

Description

[0001] This invention relates to a launching unit for automatic strapping machines and an automatic strapping machine.

[0002] Strapping machines are machines used for sealing a packaging on a respective pallet. The automatic strapping machines perform this task automatically. By means of the strapping machines, a strap is moved around the packaging and around the lower surface of the pallet, to apply a sealing force which keeps the packaging attached to the respective pallet.

[0003] In order to move the strap in an operating path which surrounds the pallet it is therefore necessary to ensure that the operating path closes only after the pallet has been positioned in the sealing position. In fact, if this were not the case, during insertion in the automatic strapping machine the pallet could strike the strapping machine.

[0004] There are prior art solutions which use rigid structures movable between an extracted position, wherein they close the operating path, allowing the sealing of the pallet, and a retracted position, wherein opening the operating path they allow the correct positioning of the pallet in the sealing position.

[0005] These solutions are not, however, satisfactory in terms of overall dimensions. In effect, the fact of using rigid structures considerably increases the overall dimensions, since in the retracted position the structure is retracted outside the machine, thereby substantially doubling the overall dimensions.

[0006] The aim of this invention is to provide a launching unit for automatic strapping machines and a method for moving a strap which overcome the above-mentioned drawbacks of the prior art.

[0007] Said aim is fully achieved by the launching unit for automatic strapping machines and by the method for moving a strap according to the invention as characterised in the appended claims.

[0008] According to an aspect of the invention, the invention provides a launching unit for automatic strapping machines.

[0009] The launching unit comprises a fixed guide. The fixed guide extends along a fixed path between a first end and a second end. The fixed guide is configured for guiding a movement of a strap along said fixed path.

[0010] The launching unit comprises a first guiding element. The first guiding element extends (along a respective main direction of extension) between a respective first end and a respective second end. The first guiding element is movable between a respective operating position and a respective rest position. The first guiding element, in its operating position, is configured for guiding a movement of the strap along a first stretch. The first guiding element, in its rest position, is positioned outside a space occupied by a pallet to be sealed.

[0011] The launching unit comprises a second guiding element. The second guiding element extends (along a

respective main direction of extension) between a respective first end and a respective second end. The second guiding element is movable between a respective operating position and a respective rest position. The second guiding element, in its operating position, is configured for guiding a movement of the strap along a second stretch. The second guiding element, in its rest position, is positioned outside a space occupied by a pallet to be sealed.

[0012] The first and the second guiding elements are opposite each other relative to a direction of insertion of the pallet. In other words, the first and the second guiding elements are positioned on opposite sides of the launching unit in such a way as to be, operatively, on two opposite sides of the pallet.

[0013] The launching unit comprises a first support. The first support is movable between a respective retracted position and a respective extracted position. In the extracted position, the first support is configured to support the first guiding element in its operating position.

[0014] The launching unit comprises a second support. The second support is movable between a respective retracted position and a respective extracted position. In the extracted position, the second support is configured to support the second guiding element in its operating position. The launching unit comprises a launching element. The launching element is positioned on the fixed guide. The launching element is configured for moving the strap along an operating path. According to an embodiment, the operating path is defined by the connection between the fixed path, the first stretch and the second stretch. The operating path operatively surrounds a pallet to be sealed.

[0015] According to an embodiment, the launching unit comprises a first diverting element. The first diverting element is associated with the first guiding element. The first diverting element is configured to induce a curvature of the first guiding element, in particular in its movement from the rest position to the operating position. According to an embodiment, the launching unit comprises a second diverting element. The second diverting element is associated with the second guiding element. The second diverting element is configured to induce a curvature of the second guiding element, in particular in its movement from the rest position to the operating position.

[0016] According to an alternative embodiment, the invention comprises one or more guiding elements. Each guiding element of said one or more guiding elements extends (along a respective main direction of extension) between a respective first end and a respective second end. Each guiding element of said one or more guiding elements is movable between a respective operating position and a respective rest position. Each guiding element of said one or more guiding elements, in its operating position, is configured for guiding a movement of the strap along a corresponding operating stretch. Each guiding element of said one or more guiding elements, in its rest position, is positioned outside a space occupied

by a pallet to be sealed.

[0017] For this reason, according to this embodiment, the operating path is defined by the connecting of the fixed path with one or more stretches defined by said one or more guiding elements.

[0018] According to an embodiment, the first and/or the second guiding element are flexible elements. According to an embodiment, the first guiding element comprises a respective groove. The groove of the first guiding element is configured to house the strap during its movement along the first stretch. According to an embodiment, the second guiding element comprises a respective groove. The groove of the second guiding element is configured to house the strap during its movement along the second stretch.

[0019] According to an embodiment, the first guiding element and/or the second guiding element comprise a respective base surface. The first guiding element and/or the second guiding element comprise a respective first edge. The first guiding element and/or the second guiding element comprise a respective second edge. The first and the second edge of the first guiding element and/or of the second guiding element rise from the corresponding base surface.

[0020] The first guiding element and/or the second guiding element comprise (at least) a door. Each door is connected to the corresponding first edge or to the corresponding second edge. Each door can move between a guide position and a release position. In the guide position, the door closes, at least partly, the respective groove. In the release position, the door is lifted and the respective groove is open to allow the release of the strap from the respective first guiding element or second guiding element.

[0021] The presence of the door guarantees that, during the movement of the strap, the latter does not escape from the first or second guiding element. According to an embodiment, each of said first and second guiding elements comprises a respective additional door. Each additional door is movably connected to the edge opposite the edge on which the corresponding door is connected.

[0022] According to an embodiment, the first diverting element is a first diverting pulley. According to an embodiment, the second diverting element is a second diverting pulley.

[0023] According to an embodiment, the first diverting pulley and/or the second diverting pulley comprise one or more discs, each of which includes an inner surface and an outer surface.

[0024] In particular, according to a preferred embodiment, the first pulley and/or the second pulley comprise a respective first disc and a respective second disc. Each of said first and second discs comprises a respective inner surface and a respective outer surface. Each of said first and second discs are mutually spaced by a corresponding operating distance.

[0025] According to an embodiment, each operating distance is less than a width of the corresponding first or

second guiding element.

[0026] According to an embodiment, the first and/or the second diverting pulley comprise a respective supporting element (that is, support, that is, supporting structure). Each supporting element is connected in an idle fashion to the outer surface of the first and/or of the second disc to allow an idle rotation of the respective diverting pulley.

[0027] According to an embodiment, the first diverting pulley and/or the second diverting pulley define a respective channel in which the respective first guiding element or second guiding element is slidably positioned. The first guiding element and/or the second guiding element are oriented in the respective channel with the base surface facing towards the outside of the corresponding pulley.

[0028] This feature allows the release of the strap through the pulley.

[0029] The launching unit comprises a primary actuator. The primary actuator is configured to move the first guiding element and/or the second guiding element between the respective rest position and the respective operating position.

[0030] According to an embodiment, the launching unit comprises, for each of said first and second guiding elements, a drive element, preferably a drive pulley. Each drive element is configured for driving the respective guiding element in such a way as to reduce the overall dimensions of the respective guiding element in its rest position.

[0031] This feature makes it possible to reduce the overall dimensions of the machine when the pallet is being inserted before the sealing.

[0032] According to an embodiment, the first and/or the second support are telescopic. This makes it possible to reduce the overall dimensions of the machine when the pallet is inserted before the sealing. According to an embodiment, the first and/or the second support each comprise a plurality of elements slidable relative to each other.

[0033] According to an embodiment, the launching unit comprises a secondary actuator, configured to move the first and/or the second support between the retracted position and the extracted position.

[0034] According to an embodiment, the first guiding element and/or the second guiding element are at least partly produced with one or more of the following types of material:

- polymeric material;
- plastic;
- rubber;
- composite material;
- polymeric material charged with glass.

[0035] According to an embodiment, the launching element is configured to move the strap along the operating path in a launching direction. The launching direction is oriented in such a way that the strap passes in succession

the fixed path, the first stretch, the second stretch and again the fixed path. The fixed guide, the first guiding element and the second guiding element each have a respective inlet section and a respective outlet section.

[0036] In a preferred embodiment, the outlet section of the fixed guide is less than the inlet section of the first movable guide.

[0037] In a preferred embodiment, the outlet section of the first movable guide is less than the inlet section of the second movable guide.

[0038] In a preferred embodiment, the outlet section of the second movable guide is less than the inlet section of the fixed guide.

[0039] These embodiments prevent the strap, during its movement in the launching direction, from encountering steps and can therefore jamming.

[0040] According to an aspect of the invention, the invention provides an automatic strapping machine for constraining an article to a pallet. The strapping machine comprises a support, configured to keep a pallet resting on it. The resting, according to embodiment, comprises a plurality of rollers, parallel to each other and which extend along a direction perpendicular to a direction of insertion of the pallet.

[0041] The strapping machine comprises a frame, surrounding, at least partly, the pallet on the support.

[0042] The strapping machine comprises a launching unit according to any of the features described in this document with reference to the launching unit.

[0043] According to an aspect of the invention, this invention provides a method for moving a strap by means of a launching unit.

[0044] The method comprises a step of preparing a fixed guide, a first guiding element, a second guiding element, a first support and a second support. The method comprises a step of moving one or more guiding elements. The method comprises a step of moving the first guiding element between a respective operating position and a respective rest position.

[0045] The method comprises a step of moving the second guiding element between a respective operating position and a respective rest position. The method comprises a step of moving the first support between a respective retracted position and a respective extracted position. The method comprises a step of moving the second support between a respective retracted position and a respective extracted position.

[0046] The method comprises a step of launching the strap, by means of a launching element, through an operating path defined by the fixed guide, from the first guiding element and/or the second guiding element.

[0047] The method comprises a step of curvature of the first guiding element during movement between the respective rest position and the respective operating position. The method comprises a step of curvature of the second guiding element during movement between the respective rest position and the respective operating position.

[0048] The method comprises a step of releasing the strap from the first guiding element and/or from the second guiding element. In said releasing step, the strap protrudes from a respective groove of the first guiding element and/or of the second guiding element passing through a respective door of the first guiding element and/or of the second guiding element.

[0049] These and other features will become more apparent from the following detailed description of a preferred embodiment, illustrated by way of nonlimiting example in the accompanying drawings, in which:

- Figure 1 is a perspective view of a launching unit for an automatic strapping machine;
- Figure 2 illustrates a guiding element of the launching unit of Figure 1;
- Figure 3 illustrates a sealing unit of the launching unit of Figure 1;
- Figures 4A and 4B schematically illustrate a first operating configuration and a second operating configuration, respectively, of the launching unit of Figure 1;
- Figure 4C illustrates an embodiment of the launching unit of Figure 1;
- Figures 5A and 5B illustrate a cross-section of a first diverting element and a cross-section of a second diverting element, respectively;
- Figures 6A and 6B illustrate cross-sections of a first guiding element and a cross-section of a second guiding element, respectively;
- Figures 7A and 7B illustrate an embodiment of the launching unit of Figure 1 in a first (operating) and in a second (rest) configuration, respectively;

With reference to the accompanying drawings, the numeral 1 denotes a launching unit for automatic strapping machines. The launching unit 1 is configured to move a strap along an operating path PO, which operatively surrounds a pallet which is to be sealed by means of the automatic strapping machine.

[0050] The launching unit 1 comprises a fixed guide 11. The fixed guide 11 extends along a fixed path between a first end 11A and a second end 11B. The fixed guide 11 defines a fixed path PF, in which the strap slides. The fixed path PF is operatively located above a pallet which is being sealed. For clarity of the description, the direction of insertion I will be referred to as the direction in which a pallet is inserted in the launching unit 1. According to a preferred embodiment, the insertion direction I is perpendicular to the direction of the weight force. In other words, the insertion direction I belongs to a horizontal plane, that is, perpendicular to the weight force. Moreover, the term "transversal direction T" refers to a direction perpendicular to the direction of insertion I and to the direction of the weight force, whilst the term "vertical direction V" refers to a direction parallel to the direction of the weight force.

[0051] The launching unit 1 comprises a first guide unit

GG1. The first guide unit GG1 is configured for guiding a movement of the strap along a first stretch T1.

[0052] According to an embodiment, the guide unit GG1 comprises a first guiding element 12. The first guiding element 12 is configured for guiding the strap in its movement along the first stretch T1.

[0053] The first guiding element 12 extends along a relative main direction of extension between a first end 12A and a second end 12B.

[0054] According to an embodiment, the first guiding element is movable between an operating position PL1 and a respective rest position PR1.

[0055] In the operating position PL1, the first guiding element 12 extends transversely up to a position in which it is aligned, along the direction of insertion I with the pallet to be sealed. In the operating position PR1, the first guiding element 12 is not aligned, along the direction of insertion I with the pallet to be sealed, to allow the insertion of the pallet in the automatic strapping machine.

[0056] In the operating position PL1, the first guiding element 12 extends partly along the transversal direction T and partly along the vertical direction V.

[0057] In the rest position PR1, the first guiding element 12 extends (entirely) along the vertical direction V or along the transversal direction T, preferably in a folded configuration.

[0058] According to an embodiment, the first guiding element 12, in its operating position PL1 is configured for guiding a movement of the strap along the first stretch T1. The first stretch T1 extends partly along the transversal direction T and partly along the vertical direction V.

[0059] In the operating position PL1 of the first guiding element 12, the first end 12A of the first guiding element 12 is connected with the second end 11B of the fixed guide to define a continuity in the path of the strap, in particular a continuity between the fixed path PF and the first stretch T1. In the rest position PR1 of the first guiding element 12, the first end 12A of the first guiding element 12 is spaced from the second end 11B of the fixed guide and the operating path PO is interrupted.

[0060] The first guiding element 12 comprises a respective groove 121. The groove 121 is configured to house the strap in its movement along the first stretch T1.

[0061] The first guiding element 12 comprises a respective base surface 122. The base surface 122 forms a bottom of the groove 121.

[0062] The first guiding element 12 comprises a respective first edge 123 and a respective second edge 124.

[0063] The first edge 123 and the second edge 124 rise from the base surface 122, to define a height of the groove 121. The first edge 123 and the second edge 124, according to an embodiment, are parallel to each other and extend along the main direction of extension of the first guiding element 12. According to other embodiments, the first edge 123 and the second edge 124 are inclined relative to the base surface 122 and convergent with each other in a direction coming out of the base

surface 122.

[0064] According to an embodiment, the first guiding element 12 comprises a first door 125 and a second door 126. The first door 125 and/or the second door 126 are configured to close at least partly the access to the groove 121 to prevent the strap from escaping from the groove 121 during its movement. The first door 125 is connected to the first edge 123. In particular, the first door 125 rotates about a point of connection with the first edge 123. The second door 126 is connected to the second edge 124. In particular, the second door 126 rotates about a point of connection with the second edge 124.

[0065] The first door and/or the second door are movable between a guide position PG, wherein it closes, at least partly, the groove 121, and a release position PS, wherein the groove 121 is open to allow the release of the strap from the first guiding element 12.

[0066] According to an embodiment, the first guide unit GG1 comprises a first support 14. The first support 14 is movable between a retracted position P11 and an extracted position P12. In the retracted position P11, the first support 14 is not aligned with a pallet to be sealed along the insertion direction I. In the extracted position P12, the first support 14 is at least partly aligned with a pallet to be sealed along the insertion direction I.

[0067] According to an embodiment, the first support 14, in its extracted position P12, is configured to support the first guiding element 12 in its operating position PL1.

[0068] According to an embodiment, the first support 14 extends along the transversal direction T.

[0069] According to an embodiment, the first support 14 is connected to an upright (a pole, a column) or to any supporting structure of the automatic strapping machine on which the launching unit 1 is mounted.

[0070] According to a preferred embodiment, the first support 14 is telescopic. In other words, the first support 14 comprises a plurality of elements slidable relative to each other along a direction of extraction of the first support 14.

[0071] According to an embodiment, the plurality of elements includes T-shaped beams, slidable with each other for modifying the transversal extension of the first support 14. In particular, when the plurality of elements is in a packed arrangement, the first support 14 is in the retracted position P11, whilst when the plurality of elements is extended, the first support 14 is in the extracted position P12.

[0072] According to an embodiment, the launching unit 1 comprises a primary actuator A1 and/or a secondary actuator A2.

[0073] The primary actuator A1 is configured to move the first guiding element 12 between the operating position PL1 and the rest position PR1.

[0074] The secondary actuator A2 is configured to move the first support 14 between the retracted position P11 and the extracted position P12.

[0075] In particular, according to a preferred embodiment, the secondary actuator A2 comprises a first plu-

rality of cylinders A21, telescopically slidable relative to each other for completely extending the first support 14.

[0076] According to an embodiment, the first guide unit GG1 comprises a first diverting element 17. The first diverting element 17 is configured to curve the first guiding element 12 during its movement between the operating position PL1 and the rest position PR1.

[0077] According to a preferred embodiment, the first diverting element 17 is a diverting pulley.

[0078] According to an embodiment, the first guide unit GG1 comprises a first drive element 21. The first drive element 21 is configured for driving the first guiding element 12 to its rest position PR1, for reducing the transversal and/or vertical dimensions of the automatic strapping machine. According to a preferred embodiment, the first drive element 21 is a drive pulley.

[0079] Depending on the relative positioning between the diverting pulley 17 and the drive pulley 21, the invention provides a first embodiment and a second embodiment.

[0080] According to a first embodiment, the drive pulley 21 is configured for driving the first guiding element 12 along the transversal direction T.

[0081] According to this embodiment, the drive pulley 21 is positioned in a zone which, operatively, is positioned below the pallet to be sealed. The first guiding element 12 is looped on the diverting pulley 17 and on the drive pulley 21. In particular, according to this first embodiment, the first guiding element 12 is oriented with the base surface 121 facing towards the centre of the diverting pulley 17. According to the first embodiment, the diverting element 17 comprises a solid disc.

[0082] According to this embodiment, the drive pulley 21 is not essential. In fact, the diverting pulley 17 is positioned below the pallet to be sealed along the vertical direction V and substantially reverses the sliding direction of the first guiding element 12. According to this embodiment, since the first guiding element 12 has a maximum length substantially equal to half the transversal distance T between the first and second guide units GG1, GG2, the diverting pulley 17 is sufficient to allow a switching between the operating position PL1 and the rest position PR1. According to this embodiment, the first guide unit GG1 includes a guide, extending along the transversal direction, for the first guiding element 12. For this reason, according to this embodiment, when the first guiding element is in the rest position PR1, the latter extends transversely below the first support 14. When the operations are started, the first guiding element 12 slides along the transversal direction T in a first direction, reverses the direction of sliding through the diverting pulley 17 and continues its sliding up to the operating position PL1.

[0083] According to a second embodiment, which has particular advantages, the drive pulley 21 is configured for driving the first guiding element 12 along the vertical direction V, reducing in this way the transversal dimensions T. According to this embodiment, the drive pulley 21 is positioned in a lateral zone of the launching unit

which, operatively, is positioned on one side of the pallet to be sealed. The first guiding element 12 is looped on the diverting pulley 17 and on the drive pulley 21.

[0084] In particular, according to this second embodiment, the first guiding element 12 is oriented with the base surface 121 facing in the direction opposite to the centre of the diverting pulley 17.

[0085] According to the second embodiment, the diverting pulley 17 comprises a first disc 171 and a second disc 172. The first and the second disc 171, 172 each comprise a respective inner surface 171A, 172A and an outer surface 171B, 172B. The first and the second disc 171, 172 are spaced from each other by an operating distance DP.

[0086] The operating distance DP is less than a width of the respective first guiding element 12 (along a direction perpendicular to the main direction of extension of the first guiding element 12).

[0087] According to this embodiment, the strap can escape from the groove 121 passing through the hollow space between the first and the second discs 171, 172 of the diverting pulley 17.

[0088] The diverting pulley 17 and/or the drive pulley 21 are connected to a supporting structure (a frame) of the automatic strapping machine on which the launching unit 1 is mounted, by means of a supporting element 191. The supporting element 191 is connected in an idle fashion to the outer surfaces 171B, 172B of the first disc 171 and the second disc 172 to allow an idle rotation of the respective diverting pulley 17.

[0089] It should be noted that, according to an embodiment, the launching unit comprises at least one guide unit, for example the first guide unit GG1 described above.

[0090] According to this embodiment, the first guiding element 12 is connected, in its first end 12A, with the second end of the fixed guide 11B, and, in its second end 12B, with the first end 11A of the fixed guide 11. In other words, according to this embodiment, the operating path PO is defined by the fixed path PF and by the first stretch T1.

[0091] On the other hand, according to a further advantageous embodiment, there is a second guide unit GG2.

[0092] The second guide unit GG2 is opposite the first guide unit GG1 relative to the direction of insertion I.

[0093] The second guide unit GG2 is configured for guiding a movement of the strap along a second stretch T2.

[0094] According to an embodiment, the second guide unit GG2 comprises a second guiding element 13. The second guiding element 13 is configured for guiding the strap in its movement along the second stretch T2.

[0095] The second guiding element 13 extends along its main direction of extension between a first end 13A and a second end 13B.

[0096] According to an embodiment, the second guiding element is movable between a respective operating

position PL2 and a respective rest position PR2.

[0097] In the operating position PL2, the second guiding element 13 extends transversely up to a position in which it is aligned, along the direction of insertion I with the pallet to be sealed. In the operating position PR2, the second guiding element 13 is not aligned, along the direction of insertion I with the pallet to be sealed, to allow the insertion of the pallet in the automatic strapping machine.

[0098] In the operating position PL2, the second guiding element 13 extends partly along the transversal direction T and partly along the vertical direction V. In the rest position PR2, the second guiding element 13 extends (entirely) along the vertical direction V or along the transversal direction T, preferably in a folded configuration.

[0099] According to an embodiment, the second guiding element 13, in its operating position PL2 is configured for guiding a movement of the strap along the second stretch T2. The second stretch T2 extends partly along the transversal direction T and partly along the vertical direction V.

[0100] In the operating position PL2 of the second guiding element 13, the first end 13A of the second guiding element 13 is connected with the second end 12B of the first guiding element 12 in its operating position PL1, to define a continuity in the path of the strap, in particular a continuity between the first stretch T1 and the second stretch. In the operating position PL2 of the second guiding element 13, the second end 13B of the second guiding element 13 is connected with the first end 11A of the fixed guide 11, for defining a continuity in the path of the strap, in particular a continuity between the second stretch T2 and the fixed path.

[0101] For this reason, with the first guiding element 12 in the operating position PL1 and with the second guiding element 13 in the operating position PL2, the operating path PO is defined by the connection between the fixed path PF, the first stretch T1 and the second stretch T2.

[0102] The second guiding element 13 comprises a respective groove 131. The groove 131 is configured for housing the strap in its movement along the second stretch T2.

[0103] The second guiding element 13 comprises a respective base surface 132. The base surface 132 forms a bottom of the groove 131.

[0104] The second guiding element 13 comprises a respective first edge 133 and a respective second edge 134.

[0105] The first edge 133 and the second edge 134 rise from the base surface 132, to define a height of the groove 131. The first edge 133 and the second edge 134, according to an embodiment, are parallel to each other and extend along the main direction of extension of the second guiding element 13. According to other embodiments, the first edge 133 and the second edge 134 are inclined relative to the base surface 132 and convergent

with each other in a direction coming out of the base surface 132.

[0106] According to an embodiment, the second guiding element 13 comprises a first door 135 and a second door 136. The first door 135 and/or the second door 136 are configured to close at least partly the access to the groove 131 to prevent the strap from escaping from the groove 131 during its movement. The first door 135 is connected to the first edge 133. In particular, the first door 135 rotates about a point of connection with the first edge 133. The second door 136 is connected to the second edge 134. In particular, the second door 136 rotates about a point of connection with the second edge 134.

[0107] The first door and/or the second door are movable between a guide position PG, wherein it closes, at least partly, the groove 131, and a release position PS, wherein the groove 131 is open to allow the release of the strap from the second guiding element 13.

[0108] According to an embodiment, the second guide unit GG2 comprises a second support 15. The second support 15 is movable between a retracted position P21 and an extracted position P22. In the retracted position P21, the second support 15 is not aligned with a pallet to be sealed along the insertion direction I. In the extracted position P22, the second support 15 is at least partly aligned with a pallet to be sealed along the insertion direction I.

[0109] According to an embodiment, the second support 15, in its extracted position P22, is configured to support the second guiding element 13 in its operating position PL2.

[0110] According to an embodiment, the second support 15 extends along the transversal direction T.

[0111] According to an embodiment, the second support 15 is connected to an upright (a pole, a column) or to any supporting structure of the automatic strapping machine on which the launching unit 1 is mounted.

[0112] According to a preferred embodiment, the second support 15 is telescopic. In other words, the second support 15 comprises a plurality of elements slidable relative to each other along a direction of extraction of the second support 15.

[0113] According to an embodiment, the plurality of elements includes T-shaped beams, slidable with each other for modifying the transversal extension of the second support 15. In particular, when the plurality of elements is in a packed arrangement, the second support 15 is in the retracted position P21, whilst when the plurality of elements is extended, the second support 15 is in the extracted position P22.

[0114] The primary actuator A1 is configured to move the second guiding element 13 between the operating position PL2 and the rest position PR2.

[0115] It should be noted that the primary actuator A1 must be understood as an actuating unit which may comprise one or more separate actuating elements, for example electric motors, cylinder-piston units or the like, which are dedicated to the actuation of the first 12 or the

second 13 guiding elements.

[0116] The secondary actuator A2 is configured to move the second support 15 between the retracted position P21 and the extracted position P22.

[0117] In particular, according to a preferred embodiment, the secondary actuator A2 comprises a second plurality of cylinders A22, telescopically slidable relative to each other for completely extending the second support 15. According to an embodiment, the second guide unit GG2 comprises a second diverting element 18. The second diverting element 18 is configured to curve the second guiding element 13 during its movement between the operating position PL2 and the rest position PR2.

[0118] According to a preferred embodiment, the second diverting element 18 is a diverting pulley.

[0119] According to an embodiment, the second guide unit GG2 comprises a second drive element 22. The second drive element 22 is configured for driving the second guiding element 13 to its rest position PR1, for reducing the transversal and/or vertical dimensions of the automatic strapping machine.

[0120] According to a preferred embodiment, the second drive element 22 is a drive pulley.

[0121] Depending on the relative positioning between the diverting pulley 18 and the drive pulley 22, the invention provides a first embodiment and a second embodiment.

[0122] According to a first embodiment, the drive pulley 22 is configured for driving the second guiding element 13 along the transversal direction T.

[0123] According to this embodiment, the drive pulley 22 is positioned in a zone which, operatively, is positioned below the pallet to be sealed. The second guiding element 13 is looped on the diverting pulley 18 and on the drive pulley 22. In particular, according to this first embodiment, the second guiding element 13 is oriented with the base surface 132 facing towards the centre of the diverting pulley 18. According to the first embodiment, the diverting element 18 comprises a solid disc.

[0124] According to this embodiment, the drive pulley 22 is not essential. In fact, the diverting pulley 18 is positioned below the pallet to be sealed along the vertical direction V and substantially reverses the sliding direction of the second guiding element 13. According to this embodiment, since the second guiding element 13 has a maximum length substantially equal to half the transversal distance T between the first and second guide units GG1, GG2, the diverting pulley 18 is sufficient to allow a switching between the operating position PL2 and the rest position PR2. According to this embodiment, the second guide unit GG2 includes a corresponding guide, extending along the transversal direction T, for the second guiding element 13. For this reason, according to this embodiment, when the second guiding element 13 is in the rest position PR2, the latter extends transversely below the second support 15. When the operations are started, the second guiding element 13 slides along the transversal direction T in a first direction, reverses the

direction of sliding through the diverting pulley 18 and continues its sliding up to the operating position PL2, to enter into contact with the first sliding element 12.

[0125] According to a second embodiment, which has particular advantages, the drive pulley 22 is configured for driving the second guiding element 13 along the vertical direction V, reducing in this way the transversal dimensions T.

[0126] According to this embodiment, the drive pulley 22 is positioned in a lateral zone of the launching unit which, operatively, is positioned on one side of the pallet to be sealed, in particular an opposite side to the side on which the drive pulley 21 of the first guide unit GG1 is positioned.

[0127] In particular, according to this second embodiment, the second guiding element 13 is oriented with the base surface 132 facing in the direction opposite to the centre of the diverting pulley 18.

[0128] According to the second embodiment, the diverting pulley 18 comprises a first disc 181 and a second disc 182. The first and the second disc 181, 182 each comprise a respective inner surface 181A, 182A and an outer surface 181B, 182B. The first and the second disc 181, 182 are spaced from each other by an operating distance DP.

[0129] The operating distance DP is less than a width of the second guiding element 13 (along a direction perpendicular to the main direction of extension of the second guiding element 13).

[0130] According to this embodiment, the strap can escape from the groove 131 passing through the hollow space between the first and the second discs 181, 182 of the diverting pulley 18.

[0131] The diverting pulley 18 and/or the drive pulley 22 are connected to a supporting structure (a frame) of the automatic strapping machine on which the launching unit 1 is mounted, by means of a respective supporting element 192. The supporting element 192 is connected in an idle fashion to the outer surfaces 181B, 182B of the first disc 181 and the second disc 182 to allow an idle rotation of the respective diverting pulley 18.

[0132] According to an embodiment, the launching unit 1 comprises a launching element 16, configured to move the strap along the operating path PO. The launching element 16 is preferably positioned on the fixed guide, in a zone which, operatively, is positioned above the pallet being sealed.

[0133] The launching element 16 is configured to support the strap after the latter has travelled along the entire operating path, in such a way as to make it escape from the fixed guide, from the first guiding element 12 and from the second guiding element 13 and therefore make it adhere to the pallet being sealed.

[0134] The launching element 16 is configured for welding two parts of the strap previously launched.

[0135] It should be noted that the first guide unit GG1, the second guide unit GG2 and the launching element 16 define a sealing unit GS.

[0136] This invention also provides a plurality of sealing units GS. In that case, said sealing units GS of said plurality are spaced along the insertion direction I, in such a way as to have various sealing straps applied on the pallet.

[0137] According to an aspect of the invention, the invention also intends to protect an automatic strapping machine.

[0138] The automatic strapping machine comprises a frame 100 comprising at least two uprights 100A, 100B and a crosspiece 100C. The two uprights 100A, 100B are rested on the ground and the crosspiece 100C is connected to the two uprights 100A, 100B.

[0139] The fixed guide 11 of the launching unit 1 is connected to the crosspiece 100C.

[0140] The frame 100 of the automatic strapping machine is connected to one or more of the following components of the launching unit:

- first and/or second support 14, 15;
- first diverting element 17 and/or second diverting element 18
- first drive element 21 and/or second drive element 22.

[0141] The automatic strapping machine comprises an element for inserting the pallet 101. The insertion element 101 is configured to facilitate an insertion of the pallet, along the insertion direction, in the automatic strapping machine.

[0142] According to a preferred embodiment, the insertion element 101 comprises a plurality of rollers 101', rotating about an axis parallel to the transversal direction T.

[0143] According to an embodiment, the automatic strapping machine comprises a sliding roller 102A, 102B, for each support of said first 14 and second 15 support of the launching unit 1.

[0144] Each sliding roller 102A, 102B is configured for guiding the sliding of the plurality of elements of the respective first support 14 or second support 15.

[0145] According to an aspect of the invention, a method is provided for launching a strap in an automatic strapping machine.

[0146] The method comprises a step of preparing a launching unit 1 including a first guide unit GG1, a fixed guide 11 and a launching element 16.

[0147] The method comprises a step of moving a first guiding element 12 from an operating position PL1, wherein it is aligned, along an insertion direction I, with a pallet to be sealed, to a rest position PR1, in which it is not aligned, along the insertion direction I, with the pallet to be sealed.

[0148] The method comprises a step of inserting along the direction of insertion I of a pallet loaded with at least one packaging.

[0149] The method comprises a step of moving the first guiding element 12 from the rest position PR1 to the op-

erating position PL1.

[0150] The method comprises a step of moving a first support 14 of the launching unit 1 from the retracted position P11, wherein it is not aligned, along the insertion direction I, with the pallet to be sealed, and an extracted position P12, wherein it is aligned, along the insertion direction I, with the pallet to be sealed. The method comprises a supporting step, wherein the first support 14 supports the first guide unit 12 in its operating position PL1.

[0151] In the movement step from the rest position PR1 to the operating position PL1, the first guiding element 12 is connected with a fixed path PF, defined by the fixed guide to receive from the fixed guide the strap being moved.

[0152] The method comprises a step of moving the strap, wherein the launching unit 16 moves the strap into the fixed guide 11 and into the first guiding element 12 for recovering it again in the fixed guide 11.

[0153] The method comprises a step of withdrawing the strap, wherein the strap is withdrawn from the launching element 16. During the step of withdrawing the strap, the strap protrudes from the fixed guide 11 and from the first guiding element 12 for adhering to the pallet and to the packaging positioned on it.

[0154] The method comprises a sealing step, wherein the strap is cut and sealed. The strap is subsequently released by the launching element 16 so that it adheres completely to the packaging.

[0155] The step of moving the first guiding element 12 comprises a diverting step. In the diverting step, a diverting element 17 of the first guide unit GG1, curves the first guiding element 12, changing the direction, for example passing from the vertical direction V to the transversal direction T. The step of moving the first guiding element 12 comprises a drive step. During the drive step, a drive element 21 folds the first guiding element 12 to limit its overall dimensions.

[0156] According to an embodiment, the method comprises a step of preparing a second guide unit GG1.

[0157] The method comprises a step of moving a second guiding element 13 of the second guide unit GG2 from an operating position PL2, wherein it is aligned, along an insertion direction I, with a pallet to be sealed, to a rest position PR2, in which it is not aligned, along the insertion direction I, with the pallet to be sealed.

[0158] The method comprises a step of moving the second guiding element 13 from the rest position PR2 to the operating position PL2.

[0159] The method comprises a step of moving a second support 15 of the launching unit 1 (of the second guide unit GG2) from a retracted position P12, wherein it is not aligned, along the insertion direction I, with the pallet to be sealed, and an extracted position P22, wherein it is aligned, along the insertion direction I, with the pallet to be sealed. The method comprises a supporting step, wherein the second support 15 supports the second guide unit 13 in its operating position PL2.

[0160] In the movement step from the rest position PR2

to the operating position PL2, the second guiding element 15 is connected with the fixed path PF, defined by the fixed guide 11, and with the first guiding element 12 (that is to say, with a first stretch T1) to receive the strap from the first guiding element 12 and to transfer it to the fixed guide 11.

[0161] During the step of moving the strap, the launching unit 16 moves the strap into the fixed guide 11, into the first guide 12 and into the second guiding element 13, then recovering it in the fixed guide 11.

[0162] During the step of withdrawing the strap, the strap protrudes from the second guiding element 13 for adhering to the pallet and to the packaging positioned on it.

[0163] The step of moving the second guiding element 13 comprises a diverting step. In the diverting step, a diverting element 18 of the second guide unit GG2, curves the second guiding element 13, changing the direction, for example passing from the vertical direction V to the transversal direction T. The step of moving the second guiding element 13 comprises a drive step. During the drive step, a drive element 22 folds the second guiding element 13 to limit its overall dimensions.

Claims

1. A launching unit (1) for automatic strapping machines comprising:

- a fixed guide (11), which extends along a fixed path between a first end (11A) and a second end (11B) and is configured for guiding a movement of a strap along said fixed path (PF);
- a first guiding element (12), extending along a respective main direction of extension between a first end (12A) and a second end (12B) and movable between a respective operating position (PL) and a respective rest position (PR), said first guiding element (12), in its operating position (PL), being configured for guiding a movement of the strap along a first stretch (T1);
- a second guiding element (13), extending along a respective main direction of extension between a first end (13A) and a second end (13B) and movable between a respective operating position (PL) and a respective rest position (PR), said second guiding element (13), in its operating position (PL), being configured for guiding a movement of the strap along a second stretch (T2);
- a first support (14), movable between a respective retracted position (P1) and a respective extracted position (P2), in which it is configured to support the first guiding element (12) in its operating position (PL);
- a second support (15), movable between a respective retracted position (P1) and a respective

extracted position (P2), in which it is configured to support the second guiding element (13) in its operating position (PL);

- a launching element (16), positioned on the fixed guide (11) and configured to move the strap along an operating path, defined by the connection between the fixed path (PF), the first stretch (T1) and the second stretch (T2) and surrounding a pallet to be sealed,

characterised in that it comprises a first diverting element (17), associated with the first guiding element (12) and configured to induce a curvature of the first guiding element (12) in its movement from the rest position (PR) to the operating position (PL), and a second diverting element (18), associated with the second guiding element (13) and configured to induce a curvature of the second guiding element (13) in its movement from the rest position (PR) to the operating position (PL).

2. The launching unit according to claim 1, wherein the first and second guiding elements (12, 13) are flexible elements and wherein each of said first guiding element (12) and second guiding element (13) comprises a respective groove (121, 131), configured for housing the strap during its movement along the first stretch (T1) and the second stretch (T2).

3. The launching unit according to claim 2, wherein each of said first (12) and second (13) guiding elements comprises:

- a base surface (122, 132);
- a respective first edge (123, 133) and second edge (124, 134), rising from the base surface (122, 132);
- a door (125, 135), connected to the first edge (123, 133) or to the second edge (124, 134) and movable between a guide position (PG), wherein it closes, at least partly, the respective groove (121, 131), and a release position (PS), wherein the respective groove (121, 131) is open to allow the release of the strap from the respective first guiding element (12) or second guiding element (13).

4. The launching unit according to claim 3, wherein each of said first and second guiding elements (12, 13) comprises an additional door (126, 136), movably connected to the edge opposite the edge on which the door (125, 135) is connected.

5. The launching unit according to any one of the preceding claims, wherein the first diverting element (17) is a first diverting pulley and wherein the second diverting element (18) is a second diverting pulley.

6. The launching unit according to claim 5, wherein the first diverting pulley (17) and the second diverting pulley (18) comprise:
- a respective first disc (171, 181) and second disc (172, 182), each including an inner surface (171A, 181A, 172A, 182A) and an outer surface (171B, 181B, 172B, 182B) and spaced from each other by an operating distance (DP), which is less than a width of the respective first or second guiding element (12, 13);
 - a supporting element (19), connected in an idle fashion to the outer surface (171B, 181B) of the first disc (171, 181) and of the second disc (172, 182) to allow an idle rotation of the respective diverting pulley.
7. The launching unit according to claim 6, the first diverting pulley (17) and the second diverting pulley (18) defining a respective channel in which is slidably positioned the respective first guiding element (12) or second guiding element (13), and wherein the first guiding element (12) and the second guiding element (13) are oriented in the respective channel with the base surface (122, 132) facing towards the outside of the pulley.
8. The launching unit according to any one of the preceding claims, comprising a primary actuator, configured to move the first guiding element (12) and the second guiding element (13) between the respective rest position (PR) and the respective operating position (PL).
9. The launching unit according to any one of the preceding claims, comprising, for each of said first guiding element (12) and second guiding element (13), a drive pulley (21, 22), configured for returning the respective guiding element (12, 13) in such a way as to reduce the overall dimensions of the respective guiding element in its rest position (PR).
10. The launching unit according to any one of the preceding claims, wherein the first and the second support (14, 15) are telescopic and each include a plurality of elements slidable relative to each other and wherein the launching unit comprises a secondary actuator, configured to move the first and the second support (14, 15) between the retracted position (P1) and the extracted position (P2).
11. The launching unit according to any one of the preceding claims, wherein the first guiding element (12) and the second guiding element (13) are at least partly produced with polymeric material and/or composite material.
12. The launching unit according to any one of the pre-

ceding claims, wherein the launching element (16) is configured to move the strap along the operating path in a launching direction (VE), oriented in such a way that the strap passes through, in succession, the fixed path (PF), the first stretch (T1), the second stretch (T2) and again the fixed path (PF), and wherein the fixed guide (11), the first guiding element (12) and the second guiding element (13) each have a respective inlet section and a respective outlet section, wherein:

- the outlet section of the fixed guide (11) is less than the inlet section of the first movable guide (12);
- the outlet section of the first movable guide (12) is less than the inlet section of the second movable guide (13);
- the outlet section of the second movable guide (13) is less than the inlet section of the fixed guide (11).

13. An automatic strapping machine (100) for securing an article to a pallet comprising:

- a support, configured to keep a pallet resting on it;
- a frame, surrounding, at least partly, the pallet on the support;
- the launching unit (1) according to any one of the preceding claims.

14. A method for moving a strap by means of a launching unit, comprising the following steps:

- preparing a fixed guide, a first guiding element, a second guiding element, a first support and a second support;
- moving the first guiding element between a respective operating position and a respective rest position;
- moving the second guiding element between a respective operating position and a respective rest position;
- moving the first support between a respective retracted position and a respective extracted position;
- moving the second support between a respective retracted position and a respective extracted position;
- launching the strap, by means of a launching element, through an operating path defined by the fixed guide, from the first guiding element and the second guiding element,

characterized in that it comprises the following steps:

- curvature of the first guiding element during

movement between the respective rest position
and the respective operating position;
- curvature of the second guiding element during
movement between the respective rest position
and the respective operating position.

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15. The method according to claim 14, comprising a step
of releasing the strap from the first guiding element
and from the second guiding element, in which the
strap protrudes from a respective groove of the first
guiding element and of the second guiding element
passing through a respective door of the first guiding
element and of the second guiding element.

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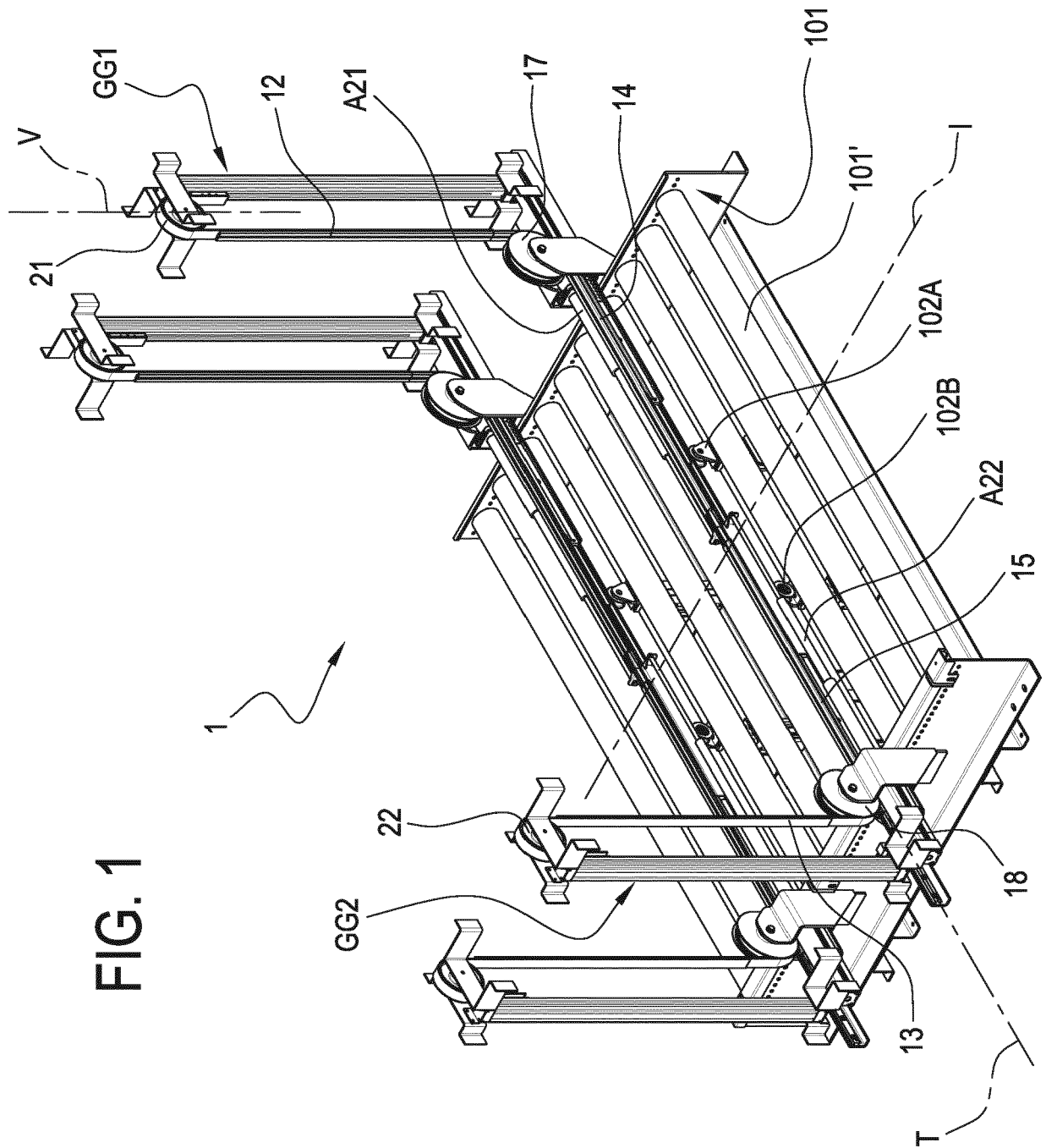
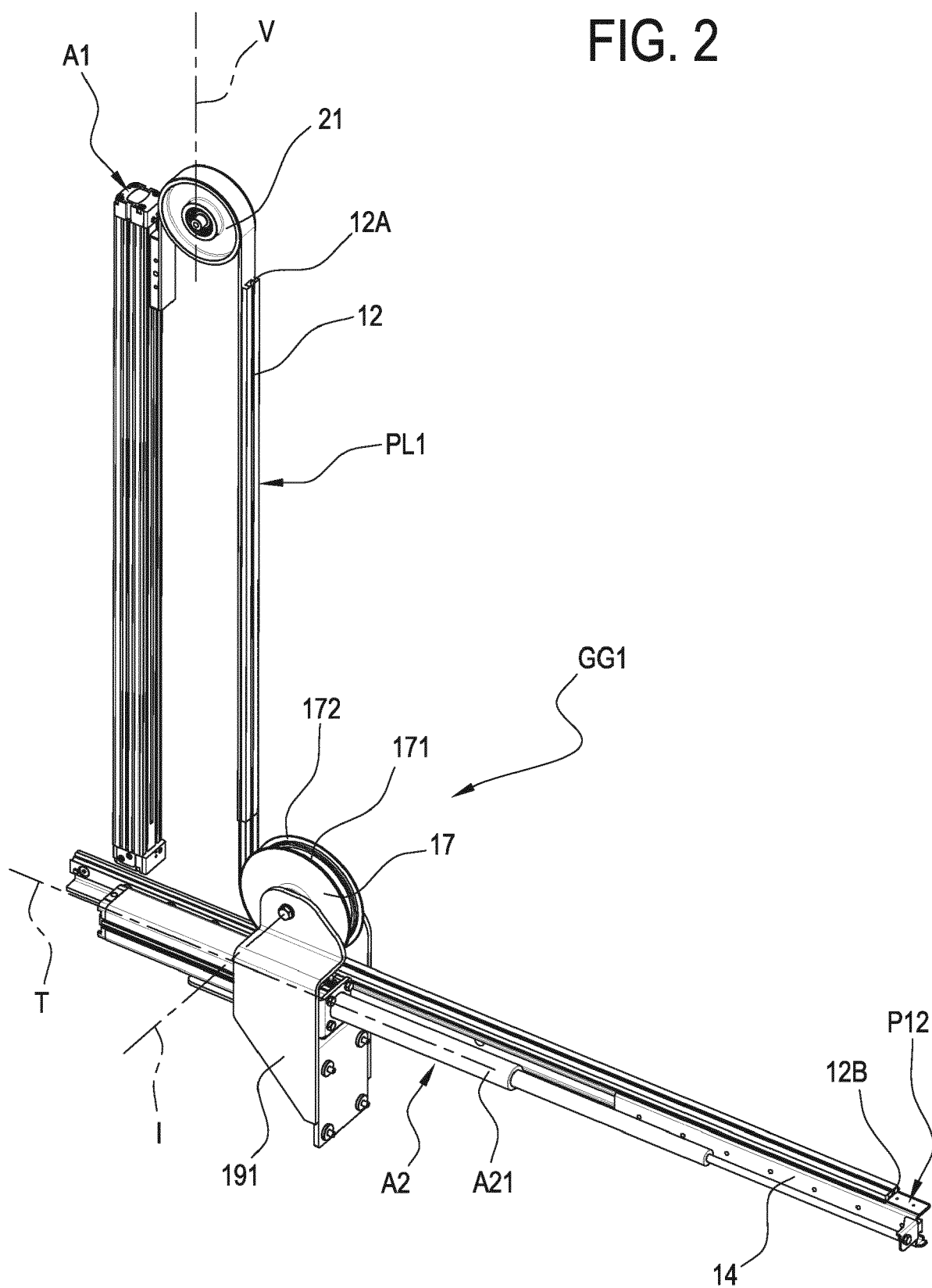


FIG. 2



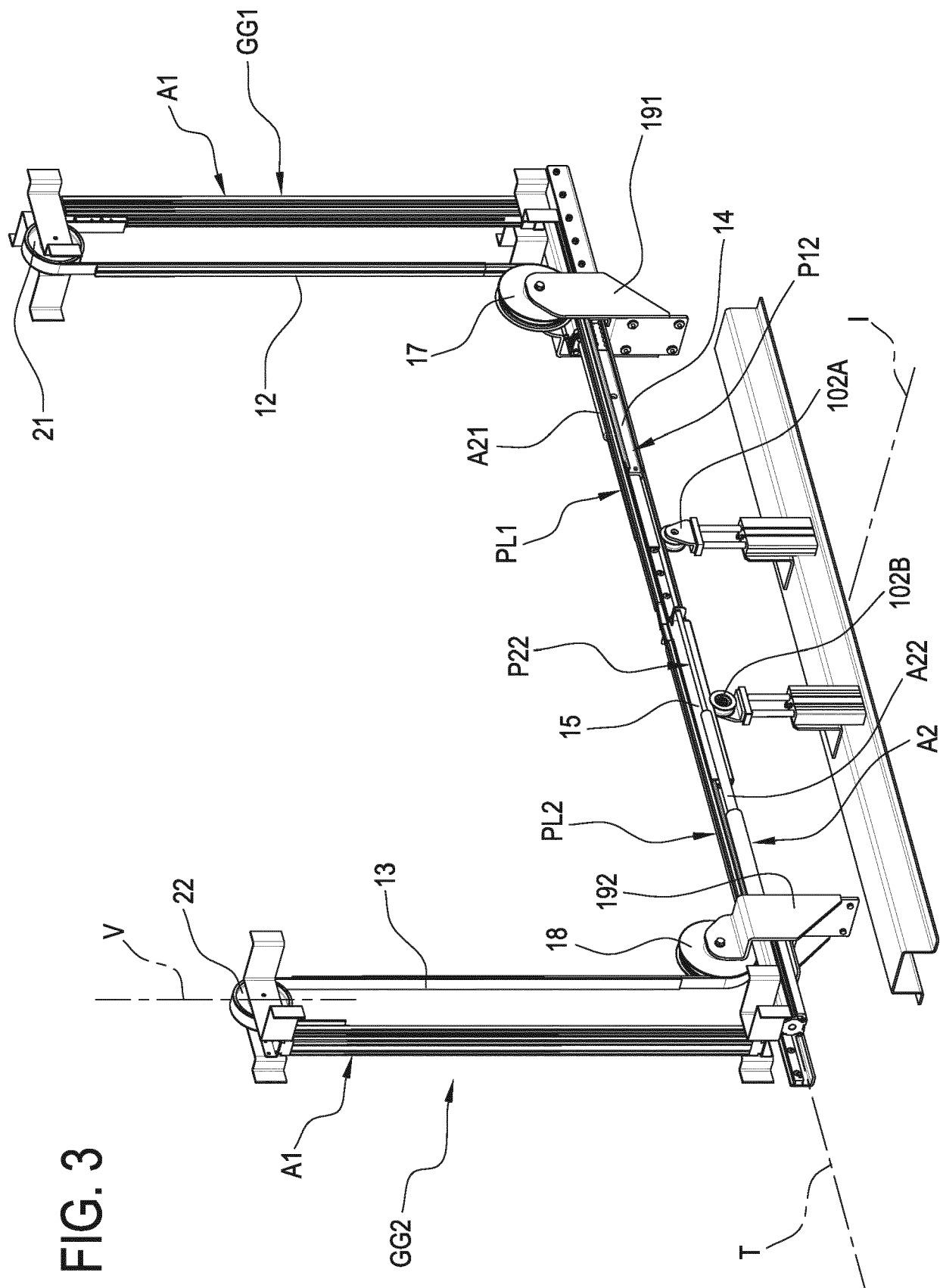


FIG. 3

FIG. 4A

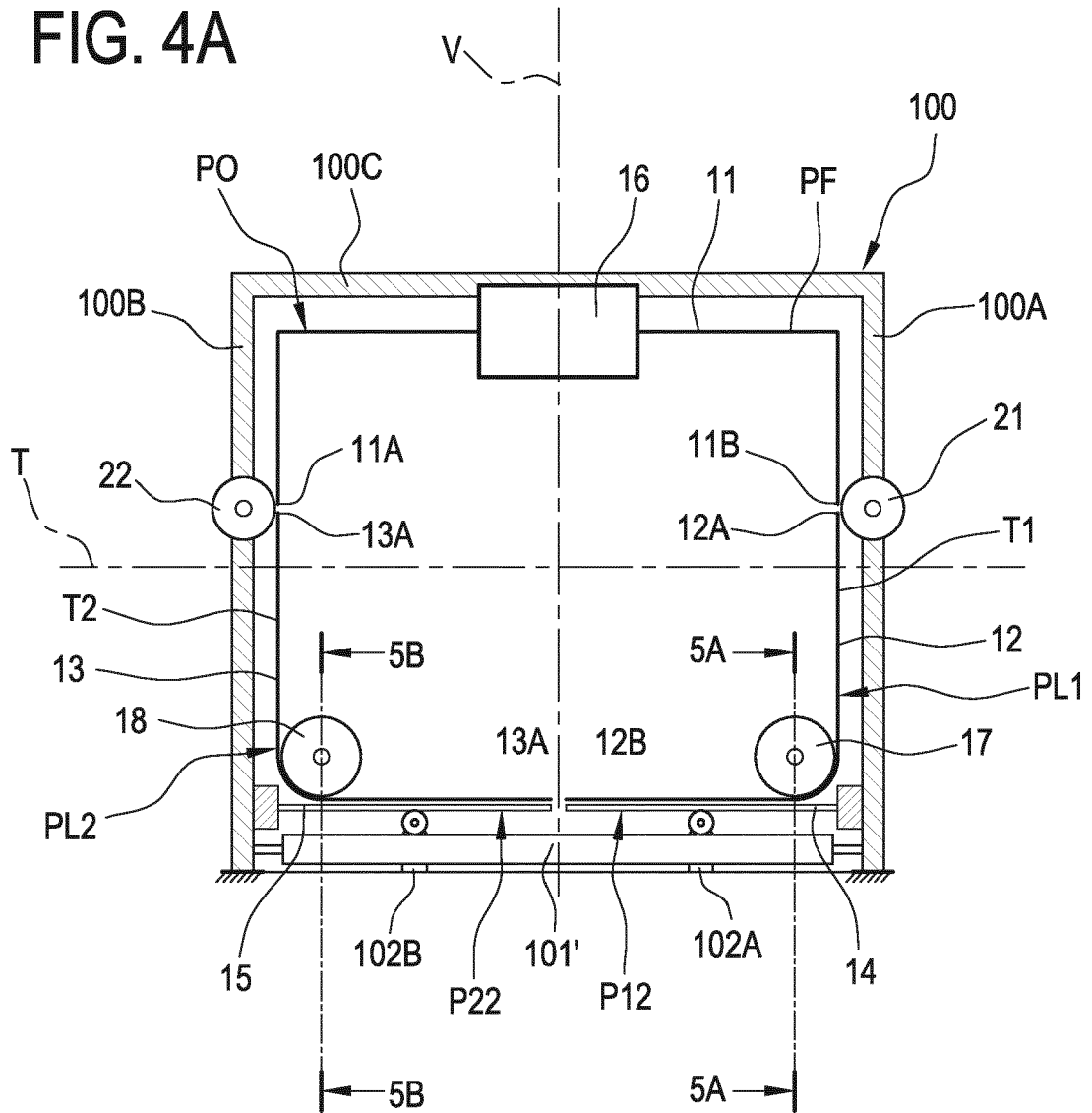


FIG. 4B

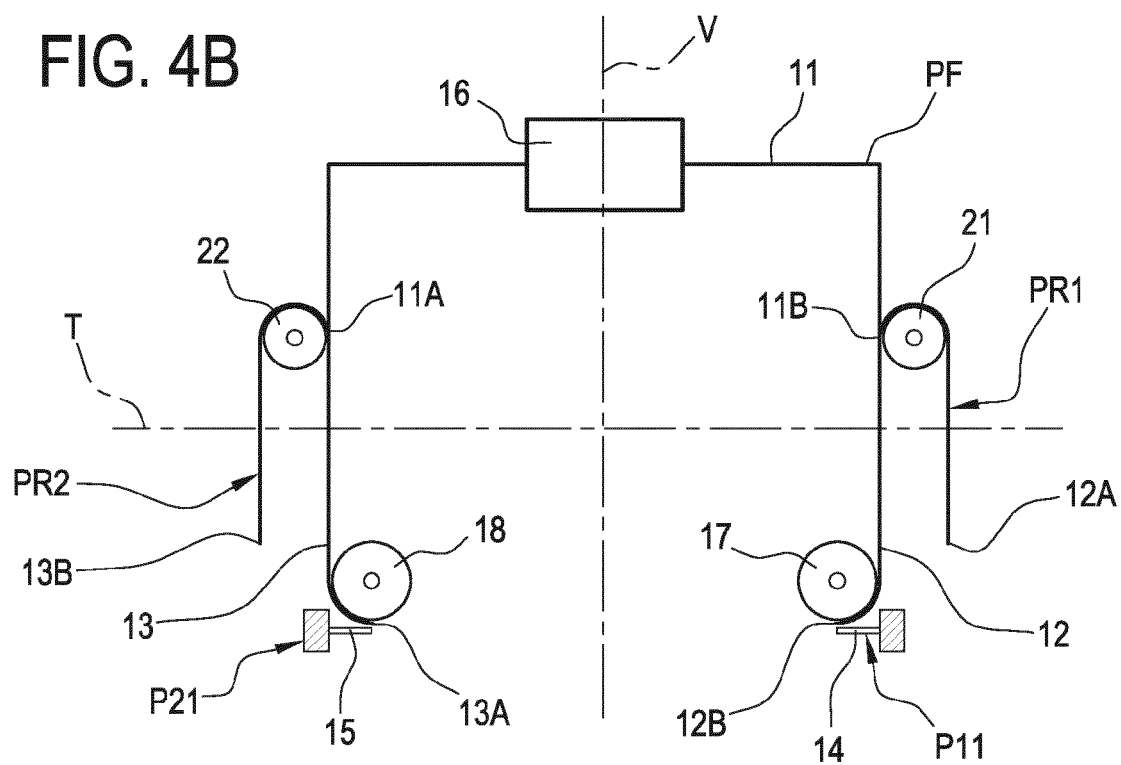


FIG. 4C

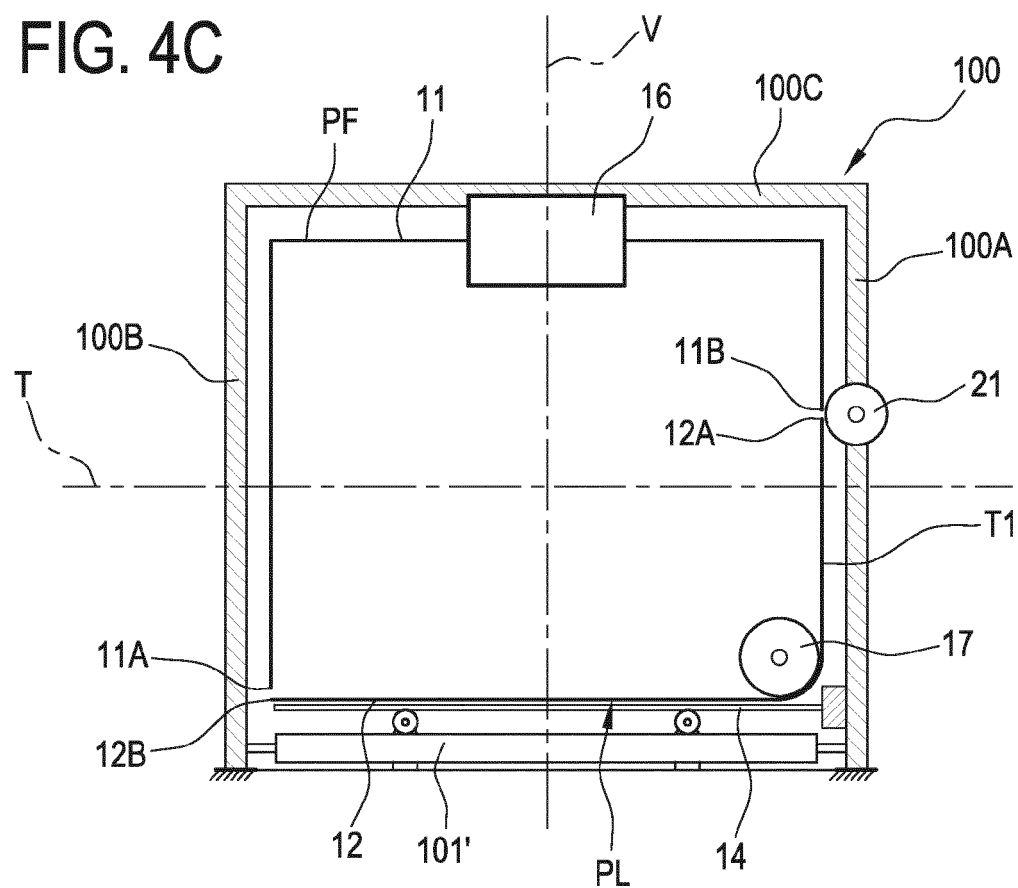


FIG. 5B

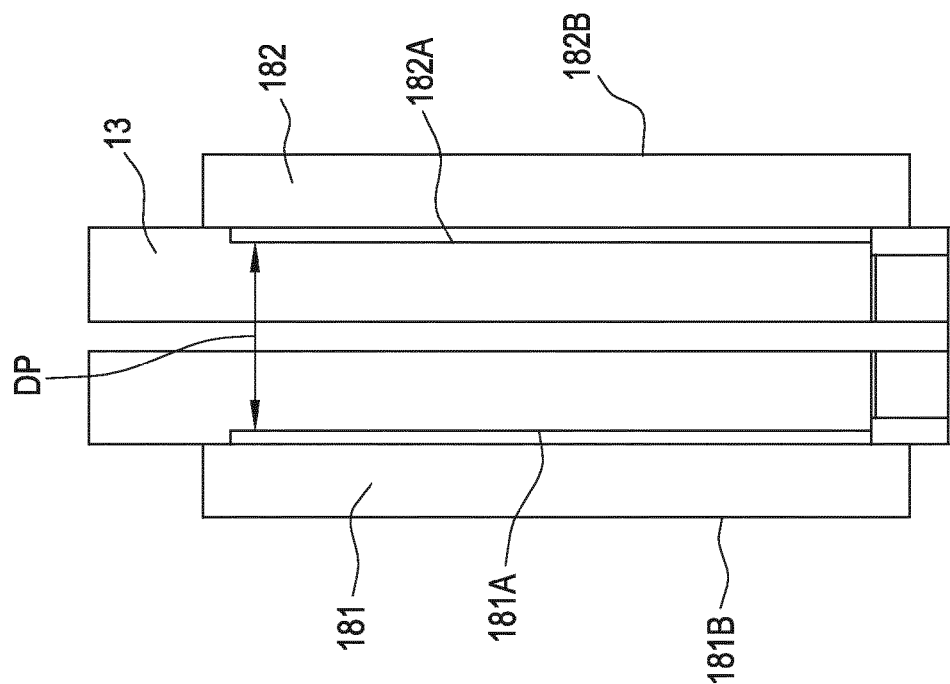


FIG. 5A

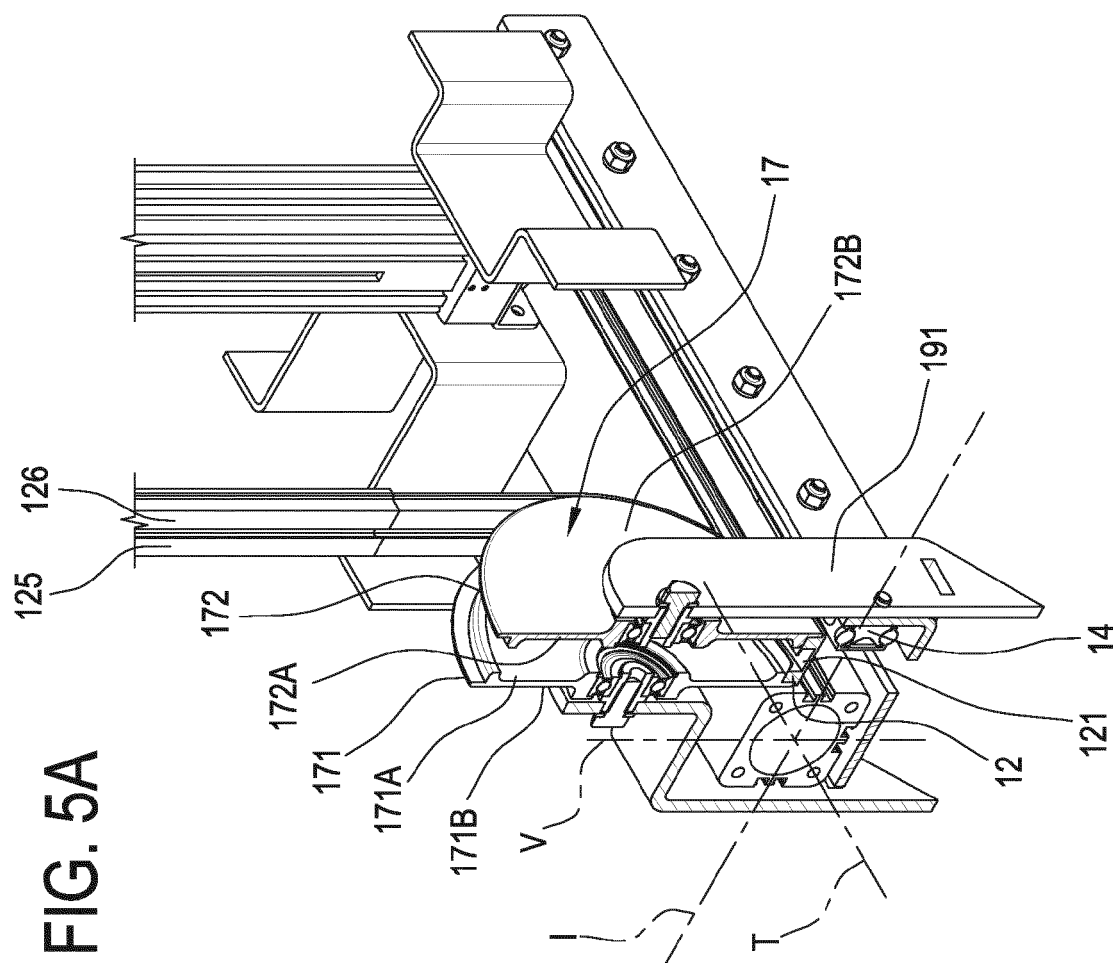


FIG. 6A

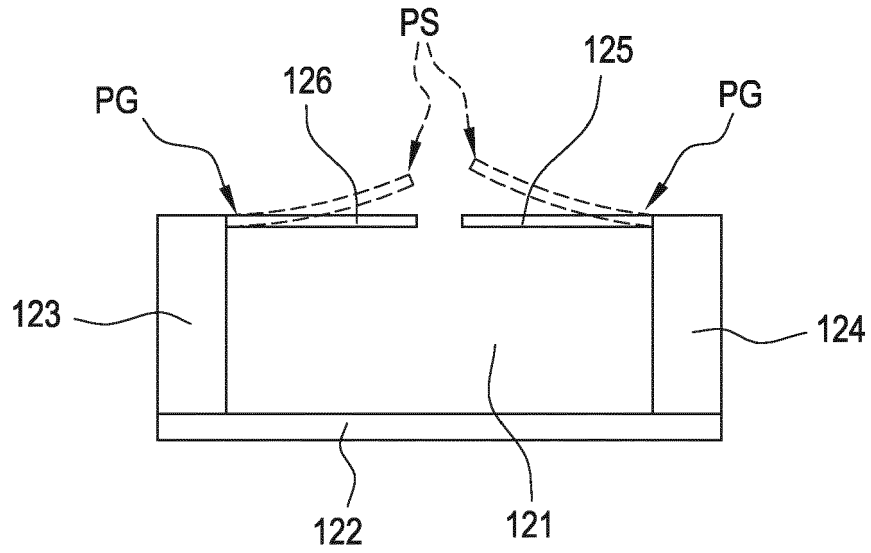


FIG. 6B

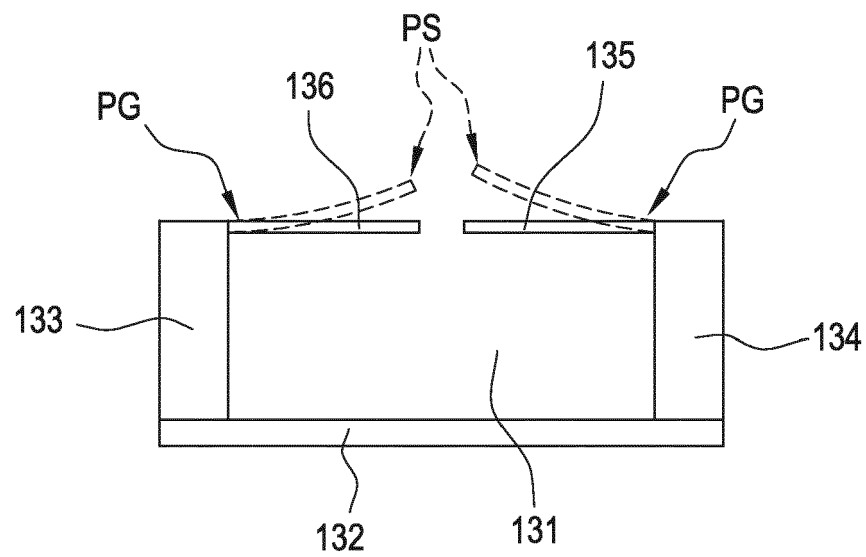


Fig. 7A

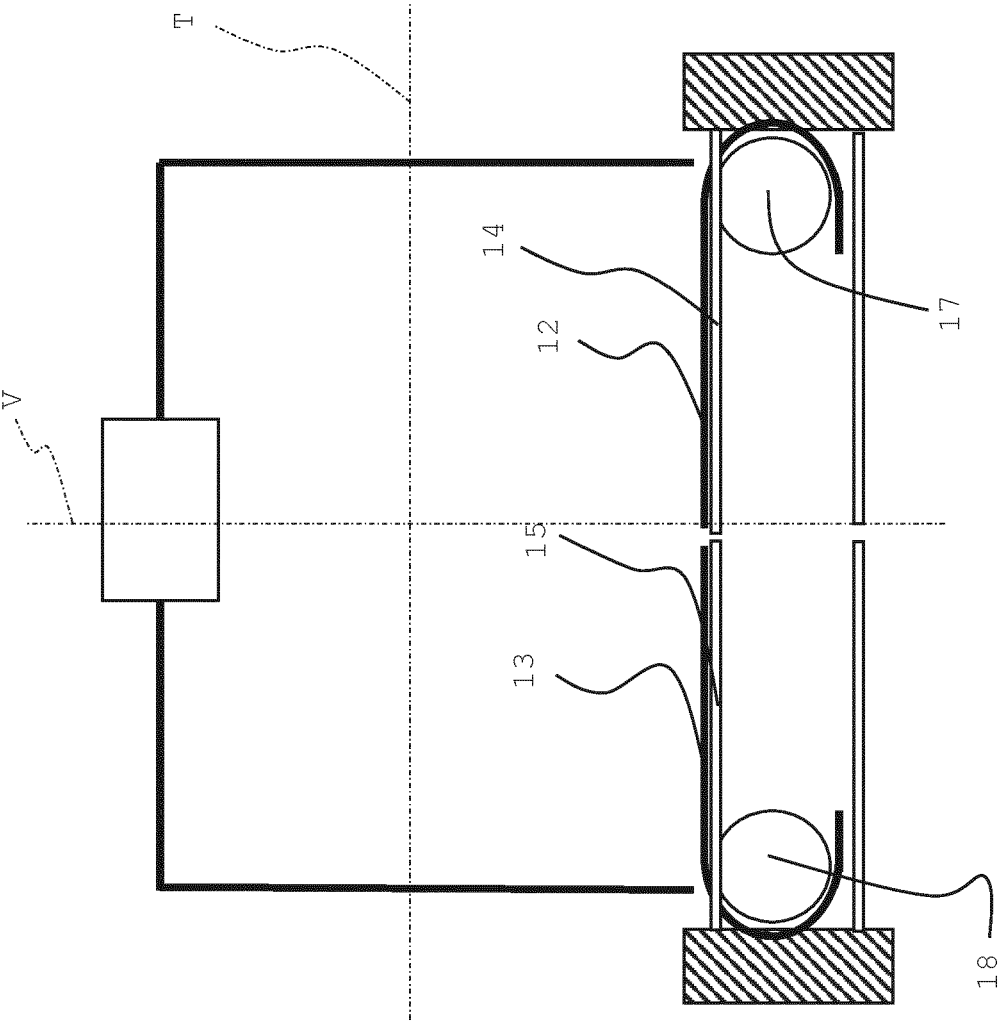
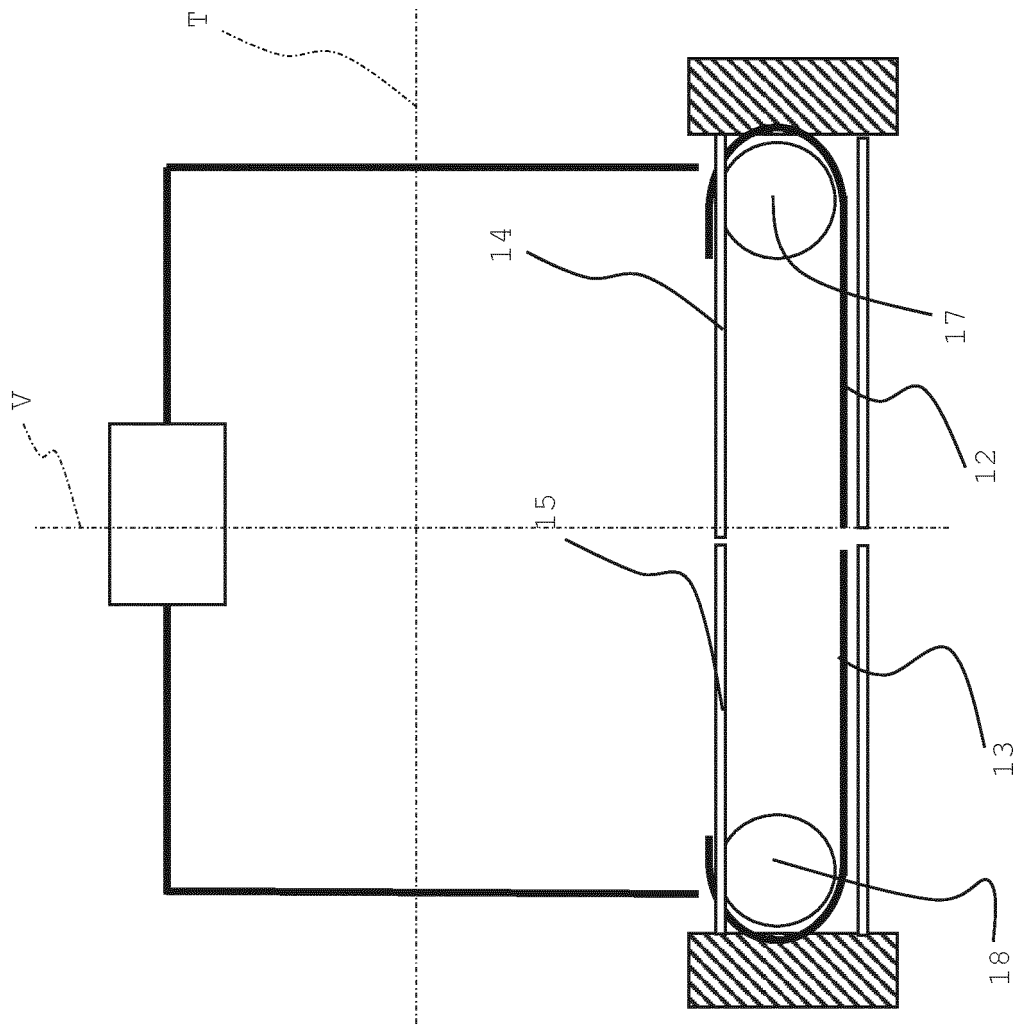


Fig. 7B





EUROPEAN SEARCH REPORT

Application Number
EP 20 21 3295

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A	US 5 355 786 A (TIPTON ALLISON D [US] ET AL) 18 October 1994 (1994-10-18) * figures 1,3,7 *	1	
A	US 3 150 585 A (STERNER OLLE P) 29 September 1964 (1964-09-29) * the whole document *	1	
A	US 5 315 808 A (MACIVOR MICHAEL [US] ET AL) 31 May 1994 (1994-05-31) * the whole document *	1	
A	US 4 905 448 A (PLITT MIKE [US]) 6 March 1990 (1990-03-06) * figure 3 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 April 2021	Examiner Ungureanu, Mirela
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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01-04-2021

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