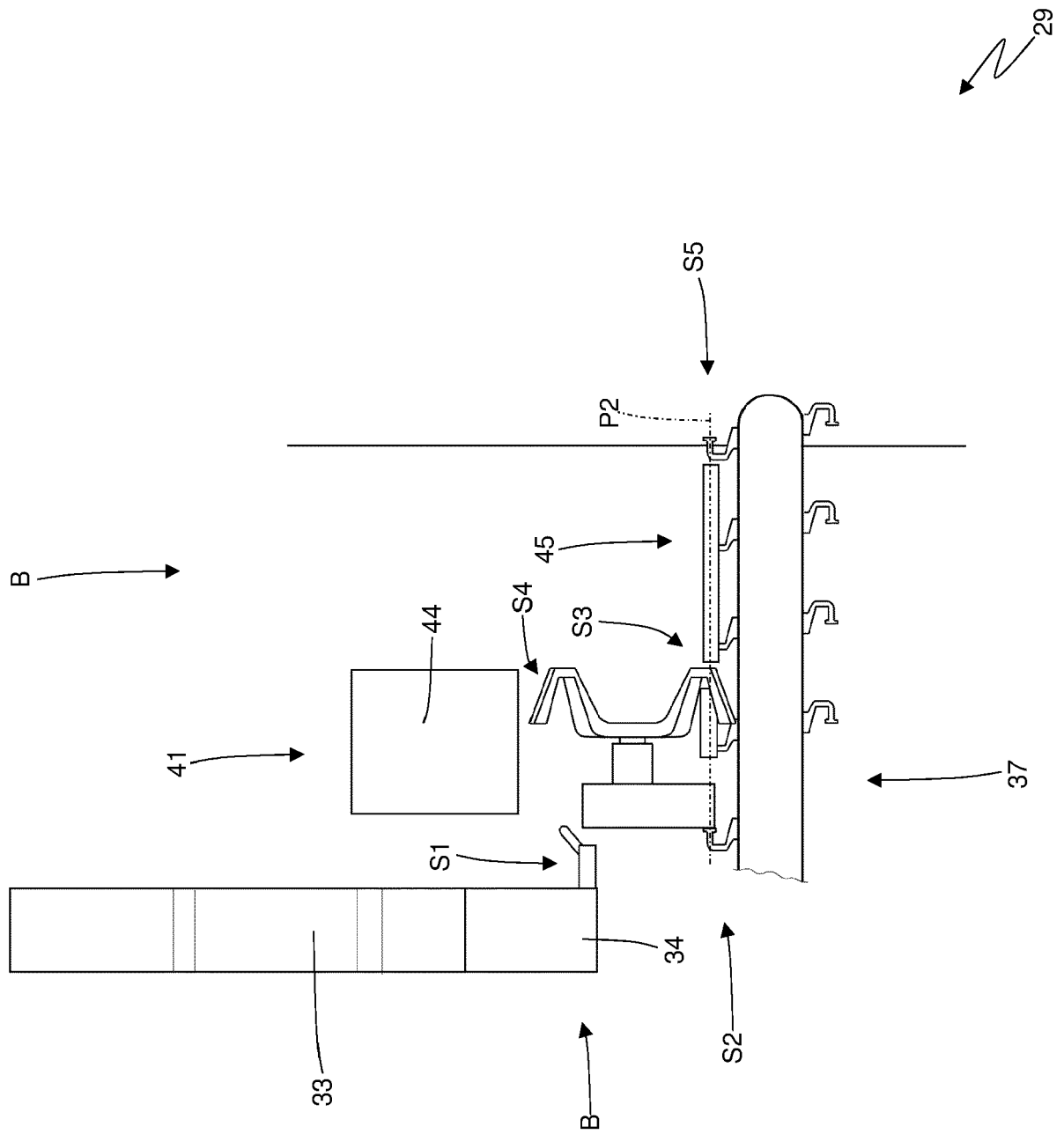
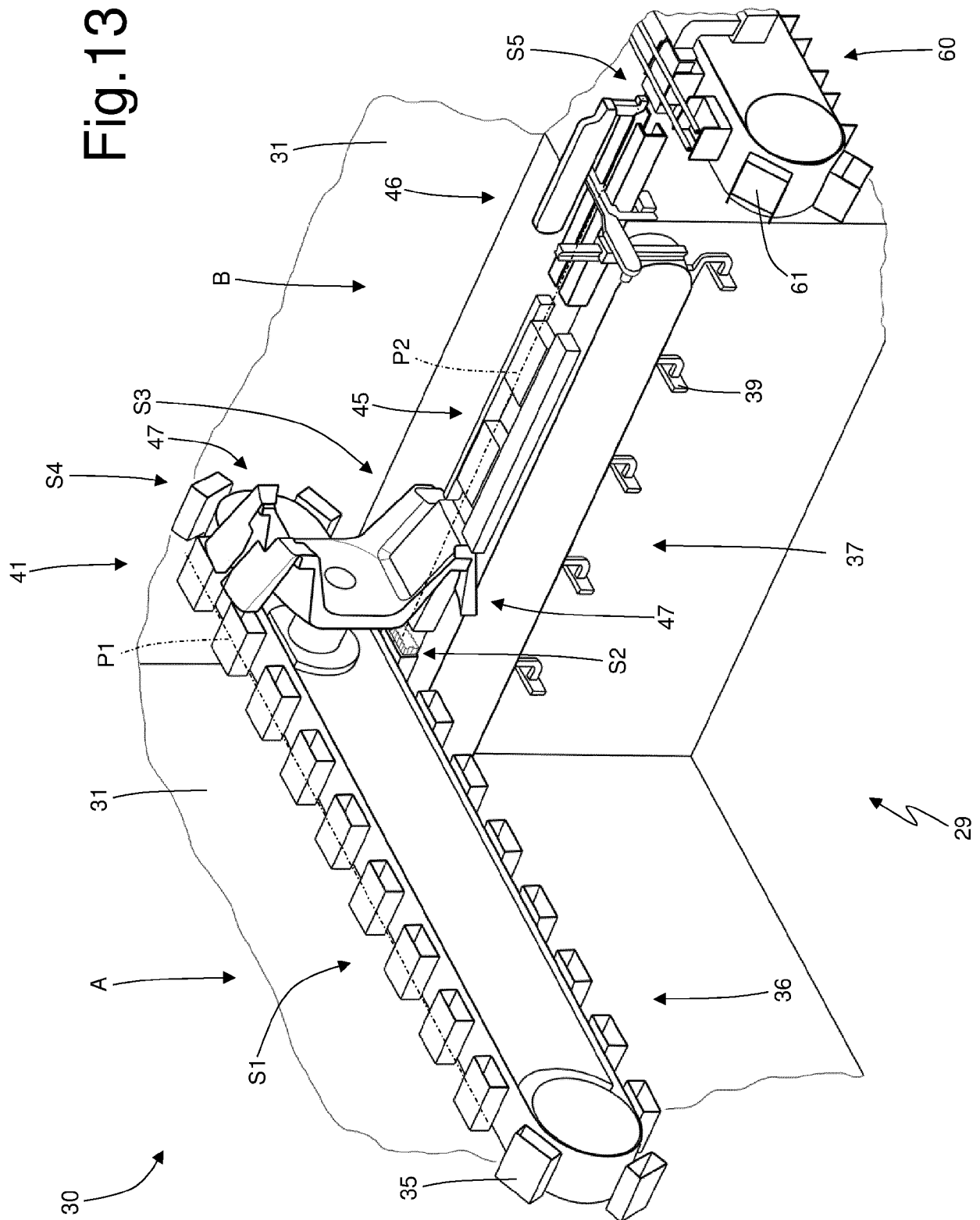


Fig. 12

Fig. 13



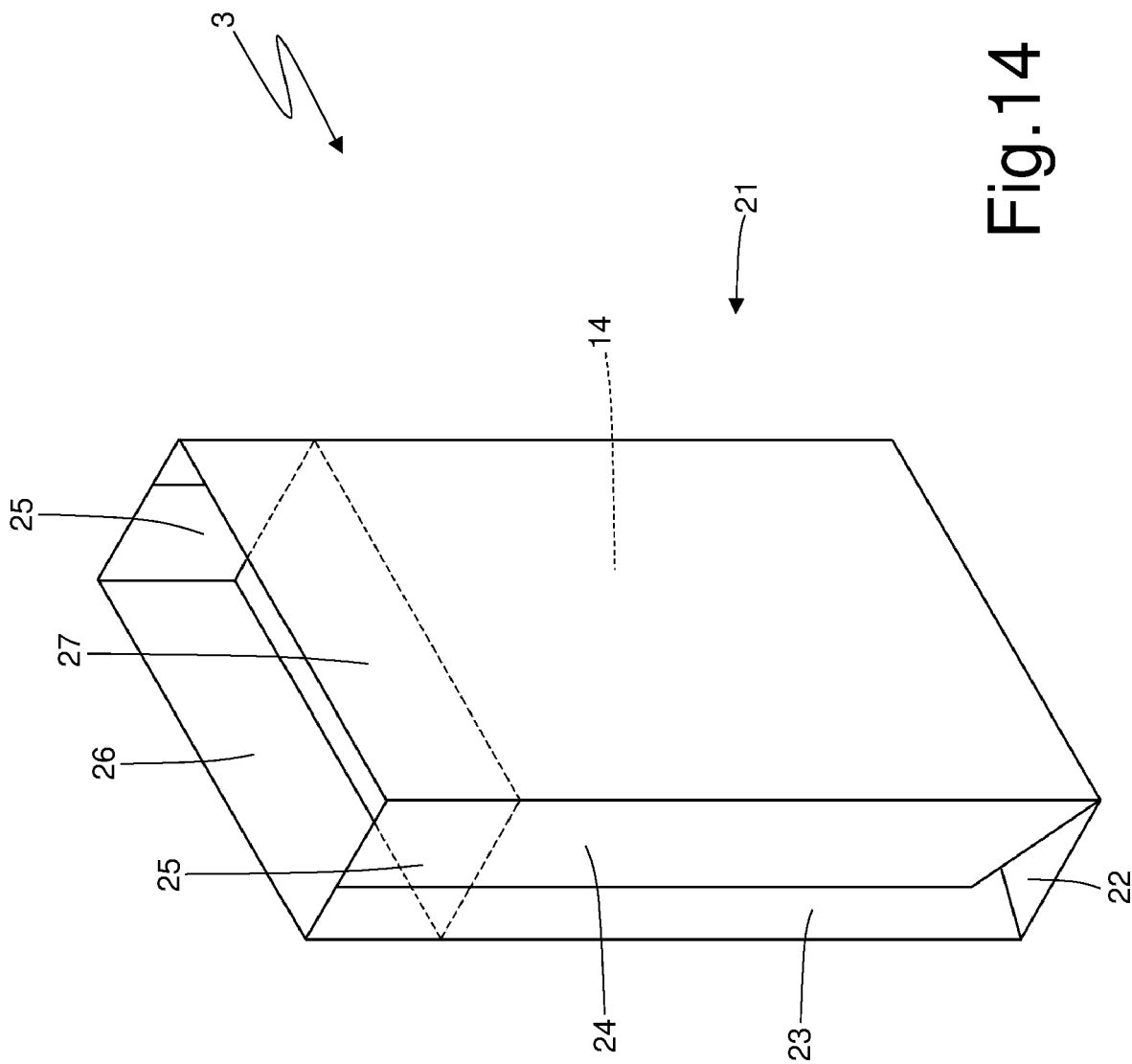


Fig.14

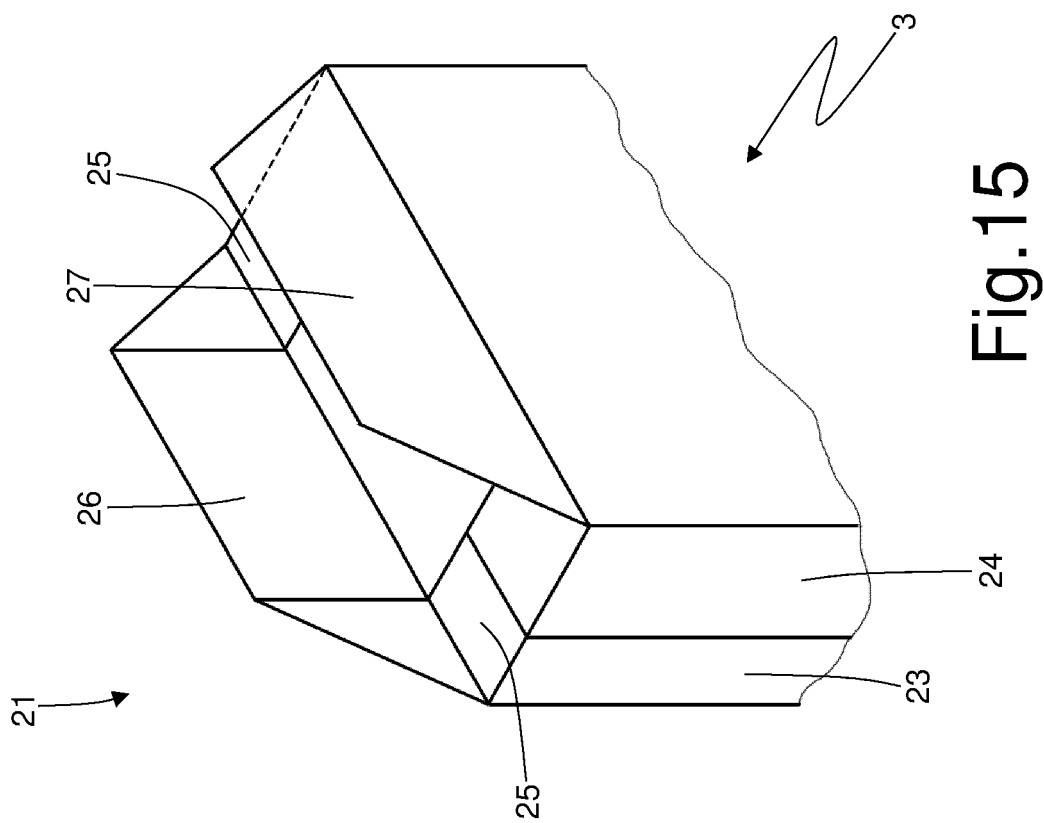


Fig. 15

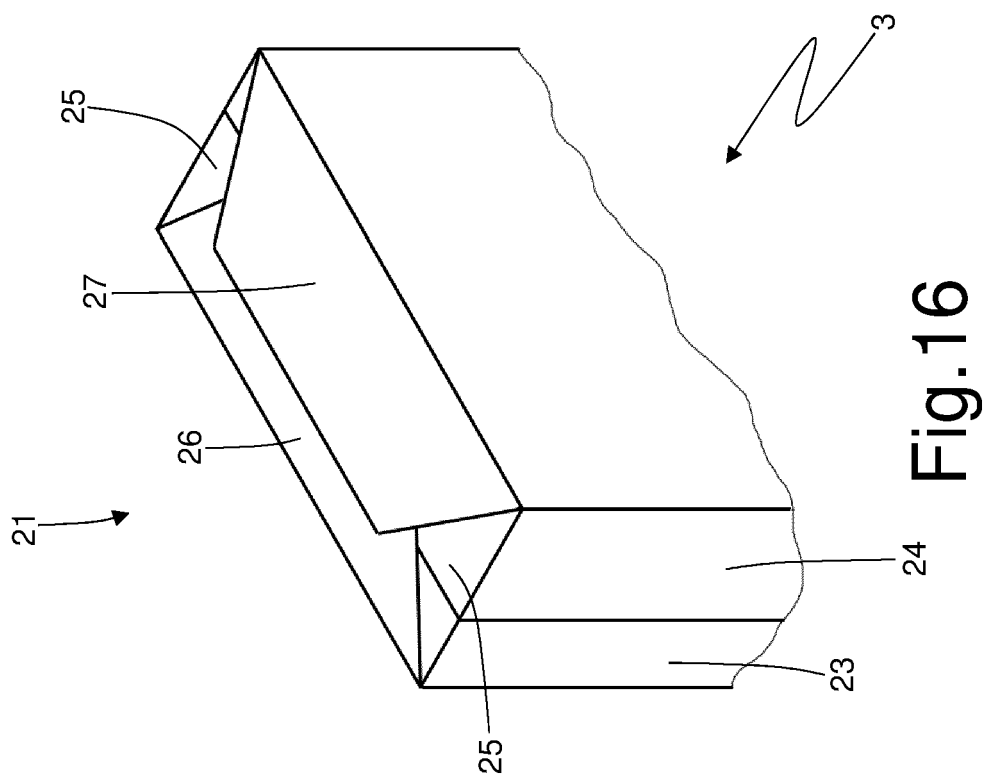


Fig. 16

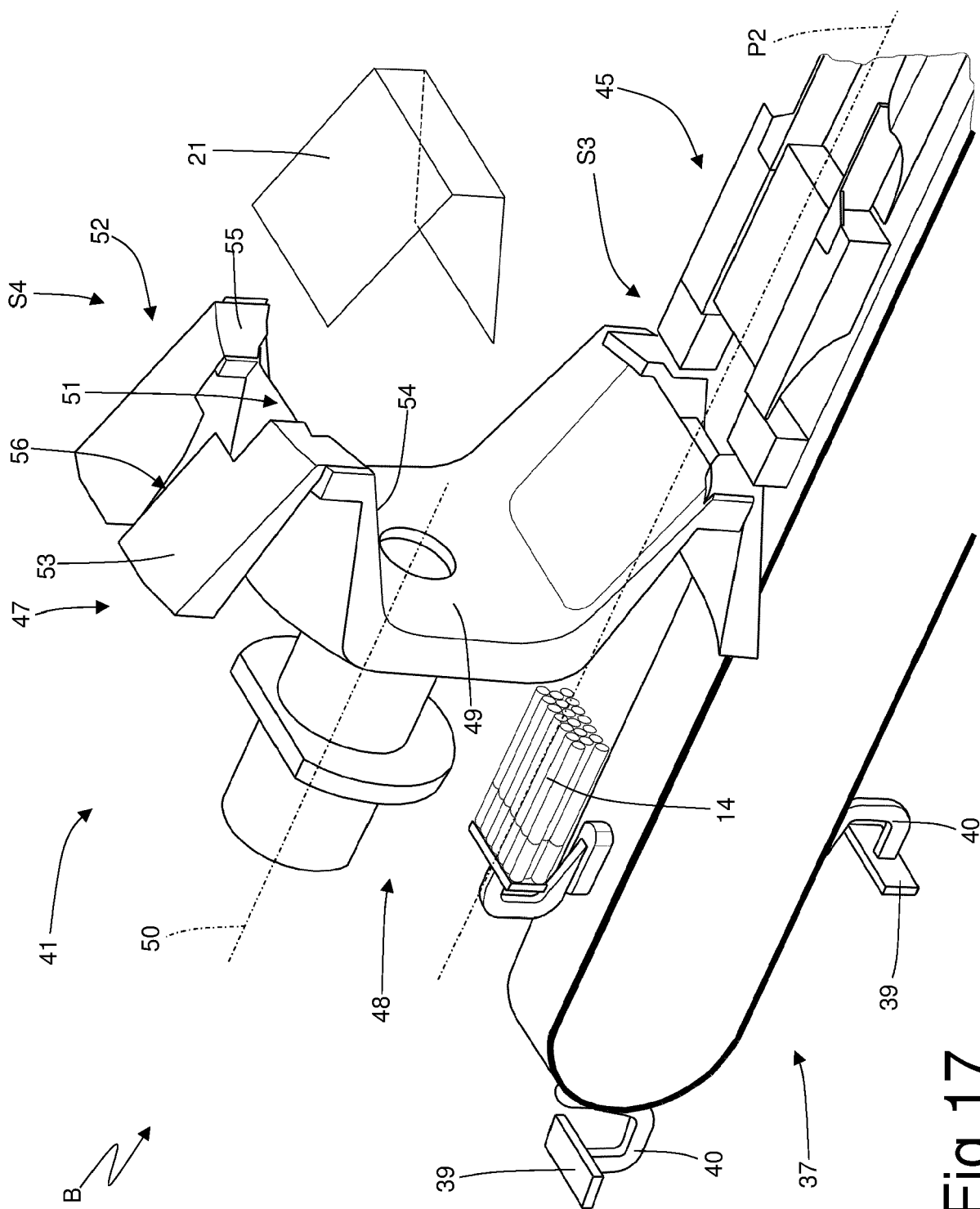


Fig. 17

Fig. 18

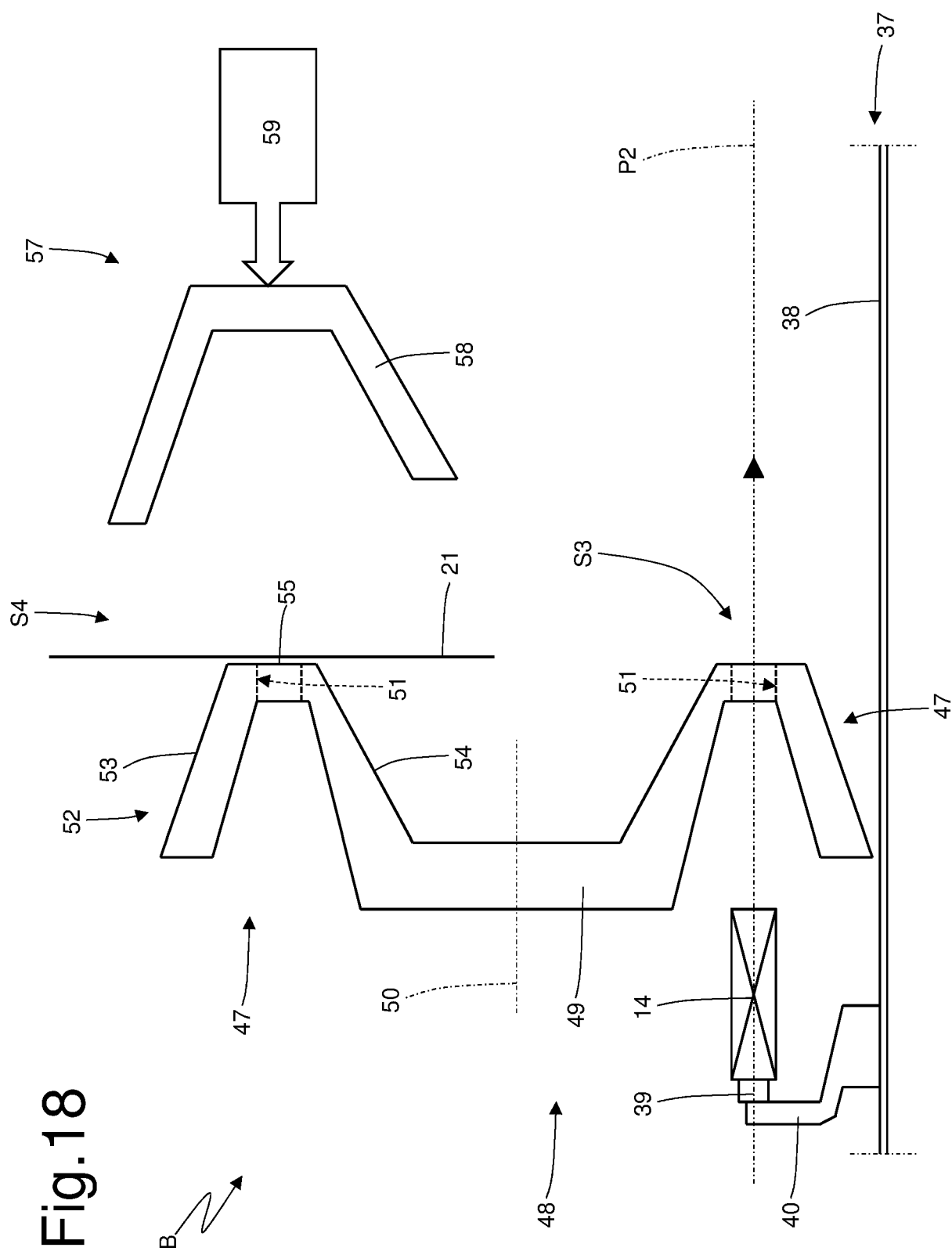


Fig.19

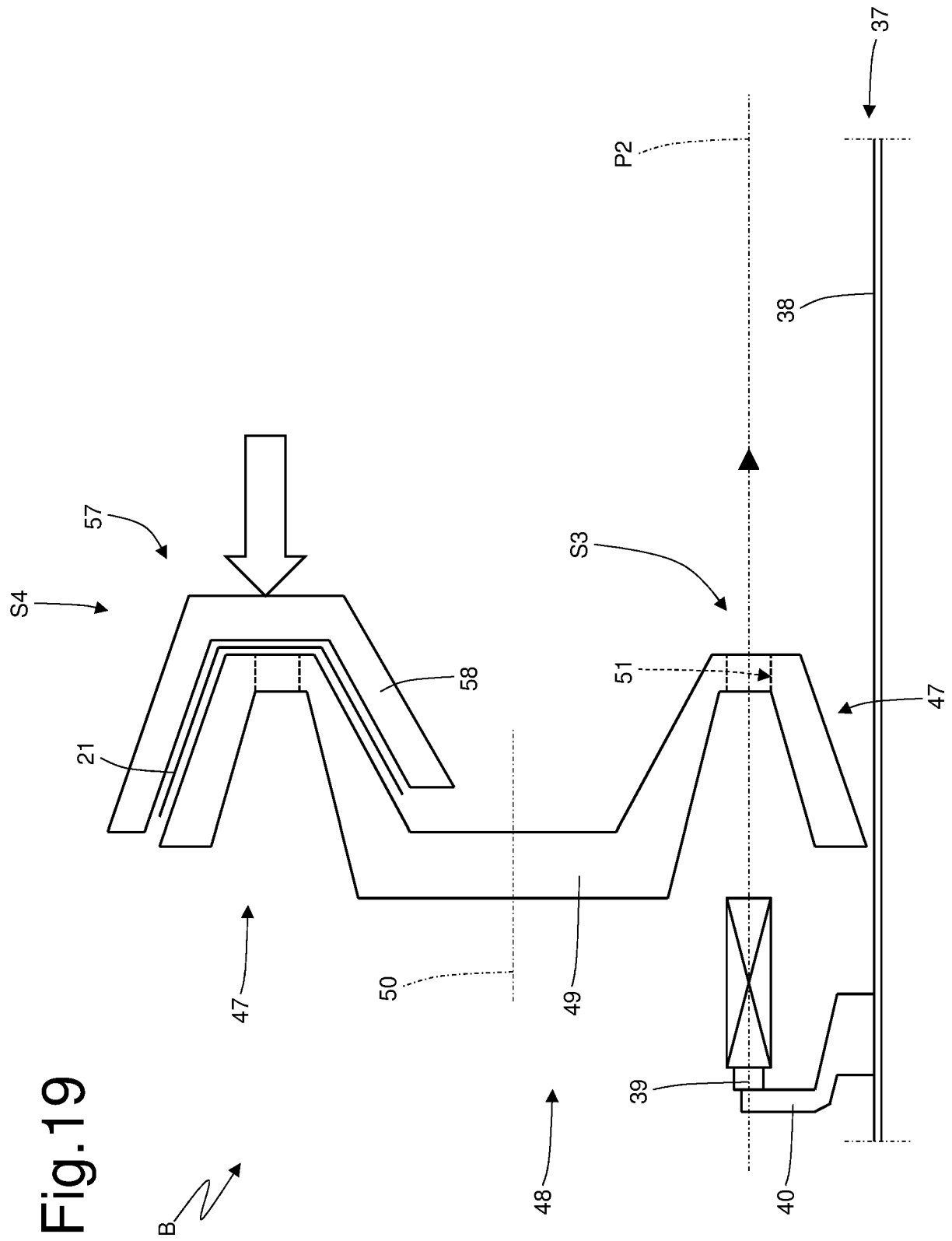
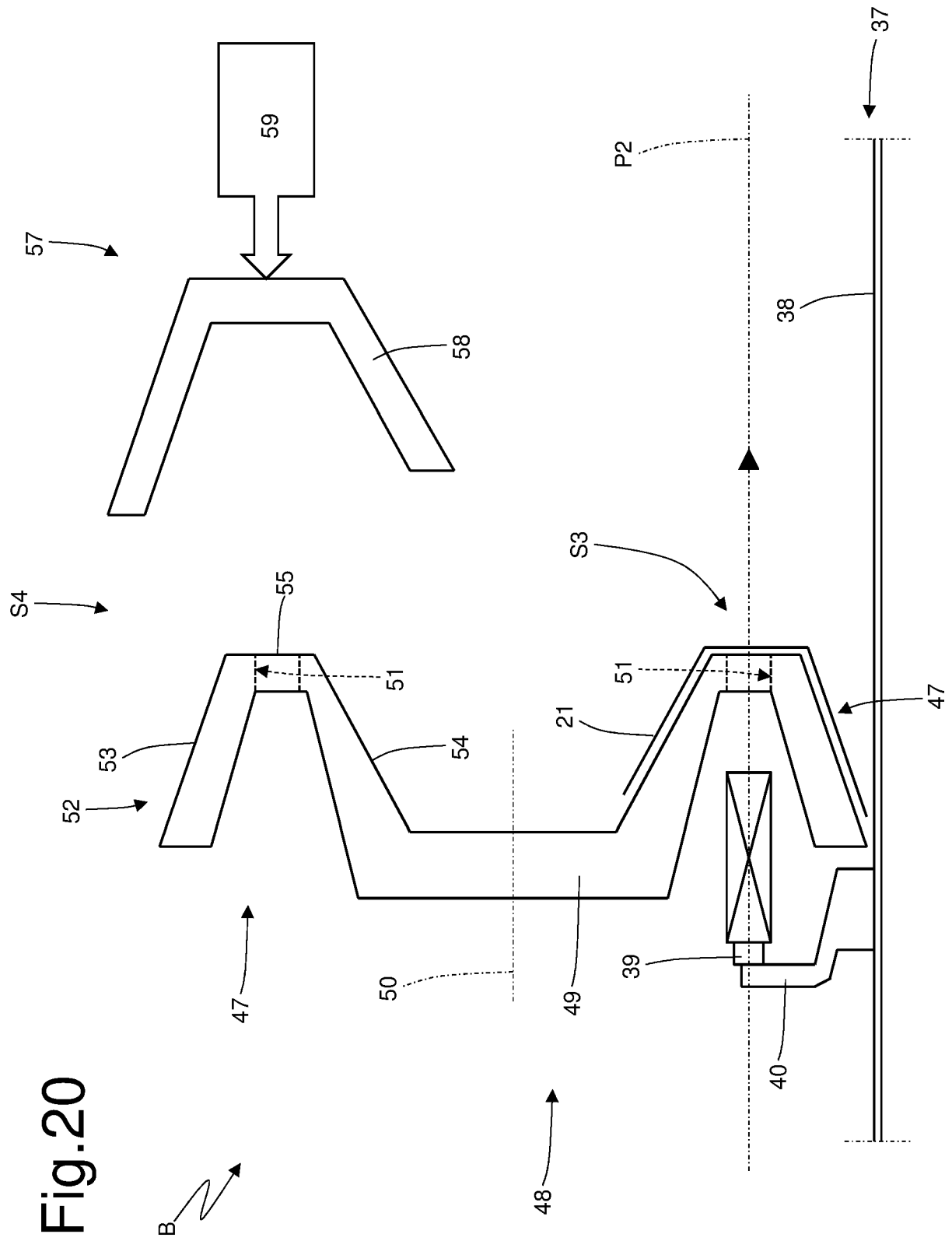


Fig.20



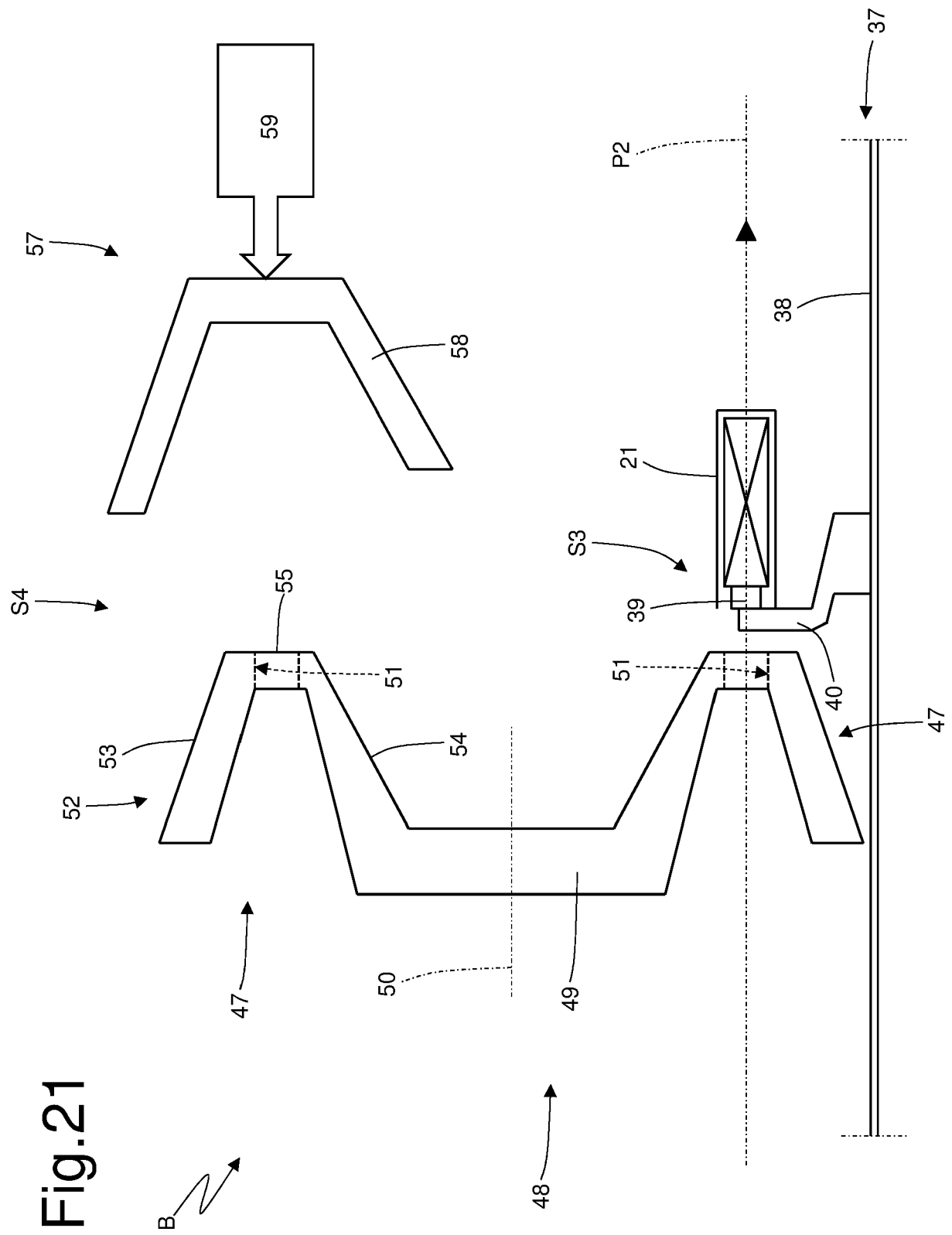


Fig.22

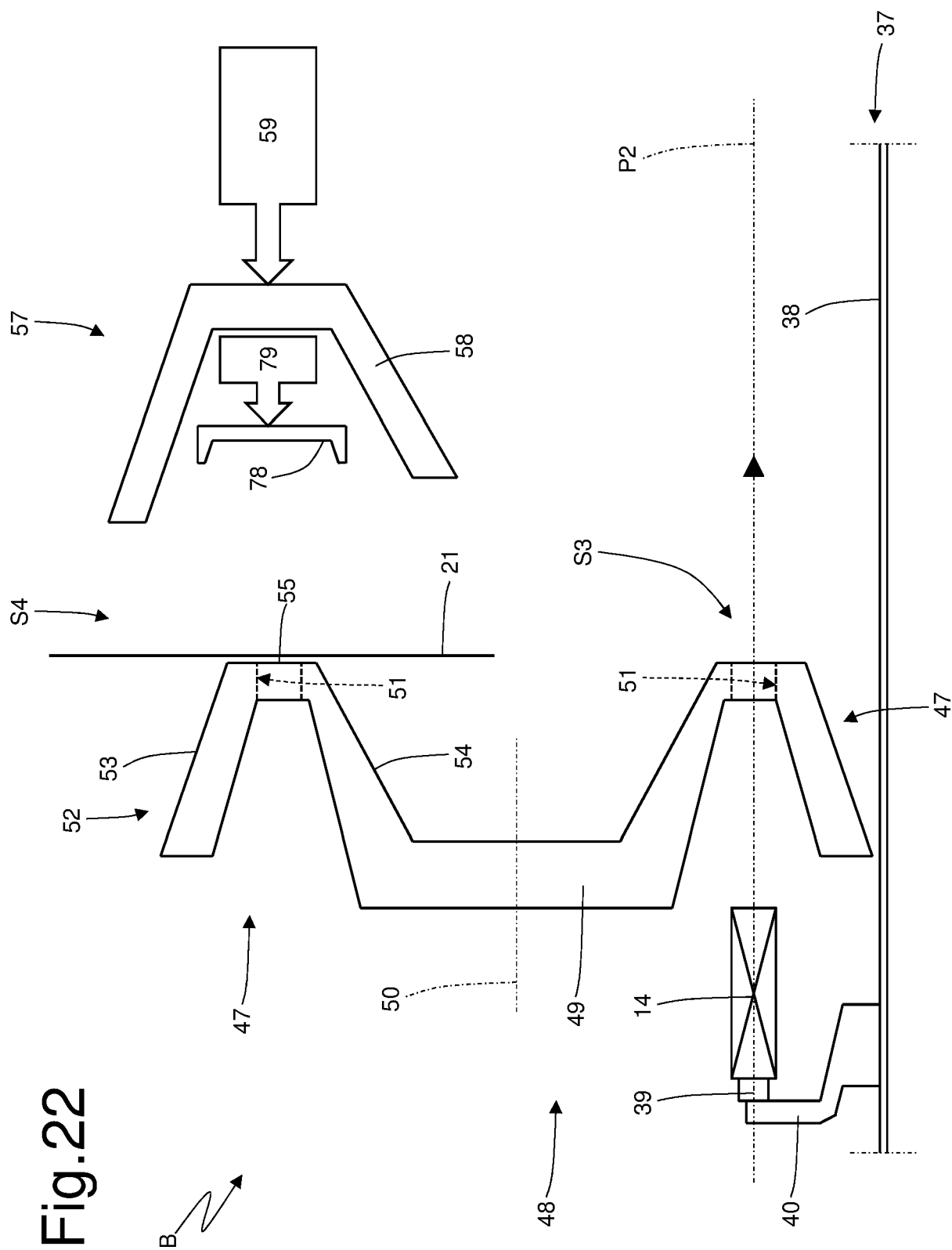


Fig.23

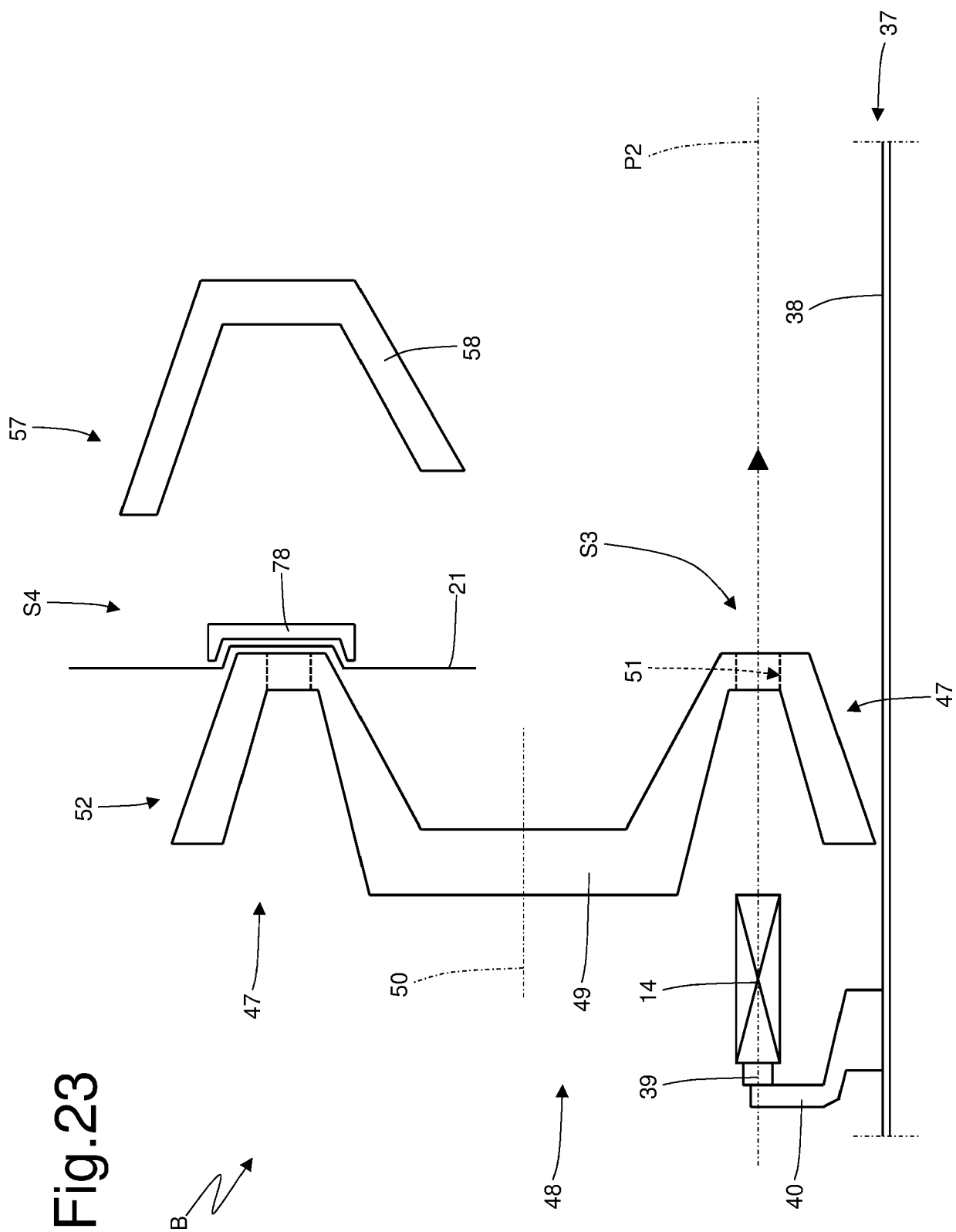
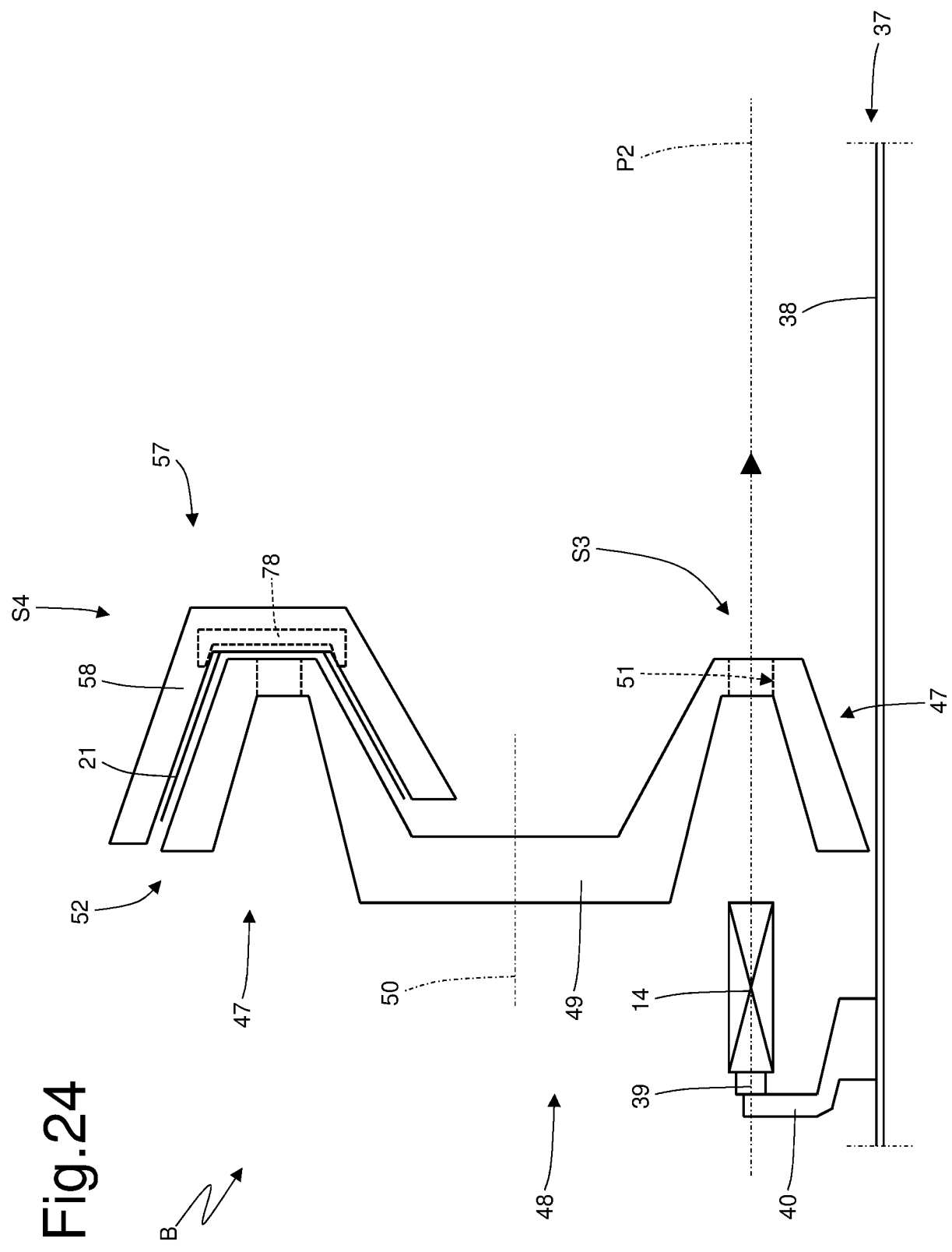


Fig.24



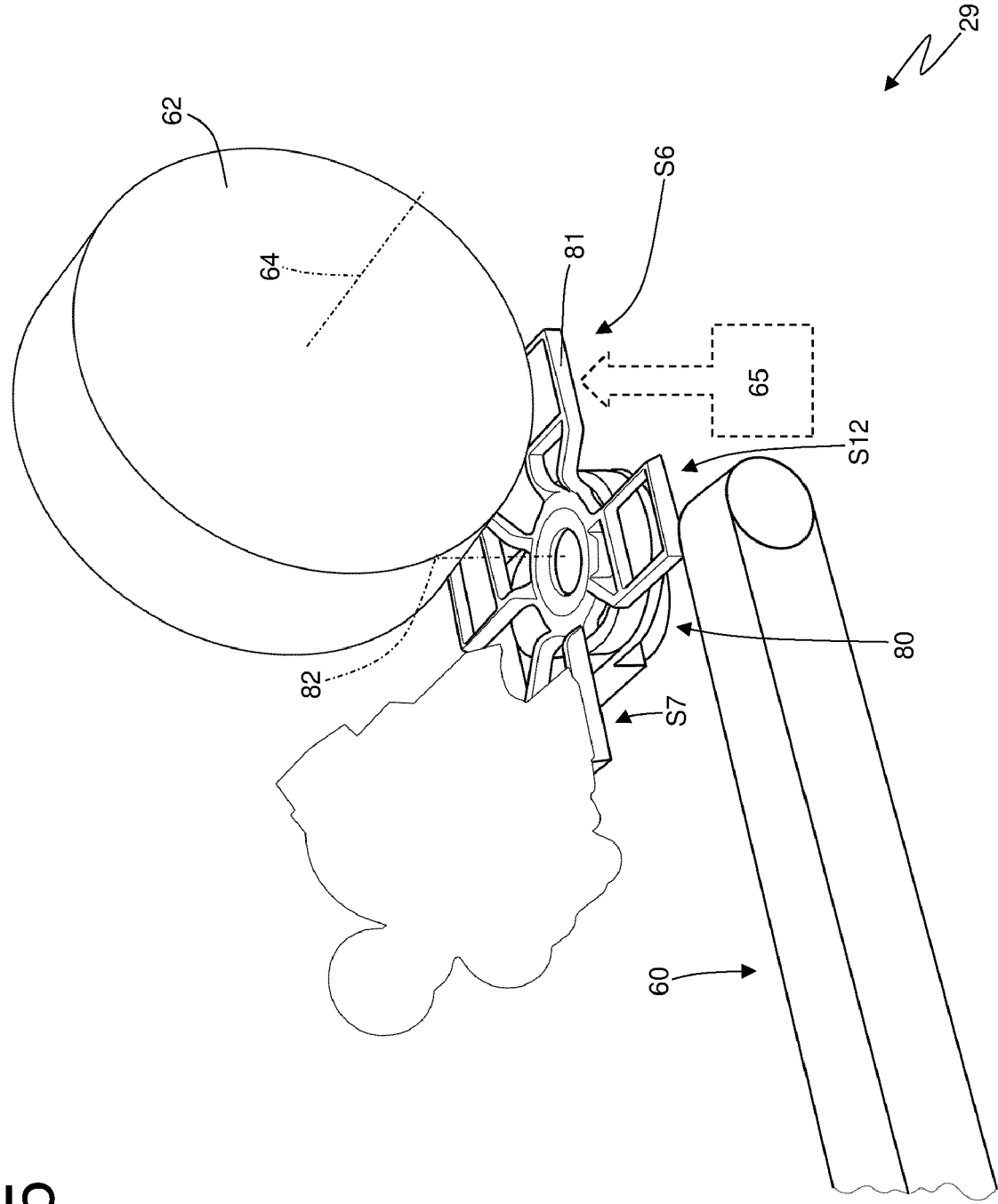


Fig. 25



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