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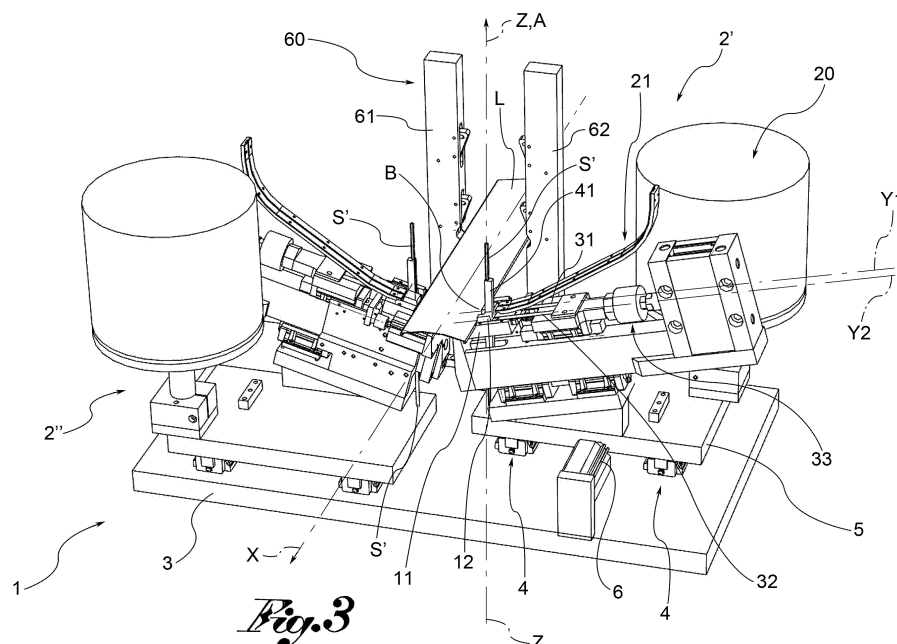
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(54) **Stacking unit of slats on support half-ladders for the production of venetian blinds and combined application method of hooks and half-ladders to a slat**

(57) The invention relates to a stacking unit of slats on support half-ladders for the production of venetian blinds, comprising at least one group 2 for assembling on a slat a hook and a half-ladder with eyelets O. Such group is positioned laterally with respect to a longitudinal sliding axis X of the slats and comprises: - a matrix 11, 12 having a cavity 13 for a portion of rim and two apertures 14 and 15 of access to the cavity, between which a through aperture 16 is made; - a device 31 for applying hooks in correspondence with the first aperture 14; - a

device 40 for guiding a half-ladder in correspondence with the through aperture 16, leaving an eyelet in correspondence with the through aperture 16; - a device 32 for closing the hook (G) in correspondence with the second aperture 15 of the matrix. The stacking unit comprises means 4, 5 for generating a relative movement between the slat and the matrix so that a hook anchored to the rim shifts along the cavity from said first aperture to the second 15 crossing the through aperture 16 engaging the eyelet. The hook is closed in correspondence with the second aperture 15.

**Fig. 3****EP 2 653 646 A2**

Description

Field of Application

[0001] The present invention relates to a stacking unit of slats on support half-ladders for the production of Venetian blinds, as well as to a combined application method of hooks and half-ladders to a slat.

State of the art

[0002] As is known, Venetian blinds are composed of a plurality of slats, positioned parallel to each other and held in position by means of cord support structures. Such structures are essentially of two types.

[0003] A first type of structure is called a "full ladder", that is to say composed of two parallel ribs (positioned in the height-wise direction of the blind) and by a plurality of cross-members which connect them to each other at regular intervals. A slat is associated to each cross-member, resting thereon (if the cross-member is single) or inserted therein if the cross-member is multiple.

[0004] A second type of structure is called a "separated ladders" or "half-ladder", that is to say is composed of two cords separate from each other and each provided with a plurality of string eyelets distributed at regular distances along the single cord. The support cords are positioned in pairs at opposite sides of the slats, generally transversally aligned. The cords are associated to the slats in correspondence with the eyelets by means of staples or hooks fixed to the lateral rims thereof. The slats, which may have any cross-section, such as a C, Z or S-shape, must have bent rims (as shown in Figure 1) so as to constitute a reinforced zone able to rigidly support a hook or a staple.

[0005] The staples are attachment elements structured to block a single eyelet directly in contact with the rim of the slat. The eyelet is positioned between the slat and the staple. Generally this operation is performed manually with the help of a staple gun to apply the staples.

[0006] The hooks may be of many types, but all characterised by the fact that the eyelet is blocked directly onto the hook and not onto the slat.

[0007] One type of widely diffused hook is shown in Figure 2 and is composed of a U-element, which defines the anchorage portion to the slat, and by an open ring, which extends from the U-element in a position opposite to the two free ends of the U and in correspondence with which the eyelet is inserted. The open ring is then closed after inserting the eyelet.

[0008] Devices for automatically applying the U-hooks with rings to the rims of the slats are known of. More in detail, such devices consists of a central guide which the slat slides along. Laterally to such guide a matrix is positioned on each side to block the bent rim of the slat. Said matrix is composed of two coupled parts, suitable for opening, which enclose the rim of the slat between them as in a vice in a suitably shaped seat. A thrust el-

ement and a hook feeder are associated to each matrix. The thrust element is guided to enter inside the inner seat of the matrix bearing in front of it a single hook to apply to the rim. The hooks are positioned in front of the head of the thrust element by means of a chute connected to the feeder.

[0009] Such application devices may be inserted in-line on a production plant (profiling, punching, etc.) of the slats. The application of the hooks is slower than the production and machining operations of the slats and becomes the bottleneck of the process. In-line configuration is therefore only acceptable in plants sized for small production lots.

[0010] For production at an industrial level in-line configuration is, instead, not acceptable. The application of the hooks is therefore performed out of line, on dedicated stations separate from the production and machining line of the slats.

[0011] Generally, the final operation of coupling the half-ladders to the hooks already fixed to the slats is conducted manually, often even in industrial production.

[0012] Automatic coupling systems of the half-ladders to the hooks already anchored to the slats exist however. These systems are placed in dedicated stations separate from those for applying the hooks, in correspondence with which the final assembling of the Venetian blinds takes place with the stacking of the slats.

[0013] Up to today, the operation of attaching the hooks has always been kept completely separate from the coupling operation of the half-ladders to the hooks on account of plant and operating complexities, not yet overcome, which the combination of such two operations entails. This slows down the assembly process of the Venetian blinds, introducing downtime and imposing a doubling of the machining stations.

Presentation of the invention

[0014] Consequently, the purpose of the present invention is to eliminate entirely or in part the drawbacks of the prior art mentioned above, by making available a unit for stacking slats on support half-ladders for the production of Venetian blinds, which makes it possible to perform the operation of attaching the hooks to the slats and the operation of coupling the half-ladders to the hooks in a combined manner.

[0015] A further purpose of the present invention is to make available a unit for stacking slats on support half-ladders which is easy to operate.

[0016] A further purpose of the present invention is to make available a unit for stacking slats on support half-ladders which is simple and economical to make.

[0017] A further purpose of the present invention is to make available a combined application method of hooks and half-ladders to a slat which permits the two operations to be combined in a simple and reliable manner.

Brief description of the drawings

[0018] The technical characteristics of the invention, according to the aforesaid purposes, can be seen clearly from the contents of the following claims and the advantages of the same will be more clearly comprehensible from the detailed description below, made with reference to the attached drawings, showing one or more embodiments by way of non-limiting examples, wherein:

[0019] - Figure 1 shows in perspective view an example of slat with bent rims;

[0020] - Figure 2 shows in perspective view an example of a hook with an open ring;

[0021] - Figure 3 shows an overall perspective view of a stacking unit according to a preferred embodiment of the present invention, shown in an operating step prior to the application of the hooks and of the half-ladders to the rim of a slat;

[0022] - Figure 4 shows a perspective view of the stacking unit in Figure 3, shown in an operating step of lifting after the application of the hooks and of the half-ladders;

[0023] - Figure 5 shows a perspective view of the stacking unit in Figures 3 and 4, shown in an operating step of inserting a new slat;

[0024] - Figures 6 and 7 show a view respectively from above and from the side of the stacking unit in Figure 3;

[0025] - Figures 8 to 16 show in sequence the steps of applying a hook and inserting a half-ladder by means of a stacking unit according to a preferred embodiment of the present invention; the drawings are relative to a detail of an assembling group where some parts have been removed to show others more clearly;

[0026] - Figures 17 and 18 show two views in lateral cross-section of a detail relative to a matrix in two different operating positions.

Detailed description

[0027] With reference to the appended drawings reference numeral 1 globally denotes a stacking unit of slats on support half-ladders for the production of Venetian blinds according to the invention.

[0028] As will be described clearly below the stacking unit 1 according to the invention makes it possible to perform the operation of attaching the hooks to the slat and the operation of coupling the half-ladders to the hooks in a combined manner.

[0029] Reference will be made to a half-ladder S' of the known type, having a longitudinal rib P from which eyelets O extend positioned at a regular intervals. Reference will be made to a hook G, of the known type, an example of which is shown in Figure 2, comprising an anchorage portion G1 to the slat L and an open ring G2, which extends in an opposite position to the coupling portion and destined to engage an eyelet O of a half-ladder. The anchorage portion is composed of two parallel appendages G1' and G1'' which at the moment of anchorage get deformed to engage on the rim of the slat

assuming the shape of hooks.

[0030] In particular, the stacking unit 1 is destined to be associated to one or more identical units to constitute an assembling station of the Venetian blinds. In particular, the units 1 are moveably associated to a longitudinal support bar (not shown) along which the slats are made to slide. The units 1 may be repositioned along said bar to adapt to the length of the slats. Such assembling station may be placed in line with a slat production machine, or be placed off line so as not to slow down the faster slat production process.

[0031] Here and henceforth in the description and the claims, reference will be made to the stacking unit in conditions of use. The references to an upper or lower position should therefore be understood in this sense.

[0032] According to a general embodiment of the invention, The stacking unit 1 comprises at least one group 2 for assembling on a slat L a hook G and a half-ladder S'. Said assembling group 2 being positioned laterally in relation to a longitudinal axis X along which the individual slats L slide to engage a longitudinal rim B of a slat L.

[0033] Preferably, as shown in Figures 3 to 7, and as described further below, the stacking unit comprises two assembling groups 2', 2'' positioned on opposite sides of the longitudinal axis X to engage both longitudinal rims B of a slat L and thus permit the application of hooks and half-ladders contemporaneously on both sides of the slat.

[0034] As will be clarified by the description below, according to a preferred embodiment, the single assembling group 2', 2'' has an asymmetric structure with respect to a transversal direction to the axis X. Considering this asymmetric structure, it is preferable for the two assembling groups 2', 2'' to be entirely identical. The arrangement of the two assembling groups in frontal positions opposite in relation to the longitudinal axis X permits however that the forces applied to the slat are balanced, reducing the risk of deformation thereof.

[0035] According to the aforesaid general embodiment, each assembling group 2', 2'' in turn comprises a matrix 11, 12 which defines a cavity 13 parallel to the longitudinal axis X to house a rim portion B of a slat.

[0036] Operatively, the matrix 11, 12 acts so as to retain the rim portion B of the slat in correspondence with which the hook G is to be applied, so as to absorb the impulsive force applied to the hook to permit the anchorage thereof and impose a bending of the anchorage appendages G1' and G1'' against the rim of the slat after perforating it. To such purpose, in particular the matrix is provided with suitable seats 13a in correspondence with the cavity 13 to guide the bending of such appendages.

[0037] The matrix comprises a first 14 and a second 15 aperture of access to the cavity 13. Between two access apertures - parallel to the longitudinal direction X - a through aperture 16 is made in said matrix. The function of such apertures will be described below.

[0038] Advantageously, as shown in Figures 17 and

18, the matrix is divided into two portions: a lower portion 11, which is positioned under the rim B of the slat, and an upper portion 12, which is positioned above such rim B. The aforesaid cavity 13 is made at the interface between said two portions 11 and 12.

[0039] Preferably, the first 14 and the second aperture 15 are made in the upper portion 12. The through aperture 16 may cross both portions in a direction which is incident to the interface surface or only to the upper portion 12.

[0040] According to one embodiment not shown in the appended Figures, the two portions of the matrix overlap at least partially and the two access apertures to the cavity are also made at the interface between the two portions.

[0041] According to the preferred embodiment illustrated in the appended Figures, the two portions 11, 12 of the matrix are movable in relation to one another between an adjacent position, in which they hold the rim portion B of the slat L between them in a vice, in correspondence with the cavity 13, and at least one partially separated position, wherein said two portions are distanced from one another to widen the cavity 13 in transversal direction, so as to permit the relative sliding of the ring G2 of a hook G anchored to the rim B inside the cavity. In particular, as will be clarified by the continuation of the description, the partial separation of the two portions aims to permit the sliding of said ring from the first aperture 14 as far as the second aperture 15, passing through the through aperture 16.

[0042] Advantageously, such two portions 11, 12 of the matrix can be moved away from each other beyond said partially separated position to reach a completely separated position, in which the two portions 11, 12 of the matrix are distanced from each other to completely free the rim B of the slat and a hook G associated to it, from the cavity 13, and thereby permit the distancing of the slat (with hook and half- ladder associated to it) from the assembling group 2', 2".

[0043] The two portions 11 and 12 of the matrix are movable by means of actuators 17, consisting for example of electric, pneumatic or hydraulic pistons.

[0044] Again according to the aforesaid general embodiment, each assembling group 2', 2" comprises a device 10, 31 for applying hooks G to the rim B of a slat L in correspondence with the first aperture 14. Said application device 10, 31 positions the individual hook G on the rim B with the anchorage portion G1 engaged on said rim and with the ring G2 positioned inside the cavity 13 of the matrix.

[0045] Preferably, as shown in the appended drawings, the hook application device 10 comprises a hook G feeder 20, which by means of a chute 21 positions one hook at a time on the matrix 13 next to the first aperture 14. The feeder may be of the stacking or vibrational type and permits feeding of the hooks G positioning them with the anchorage portion G1 facing towards the first aperture 14 and with the ring aperture G2 facing towards the

second aperture 15 transversally (i.e. parallel to the longitudinal direction X) .

[0046] According to the preferred embodiment illustrated in the appended Figures, the application device 10 comprises a first thrust element 31 movable along a first working direction Y1, incident to the rim B, between:

[0047] - a thrust position, in which said thrust element 31 engages the cavity 13 of the matrix passing through the first aperture 14 to push a hook G positioned next to the first aperture 14 against the rim B so as to bring the anchorage portion G1 to engage on the rim and leave the ring G2 outside the rim B inside the first aperture 14, and

[0048] - a release position, in which it does not engage the cavity 13, freeing the first aperture 14.

[0049] As can be seen in particular from figures 8 to 13, the first thrust element 31 slides inside a guide 34, in correspondence with which the exit of the feeder chute 21 is placed. The thrust element 31 acts as a regulator element of the descent movement of the hooks from the chute. In particular, when the end tip of the thrust element 31 occupies the guide 34 passing beyond the exit of the chute 21, the descent of the hook is prevented.

[0050] Each assembling group 2', 2" comprises:

[0051] - a device 40 for guiding a half- ladder S' in a positioning direction Z which crosses the matrix 13 in correspondence with the through aperture 16; and

[0052] - a device 32 for closing the open ring G2 of a hook G, said closure device 32 being positioned to act in correspondence with the second aperture 15 of the matrix.

[0053] More in detail, the guide device 40 comprises a linear guide 41 which retains within it in the aforesaid positioning direction Z the longitudinal rib P of the half- ladder S' , leaving an eyelet O on the outside at the point of the through aperture 16 and facing towards the inside of the cavity 13.

[0054] The stacking unit 1 comprises means 4, 5 for generating a relative movement between the slat L and the matrix 13 parallel to the longitudinal direction X for a tract equivalent to the distance D between the first 14 and the second aperture 15.

[0055] Operatively, as already mentioned, thanks to this relative movement, a ring G2 of a hook G- already anchored to the rim B by means of the application device 31 at the first aperture 14- shifts along the cavity 13 from said first aperture 14 to the second aperture 15 crossing the through aperture 16. During such relative movement along the cavity 13, the open ring G2 engages the eyelet O positioned there and pulls it with itself as far as the second aperture 15, where the ring G2 with the eyelet O engaged inside it, is closed by the closure device 32.

[0056] Preferably, to permit or merely facilitate (depending on the conformation of the cavity) the aforesaid relative sliding movement the portions of the matrix are brought into the aforesaid partially separated position.

[0057] Preferably, the aforesaid relative movement is obtained moving only the matrix and leaving the slat L

still.

[0058] According to a preferred embodiment, said means for generating a movement consist of means 4, 5 of moving the assembling group 2 with respect to a fixed support structure 3 parallel to the longitudinal direction X.

[0059] More in detail, as shown in particular in Figures 3 and 7, the stacking unit 1 comprises a fixed support structure 3. A movable support plate 5 is moveably connected to this fixed structure 3 by means of guides 4 parallel to the longitudinal direction X. The moveable support plate 5 supports a single assembling group 2. The movement of the plate 5 and of the group associated thereto is performed by means of one or more dedicated actuators 6.

[0060] Advantageously, the closure device comprises a second thrust element 32 movable along a second working direction Y2, incident to the rim B or passing next to it, between a thrust position, in which it engages the cavity 13 of the matrix passing through the second aperture 15, and a release position, in which it does not engage the cavity 13.

[0061] According to the embodiment illustrated in the appended Figures, the two working directions Y1 and Y2 of the two thrust elements are parallel and coplanar to each other.

[0062] Advantageously, the two thrust elements 31, 32 are moved by a common actuator 33 between the thrust and release positions.

[0063] In the stacking unit 1 a sliding plane m of the individual slat L may be defined, in correspondence with which plane the slat L is supported with both its longitudinal rims B. The common lying plane n of the two working directions Y1, Y2 is angled with respect to said sliding plane m by an angle α . Operatively, this facilitates the insertion of the hooks in the rim B.

[0064] Advantageously, as may be observed in figures 11 and 15, the head portion 32a of the second thrust element 32 has a seat shaped so that the thrust action is concentrated on the ring, deforming it. Diversely the head portion 32a of the first thrust element 32 has a seat shaped so that the ring may be entirely housed therein and the thrust applied to the sides of the ring, in correspondence with the base of the anchorage portion G1.

[0065] Preferably, the guide device 40 of the half-ladder S' comprises means of positioning a single eyelet O of the half-ladder S' in correspondence with the through aperture 16 of the matrix.

[0066] According to one embodiment, the guide device 40 comprises means of moving the half-ladder S' in the linear guide 41 according to a way of advancement A along the positioning direction Z to progressively bring each eyelet O in correspondence with the through aperture 16. The positioning means comprise at least one sensor (not shown; preferably of the optical type) to detect the transit before it of an eyelet during a movement of the half-ladder along the positioning direction Z. The sensor faces onto the through aperture 16 at a predefined

distance H from the cavity 13 with respect to the positioning direction Z. Operatively, the eyelet O is positionable in correspondence with the cavity 13 operating the movement means to move the half-ladder by a tract equivalent to the aforesaid predefined distance H along the positioning direction Z at the moment in which the sensor detects the passage of an eyelet O.

[0067] Alternatively, mechanical type positioning means may be envisaged, comprising for example mechanical abutments and vertical tensioning systems of the half-ladder (for example by means of weights).

[0068] Advantageously, the guide device 40 of the half-ladder S' comprises means of retaining the half-ladder S' in the linear guide 41. Such means may be manually adjustable frictioning elements, or frictioning systems controlled remotely which may also completely block the half-ladder inside the guide.

[0069] According to the preferred embodiment, shown in Figures 3 to 7, the stacking unit 1 comprises at least one slat loader 60.

[0070] The loader may be of any type suitable for the purpose. In particular, as shown in the appended drawings, the loader 60 may be composed of two bars 61 and 62 provided with sprung teeth for the positioning of the slats already inserted in the half-ladder.

[0071] Advantageously, the stacking unit 1 comprises means 60 of moving a slat L from a position for applying hooks and half-ladders to a dropping position into the loader.

[0072] Operatively, the movement of the slat L makes the half-ladder S' associated to it advance pulling it into the guide device 40.

[0073] Such means of movement of the half-ladder may consist for example of a hoist 30, comprising a pneumatic, hydraulic or electric cylinder.

[0074] The functional operating steps of the stacking unit 1 as they appear in the sequence in Figures 8 to 16 are briefly described. The description sets out to draw attention to the movements of the various elements in the area for applying the hooks and the slats.

[0075] In Figure 8 the matrix is shown with the two portions 11 and 12 completely separate; the slat L has just been positioned; the half-ladder is already positioned with an eyelet in the through aperture 16 in correspondence with the cavity 13. In Figure 9 the two portions of the matrix are closed and a hook G is positioned next to the first aperture 14 (Figure 10). In Figure 11, the first thrust element 31 has been activated (together with the second thrust element 32 which runs idle) and the hook is anchored to the rim. The two portions 11 and 12 of the matrix are partially separated (Figure 12) and the entire assembling group 2 is moved parallel to the direction X: the already anchored hook passes with the ring G2 from the first aperture 14 to the second aperture 15 passing through the through aperture 16 where it engages the eyelet O pulling it with itself (Figure 13). The matrix is then closed again completely (Figure 14) and the second thrust element 32 is then activated (together with the first

thrust element 31 which runs idle) with closing of the ring. The half-ladder is now associated to the hook. The matrix can be opened and the slat moves upwards inside the loader pulling the half-ladder with itself.

[0076] The present invention also relates to a method of positioning a support half-ladder (comprising a plurality of pairs of cross-members T1, T2) for the production of Venetian blinds.

[0077] Preferably, but not necessarily, the method is applied to a stacking unit 1 according to the present invention.

[0078] According to a general embodiment, the method comprises the following operating steps:

[0079] a) providing a stacking unit 1 of slats L comprising laterally, in relation to a longitudinal axis X along which the individual slats L slide, a matrix 11, 12 which defines a cavity 13 parallel to the longitudinal axis X for housing a portion of rim B of a slat and comprises a first 14 and a second aperture 15 of access to the cavity 13, between which apertures a through aperture 16 is made;

[0080] b) positioning a half-ladder S' across said through aperture 16 with an eyelet O positioned at the height of such aperture and facing towards the cavity 13 of the matrix;

[0081] c) applying a hook G to said rim portion B at the first aperture 14 with the anchorage portion G1 engaging on said rim and with the ring G2 positioned inside the cavity 13 of the matrix and positioned with the aperture facing in the direction of the second aperture 15;

[0082] d) determining a relative movement of the slat L and the matrix 13 in such a way that the ring G2 shifts along the cavity 13 from such first aperture 14 to the second aperture 15 crossing the through aperture 16 and engaging the eyelet O positioned there, pulling it with itself as far as the second aperture 15; and

[0083] e) closing the ring G2 with the eyelet O engaged inside it in correspondence with the second aperture 15.

[0084] The aforesaid operating steps are cyclically repeated on each slat which is inserted in the stacking unit and associated by the half-ladder S' to the slat preceding it.

[0085] Advantageously, the stacking unit 1 comprises two matrixes 11, 12, positioned laterally to the longitudinal axis X in opposite positions, each housing a portion of the two opposite rims of a slat. The operating steps from b) to d) of the method being performed at both matrixes for the two opposite rims. This way the hooks and relative half-ladders are applied to both sides of the slat contemporarily.

[0086] The invention permits numerous advantages to be obtained, in part already described.

[0087] The stacking unit 1 according to the invention makes it possible to perform the operation of attaching the hooks to the slat and the operation of coupling the half-ladders to the hooks in a combined manner. Such operations may therefore be conducted in the same station with a reduction of downtime, but also with a simpler plant design. The insertion of the half-ladders no longer

requires a dedicated station.

[0088] As appears clearly from the previous description, the stacking unit of slats on support half-ladders is easy to manage, for example by means of a normal PLC.

[0089] The stacking unit is also simple and economical to produce, given that it makes use of device at least in part already present on the market, such as the hook application device (without closing of the ring).

[0090] In particular, in the entirely preferred case of two opposite assembling groups, the slat is balanced as regards the forces applied during the anchorage of the hooks and the closing of the rings.

[0091] The combined application method of hooks and half-ladders to a slat permits the two operations to be combined in a simple and reliable manner.

[0092] The invention thus conceived thereby achieves the predefined aims.

[0093] Obviously, its practical embodiments may assume forms and configurations different from those described while remaining within the scope of protection of the invention.

[0094] Furthermore, all the parts may be replaced with technically equivalent parts and the dimensions, shapes and materials used may be varied as required.

Claims

1. Unit for stacking slats on support half-ladders for the production of venetian blinds, comprising at least one group (2) for assembling on a slat (L) a hook (G) and a half-ladder (S') with eyelets (O) projecting from a longitudinal rib (P), each hook (G) comprising an anchorage portion (G1) to the slat (L) and an open ring (G2) to engage an eyelet (O), said group (2) being positioned laterally to a longitudinal axis (X) along which the individual slats (L) slide to engage a longitudinal rim (B) of a slat (L), said group (2) in turn comprising:

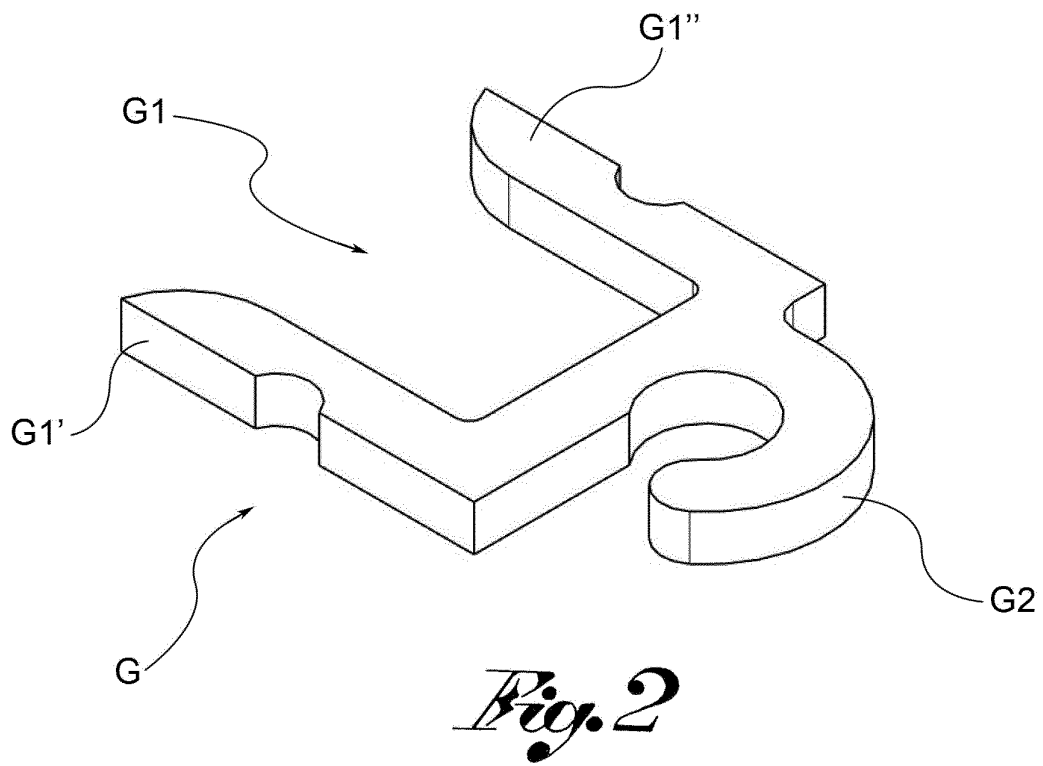
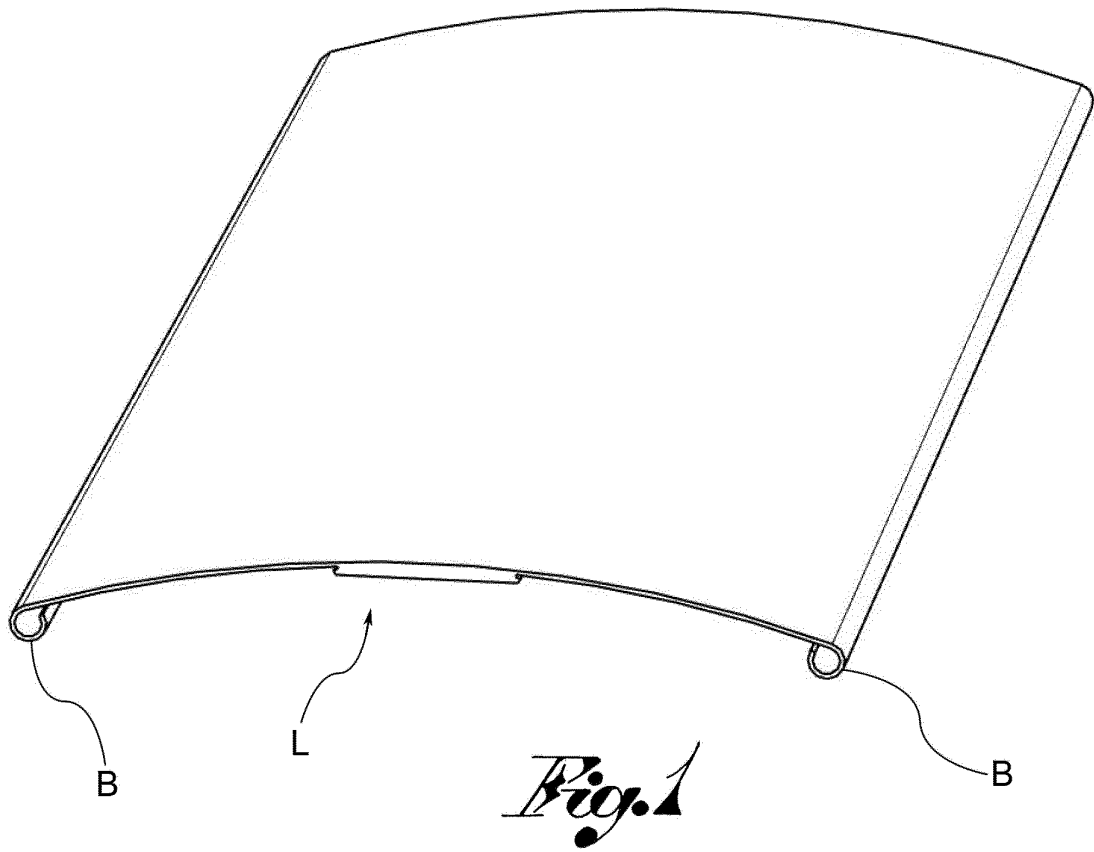
- a matrix (11, 12) which defines a cavity (13) parallel to the longitudinal axis (X) to house a portion of rim (B) of a slat and comprises a first (14) and a second aperture (15) of access to the cavity (13), between which apertures a through aperture (16) is made;

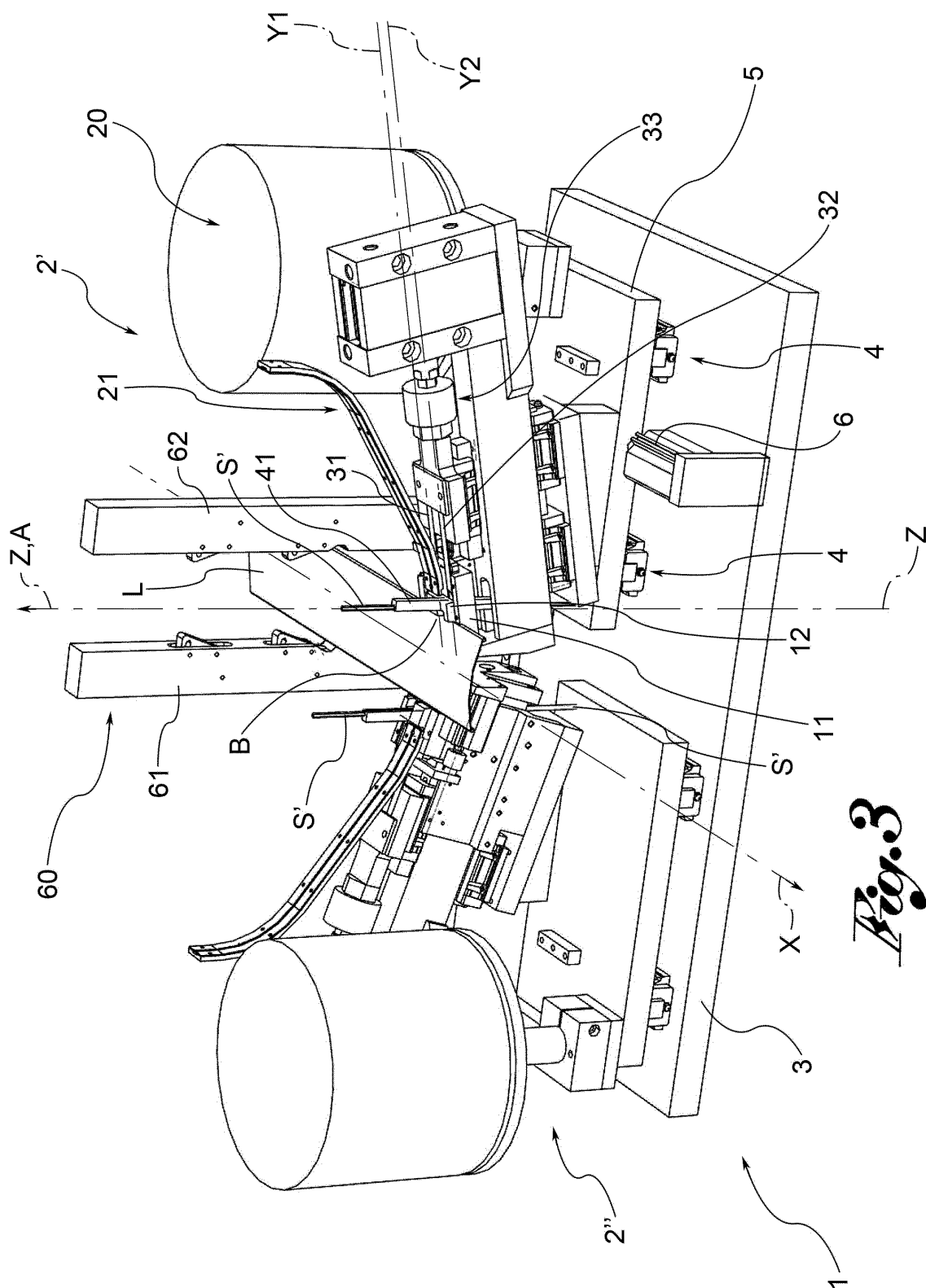
- a device (10,31) for applying hooks (G) to the rim (B) of a slat (L) at said first aperture (14), said device applying a hook (G) to the rim (B) with the anchorage portion (G1) engaging on said rim and with the ring (G2) positioned inside the cavity of the matrix ; **characterised by** the fact that the assembling group (2) comprises:

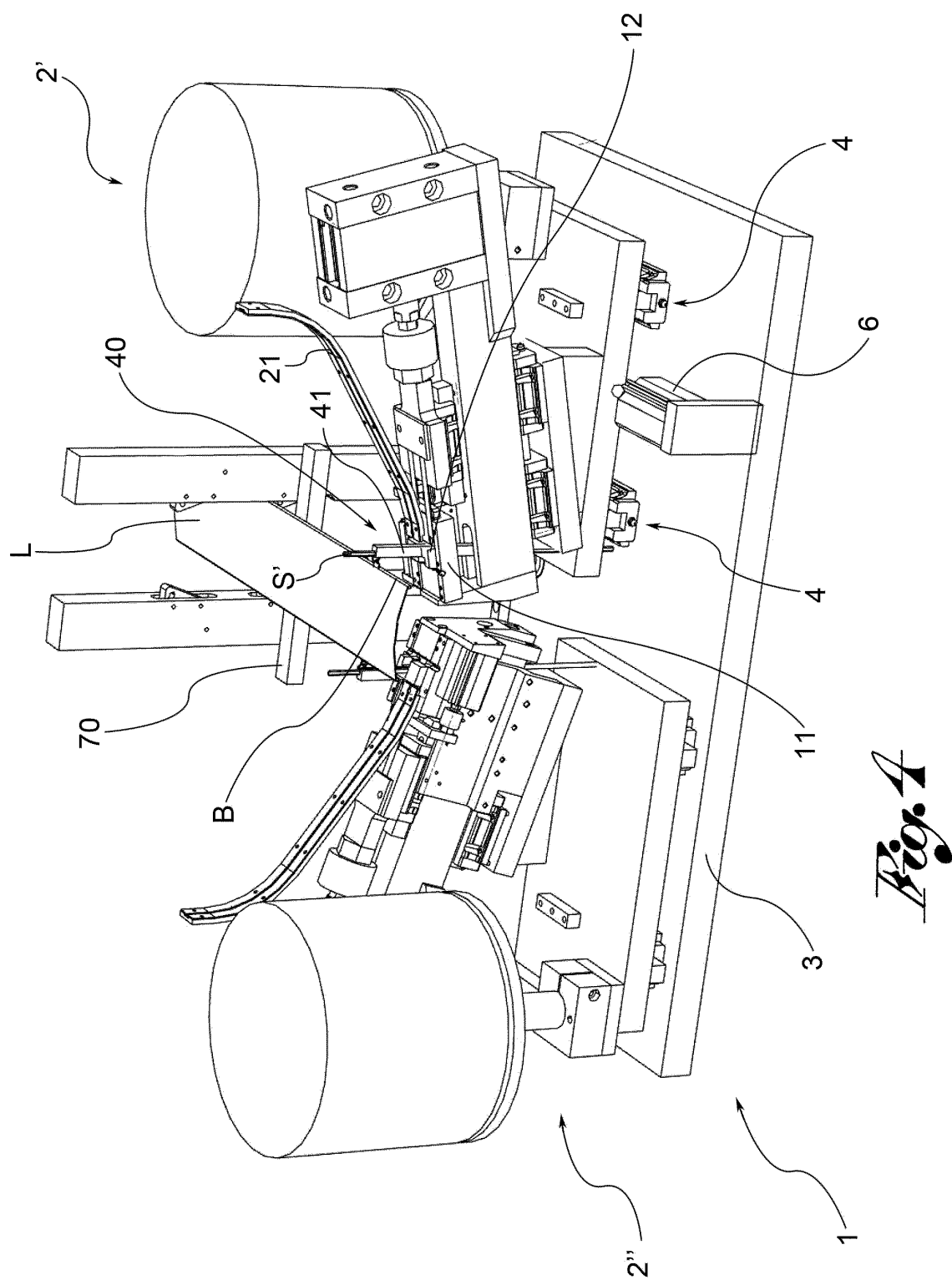
- a device (40) for guiding a half-ladder (S') along a positioning direction (Z) which crosses the matrix (13) at the through aperture (16), said device (40) comprising a linear guide (41) which retains the longitudinal rib (Z) of the half-ladder

- (S) within it along said positioning direction, leaving an eyelet (O) on the outside in correspondence with the through aperture (16) and facing towards the inside of the cavity (13);
- a device (32) for closing the open ring (G2) of a hook (G), said closure device (32) being positioned to act in correspondence with the second aperture of the matrix; and
- by the fact that the stacking unit (1) comprises means (4,5) for generating a relative movement between the slat (L) and the matrix (13) parallel to the longitudinal direction (X) for a tract equivalent to the distance (D) between the first (14) and the second aperture (15), in such a way that a ring (G2) of a hook (G) anchored to the rim (B) by means of the applicator device (10, 31) at the first aperture (14) shifts along the cavity (13) from said first aperture (14) to the second aperture (15) crossing the through aperture (16), during such relative movement along the cavity the open ring (G2) engaging the eyelet (O) positioned there and pulling it with itself as far as the second aperture (15), where the ring (G2), with the eyelet engaged inside it, is closed by the closure device (32).
2. Stacking unit according to claim 1, wherein the matrix is divided into a lower portion (11) and an upper portion (12), said cavity (13) being made at the interface between the two portions (11, 12).
 3. Stacking unit according to claim 1 or 2, wherein the first (14) and the second aperture (15) are made in the upper portion (12).
 4. Stacking unit according to claim 2 or 3, wherein the two portions (11, 12) of the matrix are movable in relation to one another between an adjacent position, in which they hold the rim portion (B) of the slat (L) between them in a vice, in correspondence with the cavity (13), and at least one partially separated position, wherein the two portions (11, 12) of the matrix are distanced from one another to widen the cavity (13) in a transversal direction, so as to permit the relative sliding of the ring (G2) of a hook (G) anchored to the rim (B) from the first aperture (14) as far as the second aperture (15), passing through the through aperture (16).
 5. Stacking unit according to claim 4, wherein the two portions (11, 12) of the matrix are movable in relation to one another between said adjacent position and a completely separated position, in which the two portions (11, 12) of the matrix are distanced from each other to completely free the rim (B) of the slat and a hook (G), associated to it, from the cavity (13).
 6. Stacking unit according to one or more of the previous claims, wherein said hook application device (10) comprises a hook (G) feeder (20) which by means of a chute (21) positions one hook at a time on the matrix (13) next to the first aperture (14), with the anchorage portion (G1) facing towards the first aperture (14) and with the ring aperture (G2) facing towards the second aperture (15) parallel to the longitudinal direction (X).
 7. Stacking unit according to one or more of the previous claims, wherein said applicator device (10) comprises a first thrust element (31) movable along a first working direction (Y1), incident to the rim (B), between a thrust position, in which it engages the cavity (13) of the matrix passing through the first aperture (14) to push a hook (G) positioned next to the first aperture (14) against the rim (B) so as to bring the anchorage portion (G1) to engage on the rim and leave the ring (G2) outside the rim (B) inside the first aperture (14), and a release position, in which it does not engage the cavity (13) freeing the first aperture (14).
 8. Stacking unit according to one or more of the previous claims, wherein said closure device comprises a second thrust element (32) movable along a second working direction (Y2), incident to the rim (B) or passing next to it, between a thrust position, in which it engages the cavity (13) of the matrix passing through the second aperture (15), and a release position, in which it does not engage the cavity (13).
 9. Stacking unit according to claim 7 and 8, wherein said first (Y1) and said second working direction (Y2) are parallel and coplanar to each other.
 10. Stacking unit according to claim 9, wherein a sliding plane (m) of the individual slat (L) is defined, in correspondence with which plane the slat (L) is supported with both its longitudinal rims (B), the common lying plane (n) of the two working directions (Y1, Y2) forming an angle (a) with the sliding plane (m).
 11. Stacking unit according to claim 9 or 10, wherein the two thrust elements (31, 32) are moved by a common actuator (33) between the thrust and release positions.
 12. Stacking unit according to one or more of the previous claims, wherein the guiding device (40) of the half-ladder (S') comprises means for positioning a single eyelet (O) of the half-ladder (S') at the through aperture (16) of the matrix.
 13. Stacking unit according to claim 12, wherein the guiding device (40) comprises means for moving the half-ladder (S') in the linear guide (41) according to a way of advancement (A) along the positioning di-

- rection (Z) to progressively bring each eyelet (O) to the through aperture (16), the positioning means comprising at least one sensor to detect the transit before it of an eyelet during a movement of the half-ladder in the positioning direction (Z), the sensor facing the through aperture (16) at a predefined distance (H) from the cavity (13) with respect to the positioning direction (Z), the eyelet (O) being positionable in correspondence with the cavity (13) operating the movement means to move the ladder by a tract equivalent to said predefined distance (H) along the positioning direction (Z) at the moment in which the sensor detects the transit of an eyelet (O).
14. Stacking unit according to claim 13, wherein the sensor is of the optical type.
15. Stacking unit according to claim 13 or 14, wherein the guide device (40) of the half-ladder (S) comprises means of retaining the half-ladder (S) in the linear guide (41).
16. Stacking unit according to one or more of the previous claims, wherein the means for generating a relative movement between the slat (L) and the matrix (13) consist of means (4,5) for moving the assembling group (2) in relation to a fixed support structure (3) parallel to the longitudinal direction (X).
17. Stacking unit according to one or more of the previous claims, comprising at least one slat loader (60) and means (70) for moving a slat (L) from a position for applying hooks and half-ladders to a dropping position into the loader, the movement of the slat (L) making the half-ladder (S) associated to it advance by pulling it into the guide device (40).
18. Stacking unit according to one or more of the previous claims, comprising two assembling groups (2', 2'') positioned on opposite sides of the longitudinal axis (X) to engage both longitudinal rims (B) of a slat (L).
19. Method for applying hooks and half-ladders in combination to a slat for the production of venetian blinds, each half-ladder (S') having a longitudinal rib (P) from which eyelets (O) extend, each hook (G) comprising an anchorage portion (G1) to the slat (L) and an open ring (G2) to engage an eyelet (O), the method comprising the following operating steps:
- a) providing a stacking unit (1) of slats (L) comprising laterally, in relation to a longitudinal axis (X) along which the individual slats (L) slide, a matrix (11, 12) which defines a cavity (13) parallel to the longitudinal axis (X) for housing a portion of rim (B) of a slat and comprises a first (14) and a second access aperture (15) to the cavity (13), between which apertures a through aperture (16) is made;
- b) positioning a half-ladder (S') across said through aperture (16) with an eyelet (O) positioned at the height of such aperture and facing towards the cavity (13) of the matrix;
- c) applying a hook (G) to said rim portion (B) at the first aperture (14) with the anchorage portion (G1) engaging on said rim and with the ring (G2) positioned inside the cavity of the matrix and positioned with the aperture facing in the direction of the second aperture (15);
- d) determining a relative movement of the slat (L) and the matrix (13) in such a way that the ring (G2) shifts along the cavity (13) from such first aperture (14) to the second aperture (15) crossing the through aperture (16) and engaging the eyelet (O) positioned there pulling it with itself as far as the second aperture (15); and
- e) closing the ring (G2) with the eyelet (O) engaged inside it in correspondence with the second aperture (15).
20. Application method according to claim 19, wherein the stacking unit (1) comprises two matrixes (11,12) positioned laterally to the longitudinal axis (X) in opposite positions, to each house a portion of the two opposite rims (B) of a slat, the operating steps from b) to d) being performed at both matrixes for the two opposite rims.







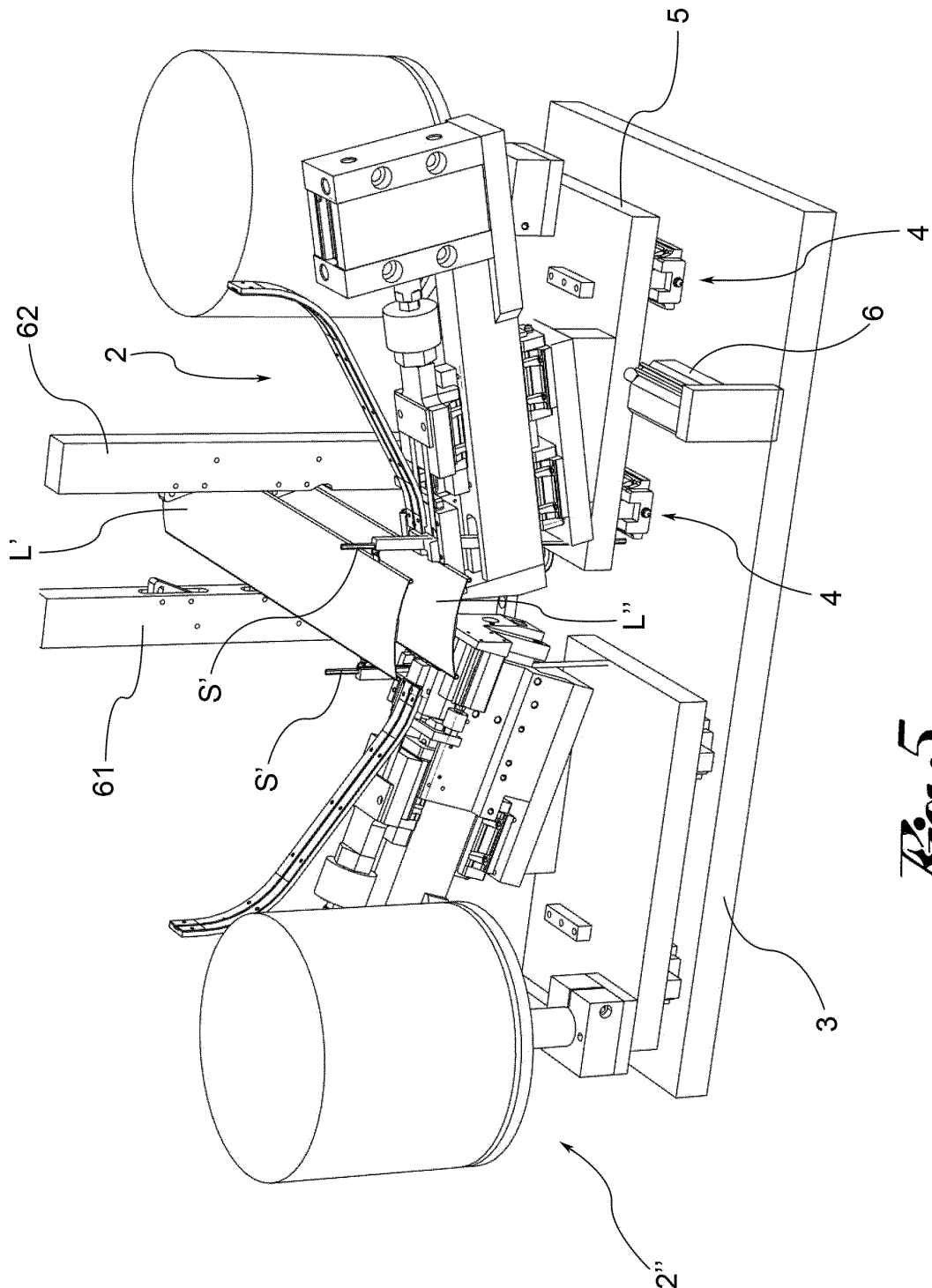


Fig. 5

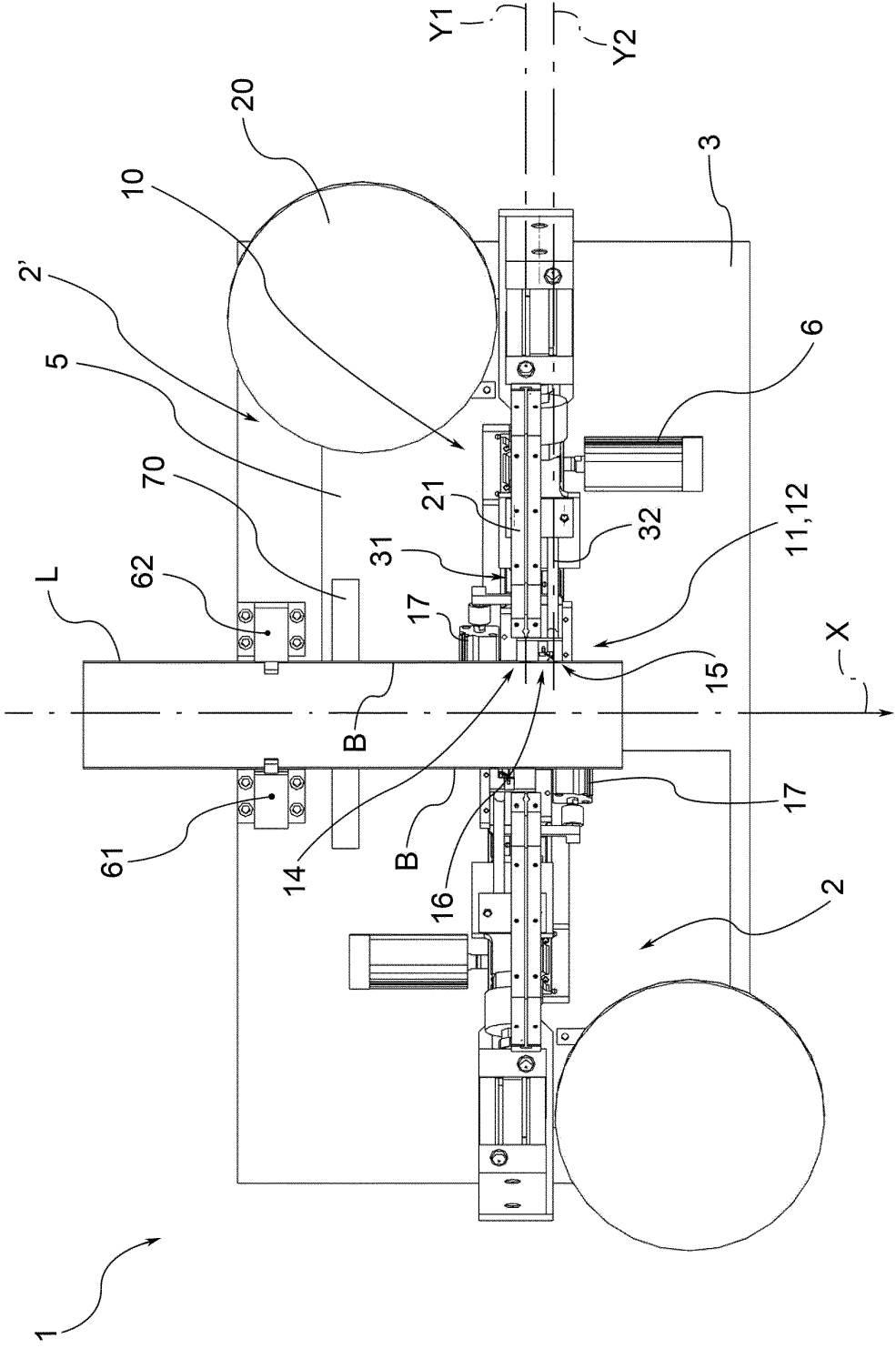
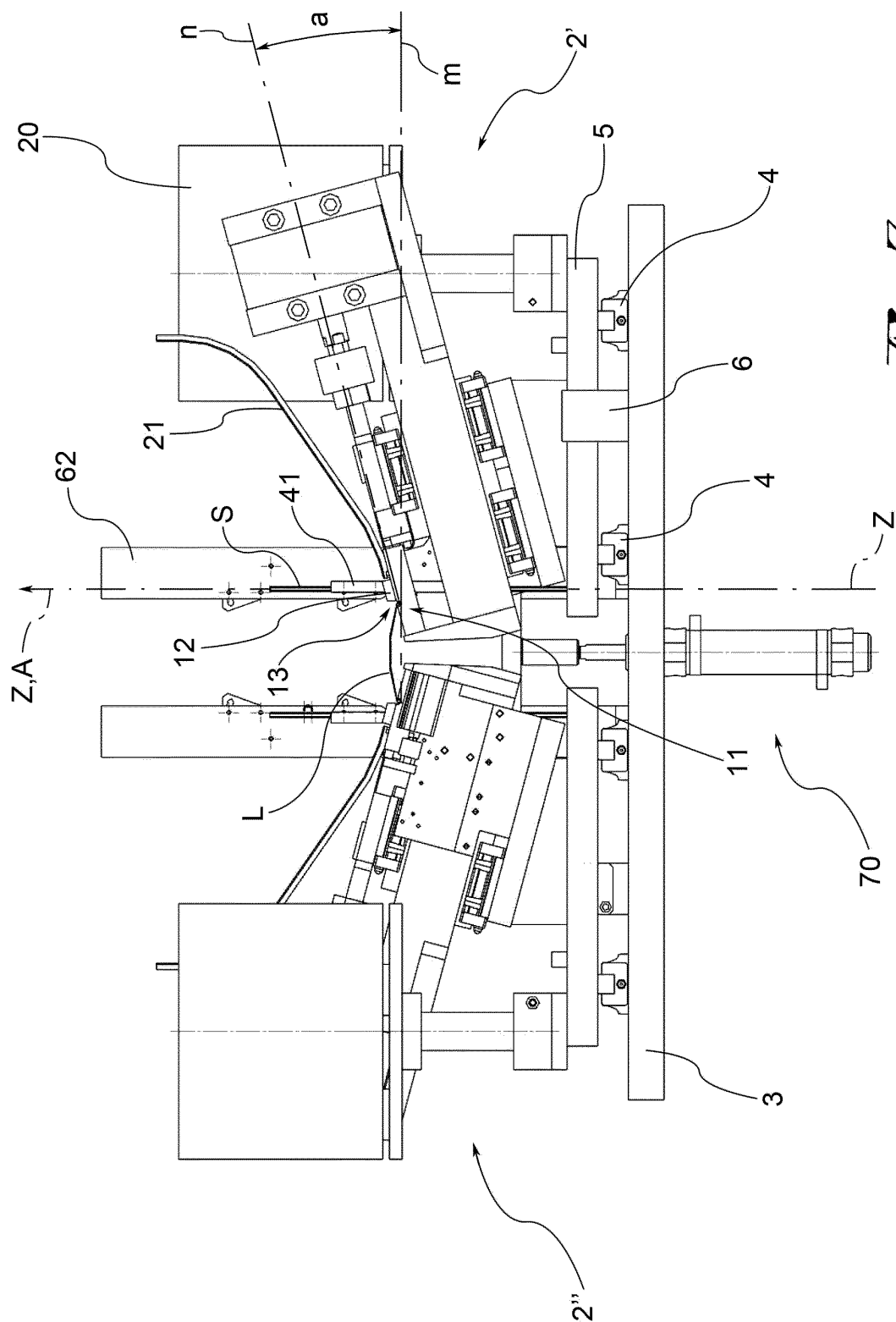
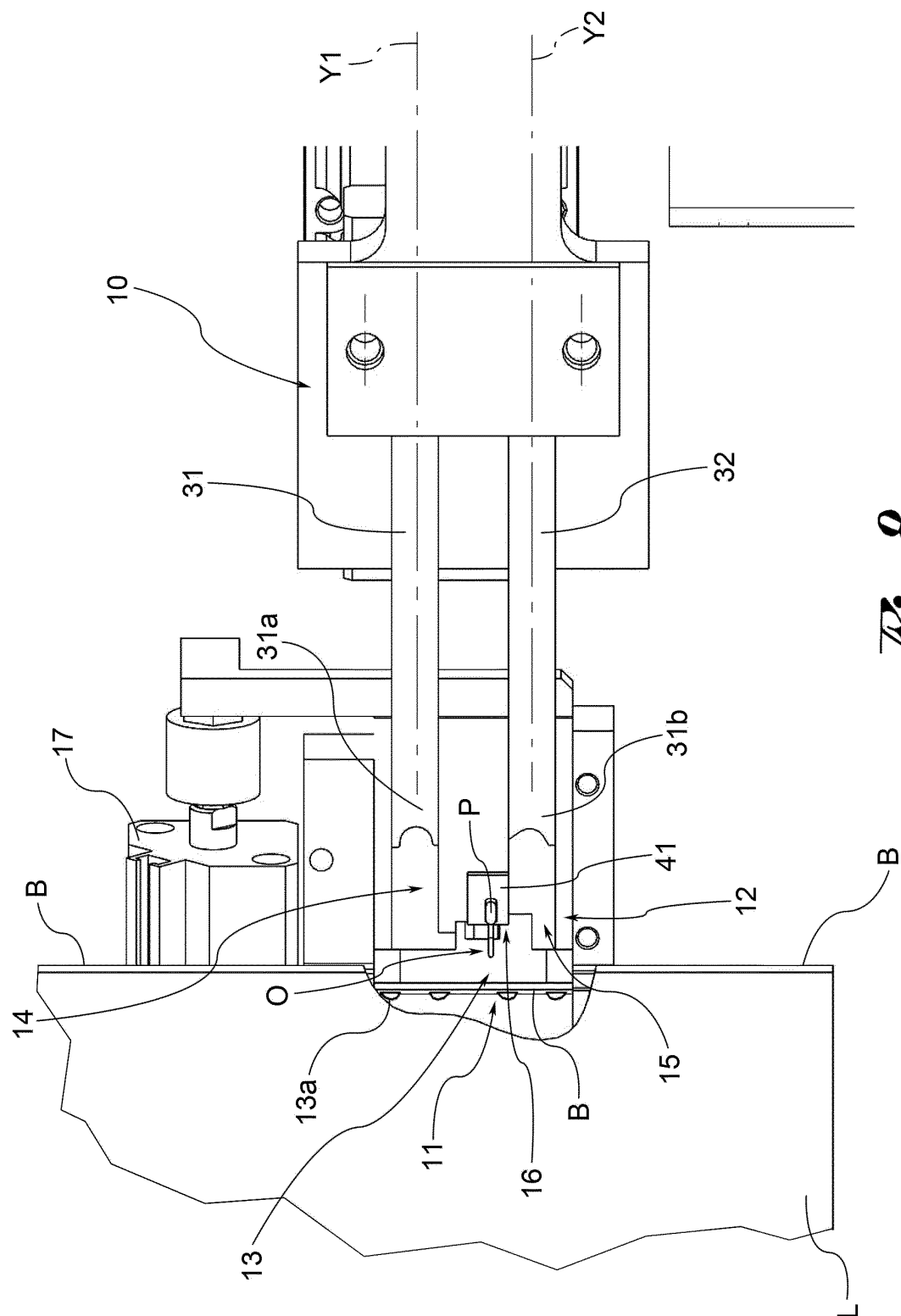


Fig. 6





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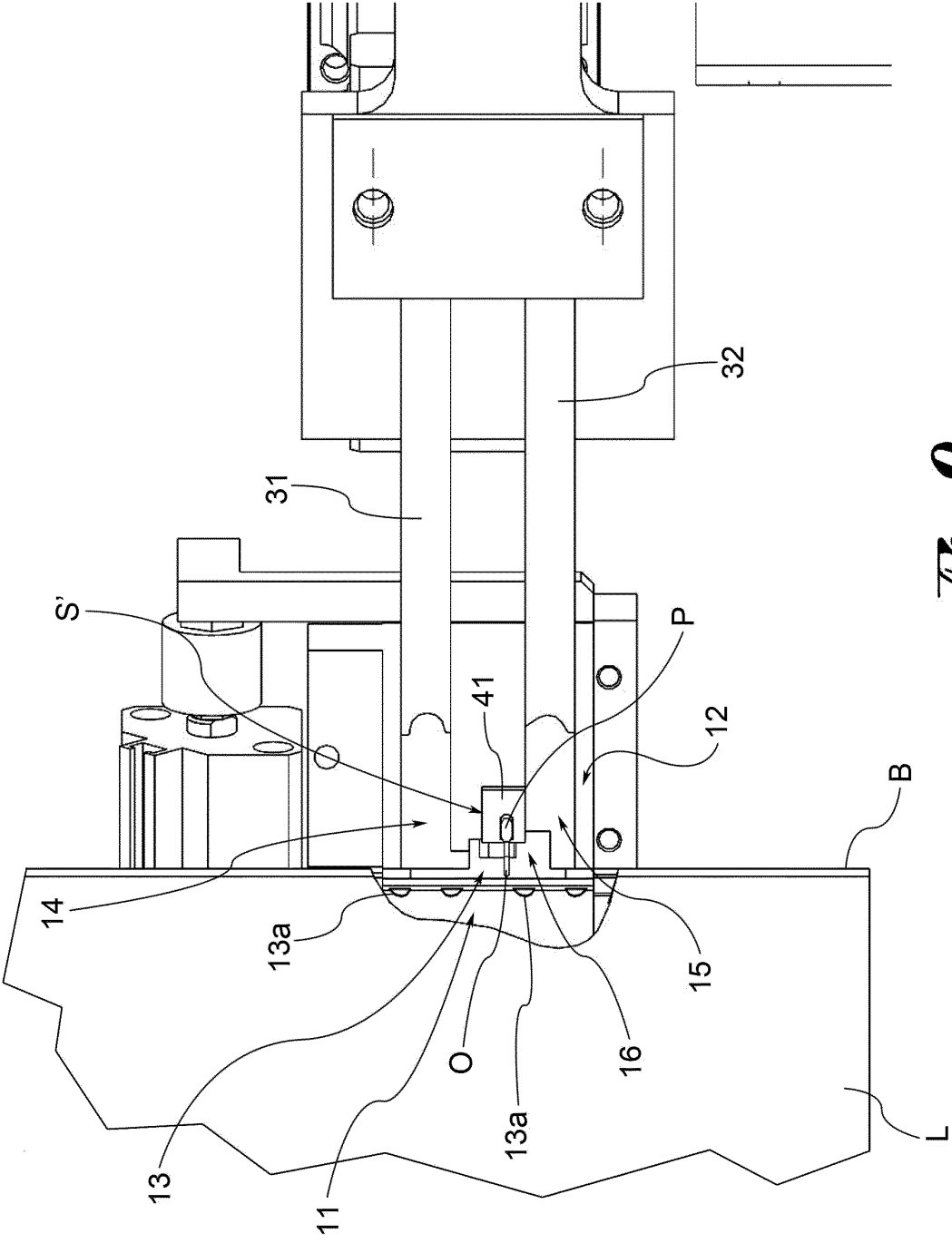


Fig. 9

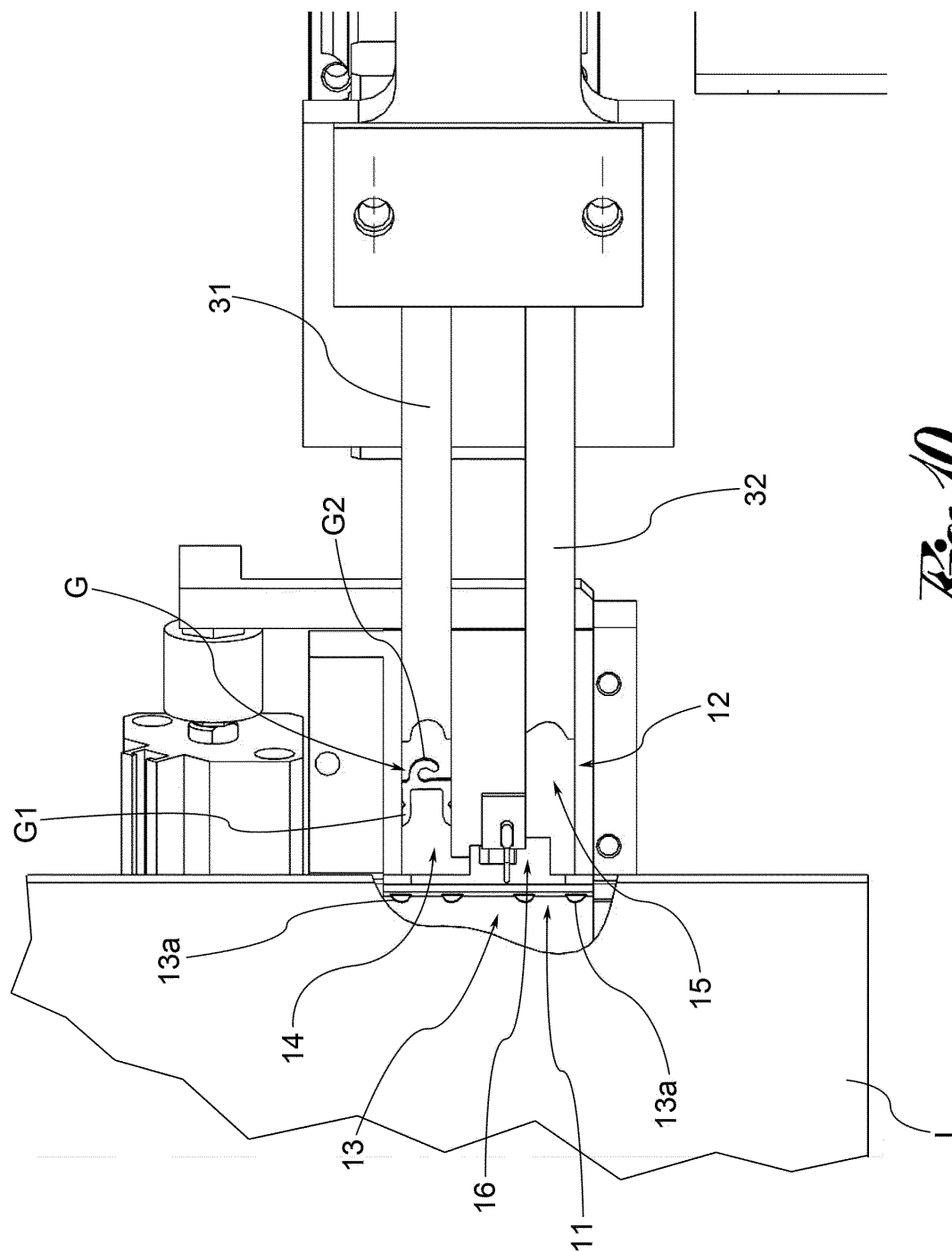


Fig. 10

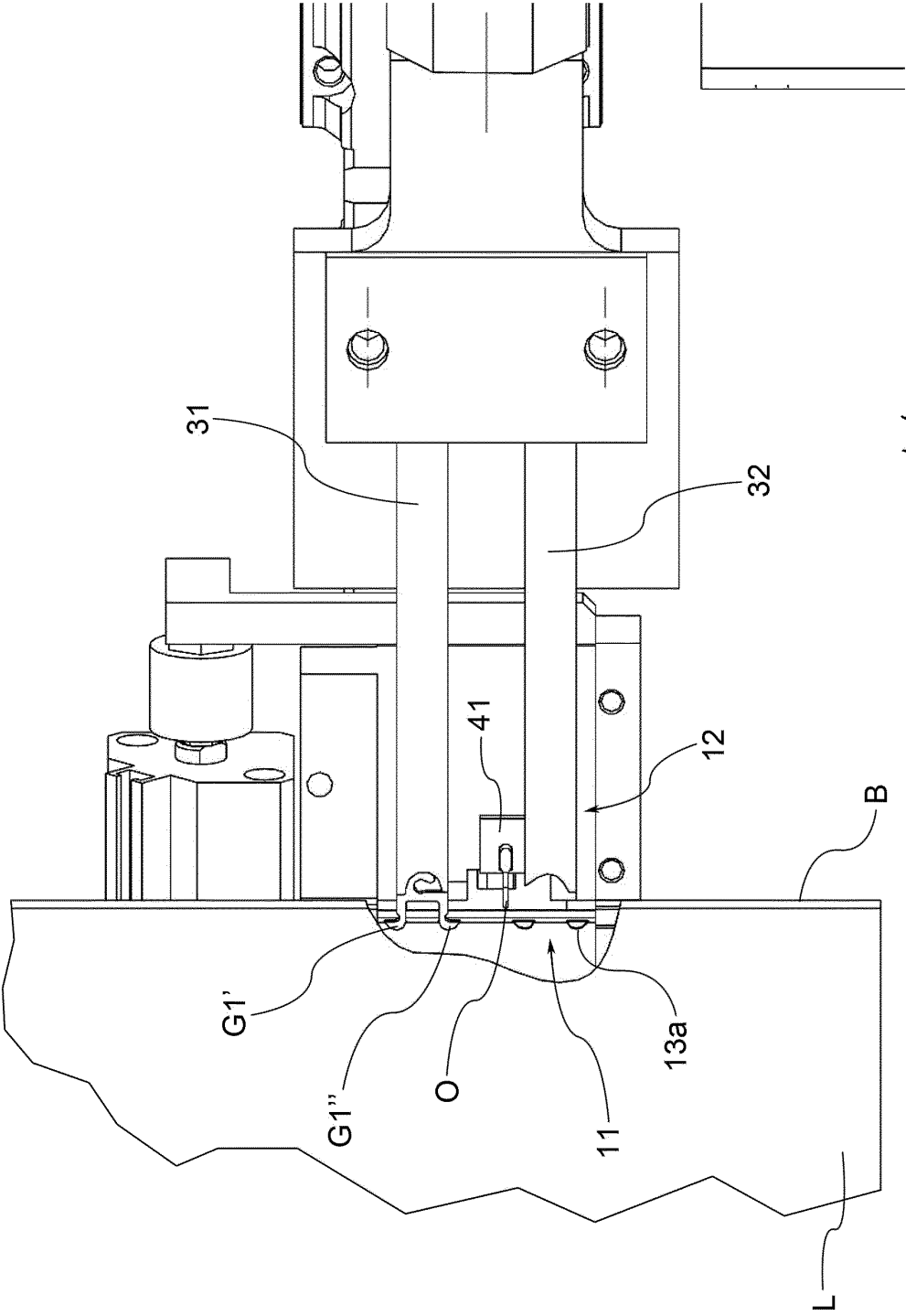


Fig. 11

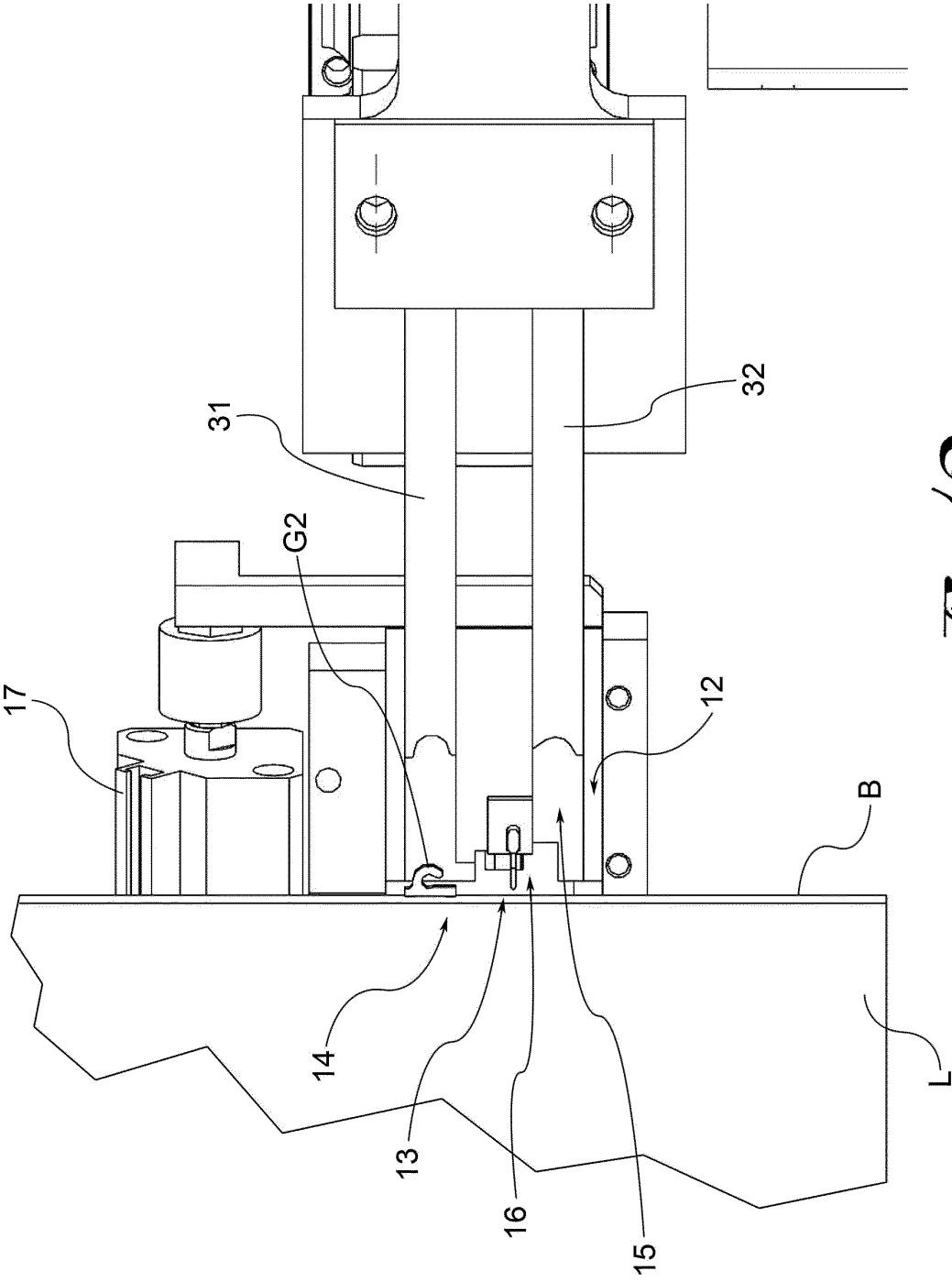


Fig. 12

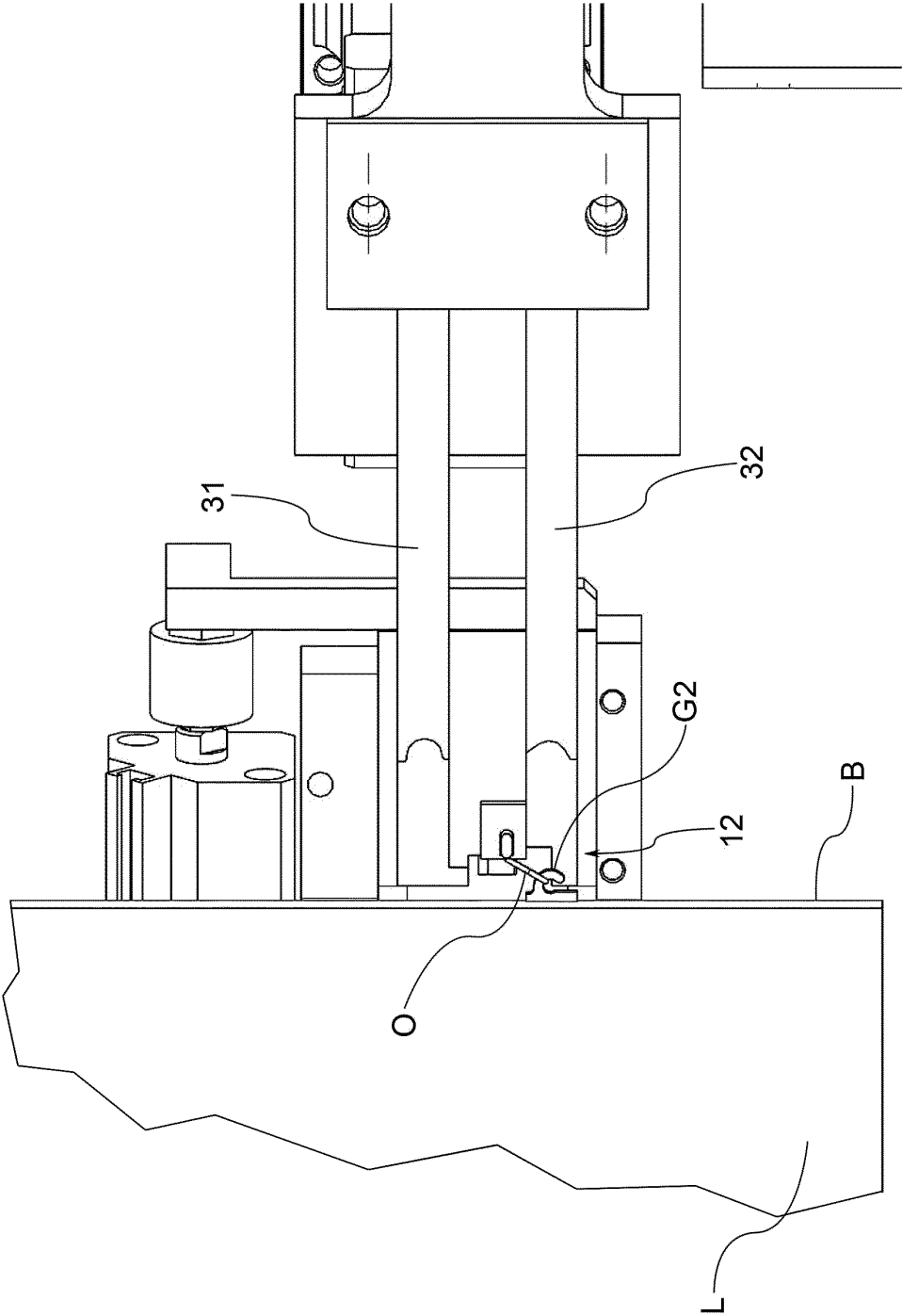


Fig. 13

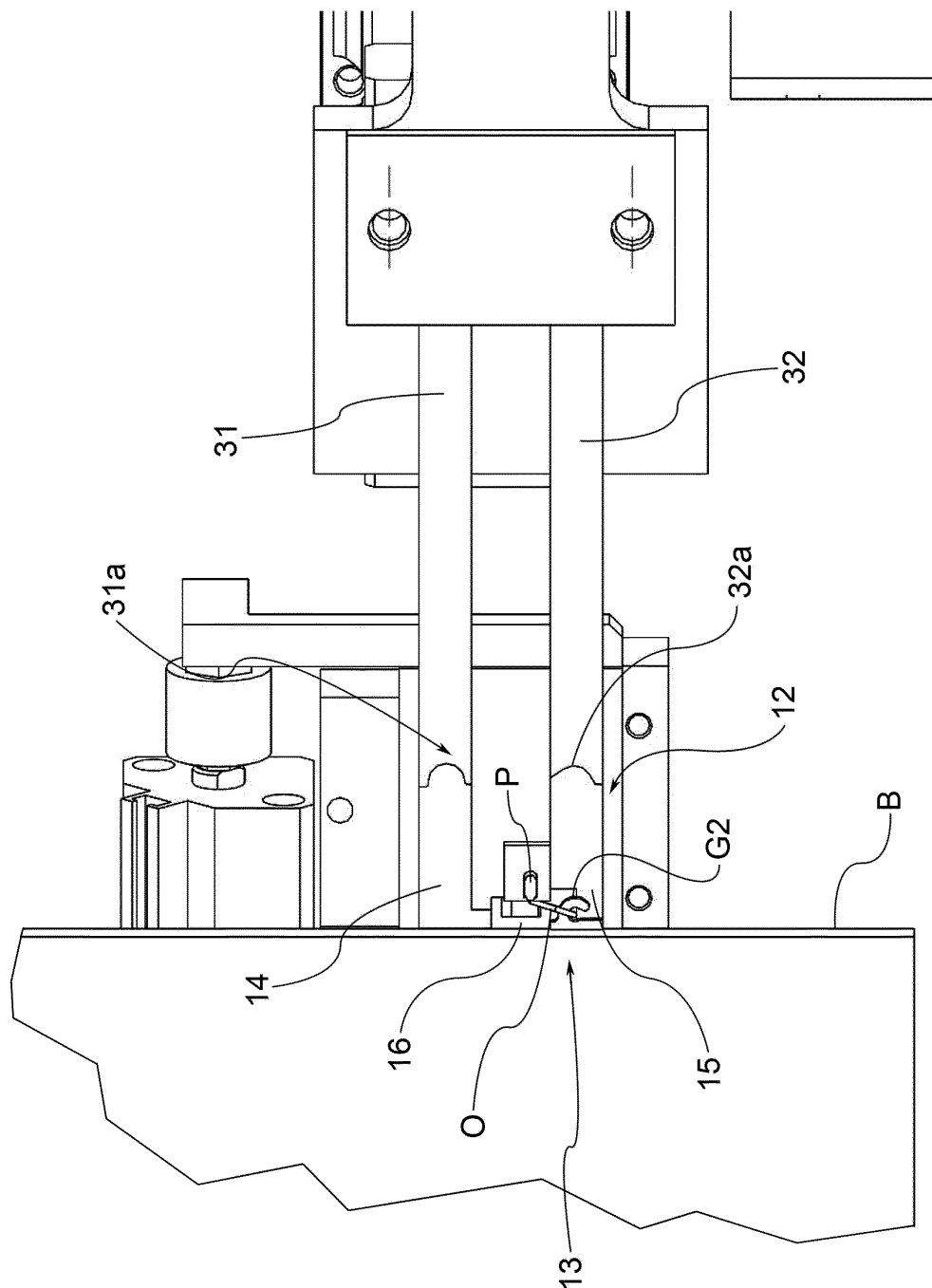
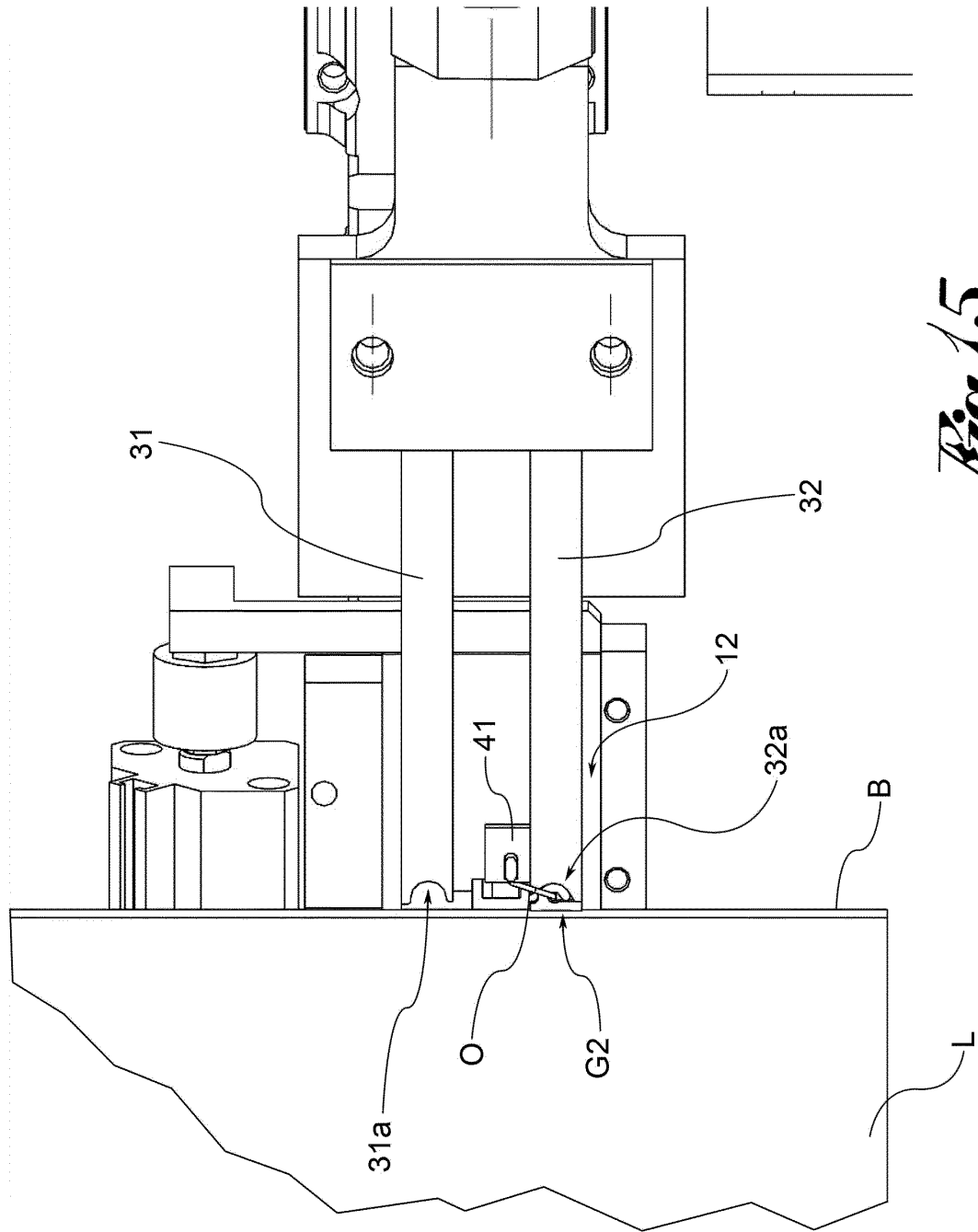


Fig. 14



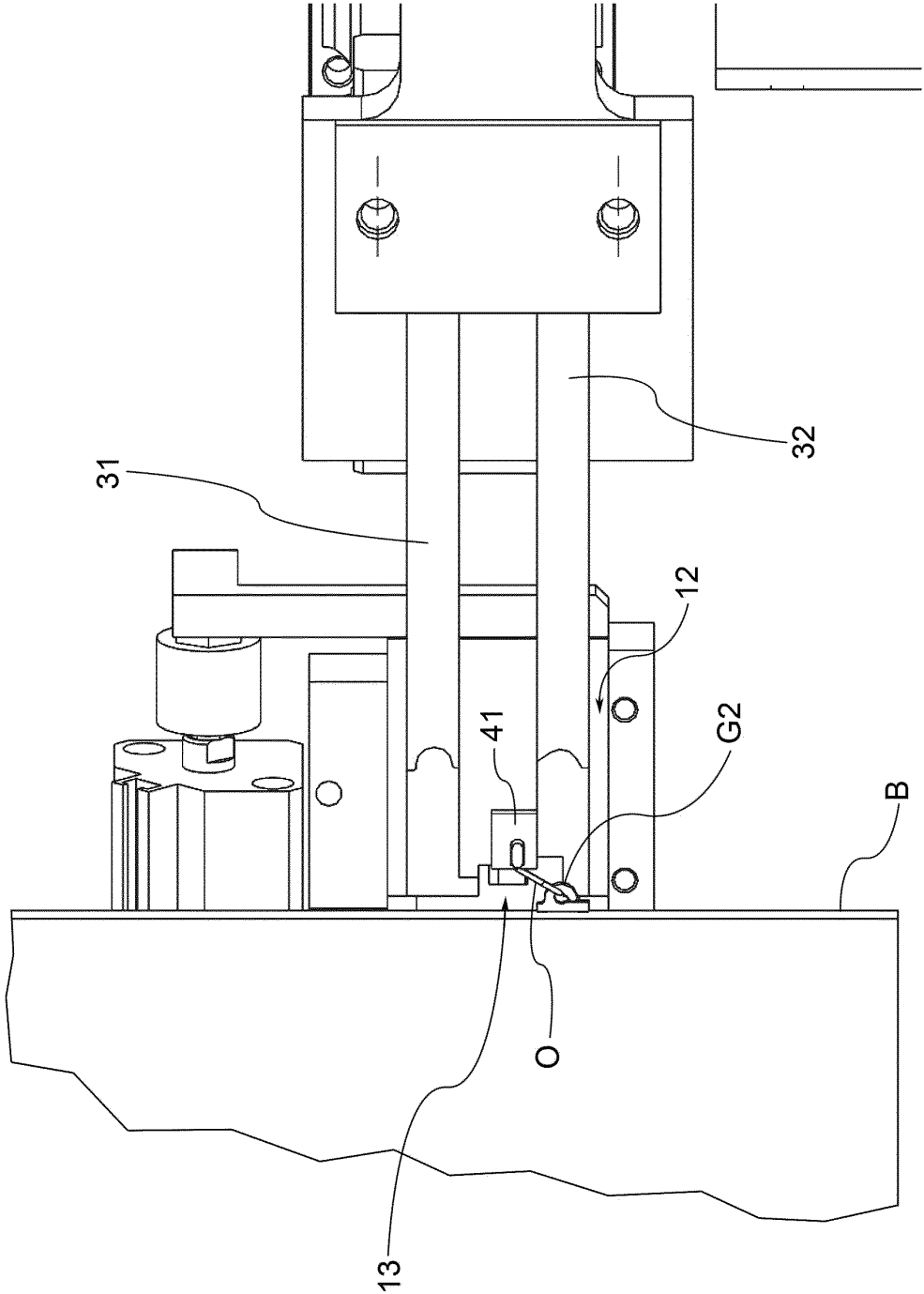


Fig. 16

