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(54) **UNIT FOR STACKING SLATS ON A SUPPORT LADDER WITH DOUBLE CROSSBEAMS FOR THE PRODUCTION OF VENETIAN BLINDS**

(57) The invention relates to a unit for stacking of slats on a support ladder for the production of Venetian blinds. Such a unit comprises means for divaricating 10 a pair of crossbeams T1,T2 on a positioning plane p at the height of an insertion plane m of a slat. The divaricating means comprise: -two distinct divaricating elements 11,12, each of which is sized so as to be inserted between a pair of crossbeams without substantially divaricating them; - an actuating device 20 that supports both divaricating elements and is suitable to allow them to assume alternately a first operating configuration, in

which they are disposed close to, or alongside, each other, and at least one second operating configuration, in which they are moved away from each other. The actuating device is movable with respect to the insertion plane m and the positioning plane p so as to move the two divaricating elements together with each other between an engagement position, in which both the divaricating elements are incident the positioning plane, and at least one disengagement position, in which both divaricating elements are not incident the positioning plane.

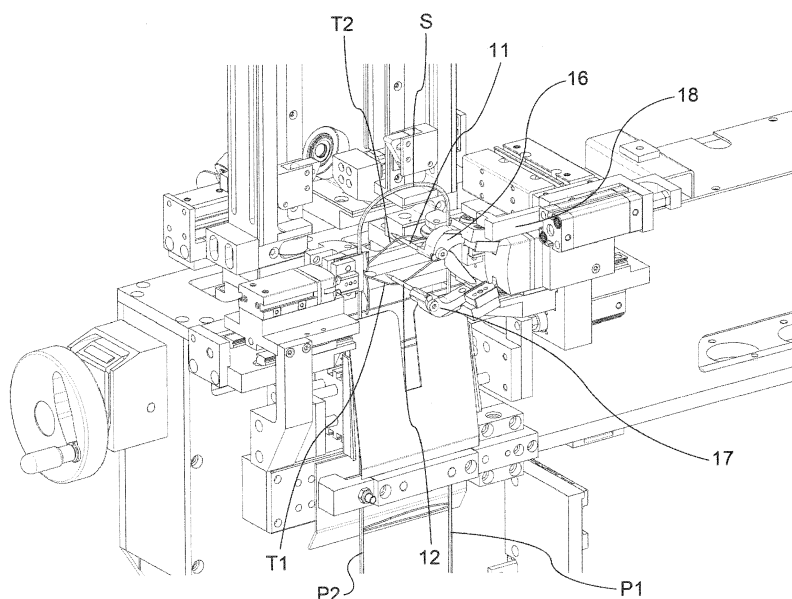


Fig.9

Description

Field of application

[0001] This invention relates to a unit for stacking slats on a support ladder with double crossbeams for the production of Venetian blinds.

State of the art

[0002] As is known, Venetian blinds are constituted by a plurality of slats, arranged parallel to each other and maintained in position by string support structures. These structures consist of two parallel longitudinal elements (arranged in the direction of the height of the blinds and hereinafter referred to as uprights) and a plurality of transverse elements that connect the two uprights to each other at regular distances. One slat is associated to each crossbeam. Due to their shape, such support structures are generally known as "support ladders".

[0003] The support ladders may be single or double crossbeams. The insertion of the slats in the ladders with double crossbeams is more difficult than insertion in ladders with single crossbeams.

[0004] Automated units are known for stacking slats on support ladders with double crossbeams for the production of Venetian blinds. Such automated units are provided with means for divaricating a pair of crossbeams and thus preparing the space for the insertion of a slat.

[0005] In particular, the aforesaid divaricating means may consist of two rotating elements, sickle-shaped and arranged specularly with respect to the longitudinal centreline of the support ladder. These sickle-shaped rotating elements engage a pair of crossbeams in the vicinity of the uprights, so as to create a free lumen centrally between the two crossbeams, wide enough to allow the insertion of a slat. An example of stacking unit equipped with such means is described in European application EP2314822A1.

[0006] More in detail, a typical sickle-shaped divaricating element comprises a flattened end portion, which is inserted first between the crossbeams of a pair, acting as a guide, and a divaricating portion, which consists of a sickle-shaped body. The divaricating element is shaped in such a way that, as it is inserted, the two crossbeams move apart creating the space for the subsequent insertion of a slat. The divaricating element defines in itself a cavity for the passage of the slat so as not to be an obstacle to the insertion of the latter between the two divaricated crossbeams.

[0007] However, this type of divaricating means, while fully performing its function, has the drawback of deforming the support ladders, and especially in a way that is often not uniform between the two uprights. This has a negative impact on the quality of the Venetian blinds produced.

[0008] There is therefore a need in the field to produce Venetian blinds of high quality, avoiding deformations of

the support ladders due to the divarication of the pairs of crossbeams of the support ladders.

Presentation of the invention

[0009] Therefore, the purpose of the present invention is to wholly or partly eliminate the drawbacks of the prior art cited above, by providing a unit for stacking slats on a support ladder for the production of Venetian blinds that allows divaricating pairs of crossbeams of ladders without causing evident or significant deformation of the ladder.

[0010] A further purpose of the present invention is to make available a slat stacking unit that is operationally simple to manage.

[0011] A further purpose of the present invention is to make available a slat stacking unit that is simple and economical to produce.

Brief description of the drawings

[0012] The technical characteristics of the invention, according to the above-mentioned purposes, can be clearly understood from the claims listed below and its advantages will become more apparent from the detailed description that follows, made with reference to the attached drawings, which show one or more purely exemplary and non-limiting embodiments wherein:

- Figure 1 shows a perspective view of a unit for stacking slats on a support ladder with double crossbeams for the production of Venetian blinds;
- Figures 2 to 15 show a sequence of images of the stacking unit that illustrate the operational steps of the unit; and
- Figure 16 shows the stacking unit illustrated in Figure 1 at the end of an operating cycle, with a ladder associated to a plurality of slats.

Detailed description

[0013] With reference to the accompanying drawings, the reference number 1 indicates, in its entirety, a slat stacking unit on a support ladder for the production of Venetian blinds according to the invention.

[0014] A support ladder S comprises two parallel uprights P1,P2 connected to each other transversely by a plurality of pairs of crossbeams T1,T2, spaced apart along the longitudinal development of the uprights.

[0015] In particular, the stacking unit 1 is intended to be inserted - together with one or more identical units - in a more complex production system (not shown in the figures). The unit 1 may be movably associated to a longitudinal support bar (not shown) at one end of which is arranged a slat production machine (not shown).

[0016] Here and in the following description and claims, reference will be made to the stacking unit 1 in condition of use. References to a lower or higher position

must be understood in this sense.

[0017] The stacking unit 1 comprises at least one guide element 2 for a slat L, which defines an insertion plane m on which the slat L slides supported along a longitudinal insertion axis X.

[0018] In correspondence of this plane m, in the stacking unit 1, the slat L is inserted between two crossbeams T1,T2 of a ladder S positioned on a positioning plane p incident the insertion plane m, with the two uprights arranged on two opposite sides with respect to the longitudinal axis X.

[0019] Advantageously, the stacking unit 1 defines an insertion lane 3 of the slats L that extends along the longitudinal axis X, aligned with the guide element 2. This insertion lane 3 delimits in plan the manoeuvring space of the slats in the stacking unit 1.

[0020] "Manoeuvring space of the slats" generically means the space that develops orthogonally in correspondence of the insertion lane 3. Preferably, the manoeuvring space M is equivalent in a transverse direction at least to the transverse extension of the slats S and is delimited at the bottom by the insertion plane m of the slats.

[0021] According to the preferred embodiment illustrated in the accompanying drawings, above the insertion plane m (and thus above the insertion lane 3) can be derived a loader 5 in which the slats are juxtaposed to each other once they have been associated to the ladder. The loader 5 of the slats can be of any type suitable for the purpose. In particular, as illustrated in the accompanying drawings, the loader 5 can consist of two bars 6 that are disposed on two opposite sides of the insertion lane and each of which is equipped with retractable brackets 7 for the support of the slats already in the ladder.

[0022] The stacking unit 1 comprises means 10 for divaricating a pair of crossbeams T1,T2 on the positioning plane p at the height of the insertion plane m, in such a way that, once divaricated, the two crossbeams are arranged one below and one above such plane m, so as to allow insertion of the slats.

[0023] According to a first essential aspect of the invention, the divaricating means 10 comprise two distinct divaricating elements 11 and 12, each of which is sized so as to be inserted between a pair of crossbeams T1 and T2 and substantially without divaricating them.

[0024] According to a preferred embodiment illustrated in the accompanying drawings, each divaricating element 11, 12 consists of a peg 13, having at one end a tapered or pointed portion 14 meant to serve as a guide for the insertion between the two crossbeams T1,T2.

[0025] The divaricating elements can also be implemented with other forms different from that of a peg, for example in the form of thin foils or chisels, so long as shaped in such a way as to easily penetrate between the two crossbeams without deforming them or markedly divaricating them.

[0026] According to another essential aspect of the in-

vention, the divaricating means 10 comprise an actuating device 20 that supports both of the divaricating elements 11,12 and is suitable to make them alternately assume a first operating configuration, in which the two divaricating elements 11,12 are arranged close or alongside each other (see Figures 6, 7 and 8), and at least a second operating configuration, in which the two divaricating elements 11 and 12 are moved away from each other (see for example Figures 1, 9, 11 and 12).

[0027] The divarication of two crossbeams is not determined by the shape of the single divaricating element, as happens in the case of conventional sickle-shaped divaricators, but by the combined action of the two divaricating elements in the passage from the first to the second configuration. As will be clarified in the description below, this allows to choosing the insertion point of the divaricating elements between the two crossbeams, freeing it from the need to necessarily position them close to the uprights in order not to hinder the insertion of the slat.

[0028] Advantageously, during the operation of the stacking unit 1, the two divaricating elements 11,12 can assume two or more different second operating configurations, which differ from each other as a function of how far the two divaricating elements are apart from each other. In particular, the divaricating elements can assume a second active configuration, in which the distancing between the two divaricating elements is less than the maximum and is functional to the level of divarication to be imposed on the two crossbeams (see Figure 9) and a second non-active configuration, in which the separation between the two divaricating elements is the maximum possible for the purpose of reducing to a minimum the overall dimensions in plan of the two divaricating elements and thus facilitate operations that require freeing as much as possible the space below the insertion plane m, for example, for the initial loading of the ladder (see Figures 1 and 16).

[0029] Preferably, as shown in particular in Figure 6, in the first operating configuration, the two divaricating elements 11 and 12 lie on the same working plane n. This working plane n is substantially coplanar with the insertion plane m when the two divaricating elements 11 and 12 are in the engagement position. This facilitates the simultaneous insertion of both divaricating elements between the two crossbeams.

[0030] According to a further essential aspect of the invention, the actuating device 20 is movable with respect to the insertion plane m and the positioning plane p so as to move the two divaricating elements 11,12 together with each other between an engagement position, in which both the divaricating elements are incident the positioning plane p (see Figures 8, 9 and 10), and at least one disengagement position, in which both divaricating elements are not incident the positioning plane p (see for example Figures 5, 6, 7, 11 and 12).

[0031] Advantageously, during the operation of the stacking unit 1, the two divaricating elements 11,12 can move in two or more different disengagement positions,

as a function of the position assumed by the divaricating elements with respect to the manoeuvring space of the slats L. In particular, they can move to an internal disengaged position that corresponds to the positioning of the divaricating elements in the manoeuvring space (see Figures 5, 6 and 7), and in an external disengagement position, which corresponds to the positioning of the divaricating elements outside the manoeuvring space to allow, for example, the lifting of a slat in the loader (see Figures 1, 12 and 16).

[0032] Thanks to the invention, and in particular to the use of a single actuating device, it is possible to precisely position both divaricating elements simultaneously with respect to a pair of crossbeams of a ladder and actuate them in a coordinated manner to divaricate the two crossbeams.

[0033] In particular, as will emerge more clearly from the following description, the actuating device allows positioning both the divaricating elements in substantially the same point between two crossbeams of a ladder, and then actuate them simultaneously at that point. Advantageously, the actuating device thus allows positioning both divaricating elements at the centre of a ladder, i.e., at a point at equal distance between the two uprights. In this way, it is possible to divaricate the two crossbeams, minimising the tensions applied on the uprights, and thus the risk of deforming the ladder. In fact, the tensioning of the crossbeams is imposed at the farthest point from both uprights.

[0034] In contrast, conventional sickle-shaped divaricators impose substantial deformations on the uprights, since their insertion takes place in the vicinity of both uprights. This bilateral positioning is required to ensure a balanced divarication of the crossbeams and to not obstruct the subsequent insertion of the slat.

[0035] The use of an actuating device that moves and actuates in a coordinated manner the two divaricating elements considerably simplifies the control and management of these elements, at the same time ensuring a precise and effective divarication action.

[0036] Advantageously, the unit 1 may comprise an electronic control unit (not shown in the accompanying drawings) that controls the actuating device 20 to impose on the two divaricating elements 11,12 a sequence of movements according to a predefined logic, for example like that illustrated in the sequence of Figures from 1 to 14.

[0037] Preferably, as illustrated in the sequence of figures from 5 to 8, the aforesaid electronic control unit controls the actuating device 20 so that - before bringing the two divaricating elements 11,12 into the engagement position - it makes them adopt the first operating configuration so that they can insert themselves between a pair of crossbeams T1,T2 already positioned on the positioning plane p at the height of the insertion plane m.

[0038] Preferably, as illustrated in the sequence of figures from 8 to 10, the aforesaid electronic control unit controls the actuating device 10 so that - once the two divaricating elements are brought to the engagement po-

sition - the actuating device 20 makes them adopt the second operating configuration (in particular, the active one) so that they, inserted between the pair of crossbeams, can divaricate them. The two crossbeams - once divaricated - result to be respectively one below and one above the insertion plane m.

[0039] Preferably, as illustrated in the sequence of figures from 10 to 12, the aforesaid electronic control unit controls the actuating device 20 so that, in the passage from the engagement position to the disengagement position, it keeps the two divaricating elements 11 and 12 in the second operating configuration so as not to interfere with a slat L inserted between the two divaricated crossbeams.

[0040] Preferably, as illustrated in the sequence of Figures 11 and 12, the aforesaid electronic control unit controls the actuating device 20 in such a way that - before raising a slat in the loader - the divaricating elements are moved from the internal disengagement position to the external disengagement position, i.e., they are moved to the outside of the manoeuvring position to allow, for example, the lifting of a slat in the loader.

[0041] According to the embodiment illustrated in the accompanying drawings, the actuating device 20 may comprise a support base 15 and two arms 16 and 17 rotationally connected to the support base 15. Each arm carries, at its free end 16' and 17', a divaricating element 11 or 12.

[0042] According to the preferred embodiment illustrated in the accompanying drawings, for the support of the two divaricating elements 11,12, the actuating device 20 thus comprises a fork-like body whose related two arms 16,17 are manoeuvred in relation to each other to make the two divaricating elements assume the aforesaid two operating configurations.

[0043] Advantageously, the support base 15 is movably connected to a support structure 4 of the stacking unit 1 so as to move the two divaricating elements 11 and 12 (supported by the two arms 16 and 17) in relation to the positioning plane p of the ladder and the insertion plane m and thus move them between the aforesaid engagement position and the aforesaid at least one disengagement position.

[0044] According to the preferred embodiment illustrated in the accompanying drawings, the support base 15 is connected to the support structure 4 in an offset position with respect to the longitudinal axis X, laterally to an insertion lane 3 of the slats L. In this way, the two divaricating elements 11 and 12, connected to the base by means of the two arms 16,17, may engage the same pair of crossbeams from substantially the same position with respect to the longitudinal axis X.

[0045] In particular, the support base 15 can consist of a slide sliding parallel to the positioning plane p to vary the position of incidence of the divaricating elements 11 and 12 on the positioning plane. Preferably, the slide moves on a plane orthogonal to the insertion plane m, as indicated by the arrow A drawn in Figure 2.

[0046] In particular, the slide is also translatable orthogonally with respect to the positioning plane p to move the divaricating elements between the engagement position and the aforesaid at least one disengagement position, as indicated by arrow B drawn in Figure 2. Preferably, the positioning plane p is orthogonal to the insertion plane m.

[0047] Advantageously, the two arms 16 and 17 are sized so as to have a longitudinal development sufficient to allow a positioning of the divaricator elements along the whole transversal development of a pair of crossbeams. The arms are sized taking into account the mobility of the support base 15 parallel to the positioning plane p.

[0048] Preferably, from an operational point of view, the divaricating elements are brought to engage a pair of crossbeams at the centre of the transverse development of the latter, in such a way that the subsequent divarication of the crossbeams stresses the two uprights P1,P2 in a balanced and least intense way possible, thus reducing the risk of unwanted deformations of the ladder S.

[0049] According to the preferred embodiment illustrated in the accompanying drawings, the two arms 16 and 17 have rotation axes Z1 and Z2 parallel to each other.

[0050] Operationally, the movement of the two divaricating elements 11 and 12 between the first operating configuration and the second operating configuration is determined by the rotation of the two arms 16 and 17 around their respective axes, both in the case in which the axes are parallel to each other or not.

[0051] Preferably, at least in the engagement position, the rotation axes Z1, and Z2 of the two arms 16 and 17 are orthogonal to the positioning plane p.

[0052] In particular, as illustrated in the accompanying drawings, the peg 13 forming each divaricating element 11,12 is associated to the respective arm 16 or 17 in such a way that the direction of longitudinal extension of the peg is orthogonal to the positioning plane p at least when the divaricator is in the engagement position.

[0053] Advantageously, each arm 16 and 17 is adjustable in length in order to vary the radial distance between the rotation axis Z1,Z2 and the free end 16',17', and therefore the distance between the rotation axis and the divaricating element. The adjustability of each arm allows adapting the divaricating means to the variation of the dimensions of the slats L being worked in the stacking unit and to the variation of the width of the insertion lane, and thus the distance that must be covered by the arms to bring the divaricating elements into the engagement position.

[0054] Preferably, the two arms 16 and 17 are shaped in such a way that, when the two divaricating elements 11 and 12 have adopted the second operating configuration and are in the engagement position, between the two arms 16 and 17 there is a free passage lumen at the insertion plane m to allow the passage of a slat L between the two arms (as can be seen, in particular, in Figures 9,

10 and 11).

[0055] In particular, the two arms 16 and 17 are shaped in such a way that, when the two divaricating elements 11 and 12 have adopted the first operating configuration, the two arms 16 and 17 are in contact with each other only at their free ends 16' and 17' (as can be seen, in particular, in Figure 6).

[0056] Advantageously, the actuating device 20 comprises means for adjusting the rotation angle of each arm with respect to the support base 15, so as to adjust the distance between the two free ends 16' and 17' of the arms, and thus between the two divaricating elements 11 and 12 in the second operating configuration.

[0057] The control means can be of any type suitable for the purpose. In particular, the adjustment means may include a mechanical stop 18 (preferably adjustable) at least for one of the two arms 16 or 17, suitable to limit the maximum opening of the arm, for example, in step of divaricating the crossbeams.

[0058] Preferably, the arms 16 and 17 are moved by means of suitable moving means (not illustrated in the accompanying drawings), for example a pneumatic cylinder or an electric motor. Advantageously, the control means may include means for controlling the actuators, for example an encoder in the case of an electric motor. Preferably, in order to simplify operational management, the two arms are moved in a coordinated way between them. However, it is possible to provide for independent movement of the two arms.

[0059] The stacking unit 1 can be equipped with all the devices useful for its optimal functioning.

[0060] In particular, the stacking unit 1 can be equipped with means for arranging a ladder S on the positioning plane p incident the insertion plane m and the insertion axis X of the slat L. In particular, as shown in particular in Figures 1, 2 and 5, such means can be constituted by a box-like body that defines inside it a seat for housing a ladder, which extends parallel to the positioning plane p. This seat is delimited by:

- a first plate 8 that is fixed to the support structure 3 and extends in height in proximity of the insertion plane m; and
- a second plate 9 that can be removed to allow access to the seat and the positioning of the ladder.

[0061] Preferably, the stacking unit 1 comprises means 31,32 for tensioning the ladder S in correspondence of a pair of crossbeams T1,T2 in the transverse direction parallel to the insertion plane m.

[0062] In particular, such tensioning means 31,32 are manoeuvred between an activation position, in which they engage a pair of crossbeams of a ladder (see for example Figure 4) and a deactivation position, in which they do not engage the ladder (see for example Figure 3). In particular, as will be taken up again below in the description, in the aforesaid activation position, the tensioning means 31,32 operate substantially on the inser-

tion plane of the slat m to engage a pair of crossbeams T1,T2 positioned in correspondence of such plane m.

[0063] According to the preferred embodiment illustrated in the accompanying drawings, the means for tensioning the ladder in the transverse direction comprise two separate tensioning elements 31 and 32.

[0064] More in detail, each tensioning element 31 and 32 is equipped with a fork head 33 with which it can releasably engage the ladder receiving the same pair of crossbeams T1,T2 in an engagement seat 35, made in the respective fork head 33. Operatively, by means of the fork head 33, the two tensioning elements 31 and 32 go into contact with the uprights P1,P2 in the vicinity of the pair of crossbeams, deviating them transversely (substantially on the positioning plane p) in opposite directions.

[0065] More in detail, the fork head 33 of each tensioning element 11,12 comprises two appendages 33,33' between which is made the engagement seat 35. Operationally, the two appendages 33',33" are intended to engage portions of an upright arranged immediately above and below the pair of crossbeams housed in the engagement seat 35. The two appendages 33',33" ensure that the two crossbeams arranged in the engagement seat 35 are tensioned uniformly and balanced.

[0066] Advantageously, the two tensioning elements 31,32 are movable in relation to each other along a tensioning direction Y substantially parallel to the positioning plane p, so that, once the activation position has been reached, the two heads 33 are moved away from each other and brought against the two uprights P1,P2 of the ladder so as to move the latter away one from each other and thus tighten the pair of crossbeams T1,T2.

[0067] For this purpose, the two tensioning elements 31,32 are movably associated to the support structure 4 of the stacking unit 1 respectively on two opposite sides with respect to the insertion axis X.

[0068] According to the embodiment illustrated in the accompanying drawings, each tensioning element 31,32 comprises an arm 34 that carries the fork head 33 at its free end and is rotationally connected at the other end to the support structure 4 to move the head 33 between the activation and deactivation positions.

[0069] In particular, each tensioning element 31,32 is associated through the respective arm to a carriage 36 translating on the support structure 4 parallel to the direction of tensioning Y.

[0070] Advantageously, the two carriages 36 of the two tensioning elements 31,32 are independent of each other. Operationally, the two carriages 36 are, however, moved in a synchronised manner to ensure a coordinated movement of the two tensioning elements 31 and 32 associated to them.

[0071] Thanks to the presence of the two carriages 36, translatable parallel to the positioning plane p, it is possible to adapt, in a simple and practical way, the stacking unit to variations in the width of the slats L, by suitably adjusting the excursion of the two carriages with respect

to the required width of the insertion lane 3.

[0072] Advantageously, both carriages 36 may be each provided with an idle wheel 37, with rotation axis orthogonal to the insertion plane m. The idle wheel 37 has a circumferential groove coplanar to the insertion plane that acts as a guide for the edges of the slat L. The presence of such guide wheels ensures the correct positioning of the slats on the insertion plane m.

[0073] Advantageously, a movable blocking element 41, 42 is coupled to each tensioning element 31, 32 (constituted, in particular, by an arm with fork head), the movable blocking element being suitable to:

- close against the tensioning element 31,32 to hold in position the portion of the ladder engaged by the tensioning element 31,32, when the latter is in the activation position, and
- open with respect to the tensioner to free the portion of ladder previously engaged by the tensioner, when the latter is in the deactivation position.

[0074] According to embodiment illustrated in the accompanying drawings, each movable blocking element 41,42 is constituted by a plate rotating about the same rotation axis of the respective tensioning element 31,32.

[0075] Preferably, the support base 15 of the actuating device 20 is associated to the support structure 4 of the stacking unit 1 by means of the carriage 36 of one of the two tensioning elements 31,32.

[0076] The support base 15 is in turn associated in a mobile way to the carriage 36 to make the movement of the divaricating elements 11,12 at least partially independent of the movement of the tensioning element 31,32.

[0077] In particular, the movement of the actuating device 20 parallel to the positioning plane p (aimed to vary the position of incidence of the divaricating elements 11 and 12 on the positioning plane) can be entrusted to the movement of the carriage 36 of one of the two tensioning elements, while the movement perpendicular to the positioning plane p (aimed to move the divaricating elements between the engagement and disengagement positions) can be obtained by the movement of the support base 15 relative to the carriage 36.

[0078] Advantageously, the stacking unit 1 can comprise means for positioning a pair of crossbeams T1,T2 of a ladder S in correspondence of the insertion plane m.

[0079] Preferably, the aforesaid positioning means coincide with the tensioning means 31,32.

[0080] In particular, the tensioning means 31,32 may also perform the function of positioning the crossbeams on the insertion plane m to allow the correct insertion of a slat. For this purpose, according to the preferred embodiment illustrated in the accompanying drawings, the engagement seat 35 of each head 33 is coplanar with the insertion plane m at least in the activation position in such a way that, by engaging the ladder in correspondence of the pair of crossbeams, the head 33 carries the

pair of crossbeams in correspondence of the insertion plane m. Preferably, for this purpose, the two appendages 33', 33" of the fork head have a profile converging towards the engagement seat 35 to act as a guide to the pair of crossbeams.

[0081] Operatively, as illustrated in the sequence of Figures from 3 to 9, the divaricating means 11, 12 operate successively to the tensioning means 31, 32, i.e., after the tensioning means have properly prepared the pair of crossbeams.

[0082] Advantageously, as illustrated in the accompanying drawings, the stacking unit 1 also comprises means 50 for lifting the slat L from the insertion plane m towards an upper position inside the loader 5 of storage 3 of the slats already associated with the ladder. In the lifting movement, the slat drags with it the ladder on the positioning plane p so as to bring another pair of crossbeams T1, T2 in the vicinity of the insertion plane m.

[0083] We will now briefly describe the operating steps of the stacking unit 1 by referring to the preferred embodiment, illustrated in the accompanying drawings.

[0084] A ladder S is placed on the positioning plane p incident the insertion plane m, in the specially provided housing seat defined by the two plates 8 and 9 (see Figures 1, 2 and 3). The two tensioning elements 31 and 32, which also serve as positioning means, are brought into the activation position, so as to position a pair of crossbeams T1, T2 in correspondence of the insertion plane m (Figure 4). The two divaricating elements 11 and 12 - maintained up to this time in the second configuration - assume the first configuration (Figure 6). The two tensioning elements 31, 32 are moved away from each other along the Y direction so as to tension the pair of crossbeams T1, T2 by acting on the related uprights (Figure 7). Keeping the two tensioning elements 31, 32 in position, the two divaricating elements 11, 12 are brought into the engagement position and inserted between the two crossbeams already tensioned (Figure 8) in central position with respect to the two uprights. The two divaricating elements 11, 12 are then made to assume the second configuration so as to divaricate the two crossbeams. The opening angle of the two arms 16 e 17 (and thus the amplitude of the divarication between the two crossbeams) is limited by the mechanical stop 18 (Figure 9). The slat L is now inserted between the two divaricated crossbeams T1, T2 (see Figure 10). At this point the two divaricating elements 11, 12 are brought to the disengagement position, i.e., are extracted from the two crossbeams (Figure 11). The two tensioning elements 31, 32 are then brought to the deactivation position and the two divaricating elements 11, 12 (along with the tensioning elements) are then made to exit from the insertion lane 3 so as not to obstruct the lifting of the slat just inserted (Figure 12). The slat L is now raised and brought into the loader 5 by means of the lifter 50 (Figure 13). The ladder is slid along the positioning plane p, dragged by the slat. After lowering the lifter (Figure 14), the cycle can start again (Figure 15).

[0085] The invention allows obtaining many advantages in part already described.

[0086] The stacking unit 1 according to the invention allows divaricating pairs of ladder crossbeams without causing evident or significant deformations of the ladder. This is achieved through use of two divaricating elements that are shaped so as to be inserted between two crossbeams without deforming them and that are moved in relation to each other and the positioning plane of a ladder by a single actuating device.

[0087] Thanks to the use of a single actuating device suitable to move and actuate both divaricating elements at the same time, it is possible to obtain an effective and precise divarication of the crossbeams of a ladder.

[0088] The use of a single actuating device not only ensures efficiency and precision, but also allows simplifying the operational management of the divaricating means.

[0089] Compared to a conventional stacking unit, the unit according to the invention does not require particularly complex realisations or devices, and it is therefore simple and economical to produce, at least as much as conventional units.

[0090] Therefore, the invention thus conceived achieves the predefined purposes. Obviously, it may even assume, in its practical embodiment, forms and configurations different from that illustrated above without, for this reason, departing from the present scope of protection. Moreover, all the details may be replaced by technically equivalent elements and the dimensions, forms and materials used may be any according to the needs.

Claims

1. Unit for stacking slats on a support ladder for the production of Venetian blinds, the ladder (S) comprising two parallel uprights (P1, P2) connected transversally by a plurality of pairs of crossbeams (T1, T2), said unit comprising:

- at least one guide element (2) for a slat (L), defining an insertion plane (m) on which the slat (L) slides supported along a longitudinal insertion axis (X), at said plane (m) the slat being inserted between two crossbeams of a ladder positioned on a positioning plane (p) incident to the insertion plane (m), with the two uprights positioned on two opposite sides of the longitudinal axis (X); and
- means for divaricating (10) at least one pair of crossbeams (T1, T2) on the positioning plane (p) at the height of the insertion plane (m), in such a way that one crossbeam (T1) is placed below said plane (m) and the other crossbeam (T2) is placed above, so as to permit the insertion of the slat between the two crossbeams, char-

- acterised in that** the divaricating means (10) comprise
- two distinct divaricating elements (11, 12), each of which is sized so as to be inserted between a pair of crossbeams (T1; T2) substantially without divaricating them;
 - an actuating device (20) which supports both divaricating elements (11, 12) and is suitable to make them alternatively adopt a first operating configuration, in which the two divaricating elements (11, 12) are arranged close to each other or alongside, and at least a second operating configuration, in which the two divaricating elements (11, 12) are distanced from each other, the actuating device (20) being movable in relation to the insertion plane (m) and to the positioning plane (p) so as to move the two divaricating elements (11, 12) together into an engagement position, in which both divaricating elements are incident to the positioning plane (p), and at least one disengagement position, in which the divaricating elements are not incident to the positioning plane (p).
2. Unit according to claim 1, comprising an electronic control unit which controls the actuating device (20) to impose on the divaricating elements (11, 12) a sequence of movements according to a predefined logic.
 3. Unit according to claim 2, wherein the electronic control unit controls the actuating device (20) so that, before bringing the two divaricating elements (11, 12) into the engagement position, it makes them adopt the first operating configuration so that they can insert themselves between a pair of crossbeams (T1, T2) positioned on the positioning plane (p) at the height of the insertion plane (m) and so that, once the two divaricating elements have been brought into the engagement position, the actuating device (20) makes them adopt the second operating configuration so that, inserted between the pair of crossbeams, they can divaricate them.
 4. Unit according to claim 2 or 3, wherein the electronic control unit controls the actuating device (20) so that in the passage from the engagement position to the disengagement position it keeps the two divaricating elements (11, 12) in the second operating configuration so as not to interfere with a slat (L) inserted between the two divaricated crossbeams.
 5. Unit according to one or more of the previous claims, wherein each divaricator (11; 12) consists of a peg (13), having at one end a tapered portion (14) meant to serve as a guide for the insertion between the two crosspieces (T1, T2).
 6. Unit according to one or more of the previous claims, wherein in the first operating configuration the two divaricating elements (11, 12) lie on a same working plane (n), said working plane (n) being substantially coplanar with the insertion plane (m) when the two divaricating elements (11, 12) are in an engagement position.
 7. Unit according to one or more of the previous claims, wherein the actuating device (20) comprises a support base (15) and two arms (16, 17) rotationally connected to the support base, each arm bearing at its free end (16', 17') a divaricating element (11, 12).
 8. Unit according to claim 7, where the support base (15) is movably connected to a support structure (4) of the stacking unit (1) so as to move the two divaricating elements (11, 12) supported by the two arms (16, 17) in relation to the positioning plane (p) of the ladder and the insertion plane (m).
 9. Unit according to claim 8, wherein the support base (15) of the actuating device (20) is connected to the support structure (4) in a offset position with respect to the longitudinal axis (X), laterally to an insertion lane (3) of the slats (L) along the longitudinal axis (X).
 10. Unit according to claim 7, 8 or 9, wherein the support base (15) consists of a slide sliding parallel to the positioning plane (p) to vary the position of incidence of the divaricating elements (11, 12) on the positioning plane, said slide preferably sliding on a plane orthogonal to the insertion plane (m).
 11. Unit according to claim 7, 8, 9 or 10, wherein the slide is translatable orthogonally to the positioning plane (p) to move the divaricating elements between the engagement position and the disengagement position, the positioning plane (p) preferably being orthogonal to the insertion plane (m).
 12. Unit according to one or more of the claims from 7 to 11, wherein the movement of the two divaricating elements (11, 12) between the first operating configuration and the second operating configuration is determined by the rotation of the two arms (16, 17) around their respective rotation axes (Z1, Z2), preferably parallel to each other.
 13. Unit according to claim 12, wherein at least in the engagement position the rotation axes (Z1, Z2) of the two arms (16, 17) are orthogonal to the positioning plane (p).
 14. Unit according to claims 5 and 13, wherein the peg (13) forming each divaricating element (11, 12) is associated to the respective arm (16, 17) in such a way that the direction of longitudinal extension of the

peg is orthogonal to the positioning plane (p) at least when the divaricating element is in the engagement position.

15. Unit according to one or more of the claims 12, 13 or 14, wherein the actuating device (20) comprises means for adjusting the angle of rotation of each arm, in order to adjust in the second operating configuration the distance between the two free ends (16', 17') of the arms, and thus of the two divaricating elements (11, 12).
16. Unit according to claim 15, wherein such adjustment means comprise a mechanical stop (18) for at least one of the two arms (16, 17) suitable to restrict the maximum aperture of the arm, said stop being preferably adjustable.
17. Unit according to one or more of the claims from 7 to 16, wherein each arm (16, 17) is adjustable in length in order to vary the radial distance between the rotation axis (Z1, Z2) and the free end (16', 17').
18. Unit according to one or more of the claims from 7 to 17, wherein the two arms (16, 17) are shaped in such a way that, when the two divaricating elements (11, 12) have adopted the second operating configuration and are in the engagement position, between the two arms (16, 17) there is a free passage lumen at the insertion plane (m) to allow the passage of a slat (L) between the two arms.
19. Unit according to one or more of the claims from 7 to 18, wherein the two arms (16, 17) are shaped in such a way that, when the two divaricating elements (11, 12) have adopted the first operating configuration, the two arms (16, 17) are in contact with each other only at their free ends (16', 17').
20. Unit according to one or more of the previous claims, comprising means (31, 32) for tensioning the ladder (s) at a pair of crossbeams (T1, T2) in a transversal direction parallel to the insertion plane (m), the tensioning means (31, 32) preferably being movable between a ladder engagement position and a ladder distancing position, in the engagement position the tensioning means (31, 32) operating substantially on the insertion plane (m) of the slat.
21. Stacking unit according to claim 20, wherein the means for tensioning the ladder in the transversal direction comprise two separate tensioning elements (31, 32), each provided with a fork head (33) with which they can engage the ladder in a releasable manner receiving said pair of crosspieces (T1, T2) in an engagement seat (15) made in the respective fork head (33) and acting on the uprights (P1, P2) in the proximity of said pair of crossbeams, the two tensioning elements (31, 32) being movable between an activation position and a deactivation position with respect to the ladder.
22. Stacking unit according to claim 21, where the two tensioning elements (31, 32) are movable in relation to each other along a tensioning direction (Y) substantially parallel to the positioning plane p, so that, once the activation position has been reached, the two heads (33) are moved away from each other and brought against the two uprights (P1, P2) of the ladder so as to move the latter away one from each other and thus tighten the pair of crossbeams T1, T2
23. Stacking unit according to claim 22, wherein the two tensioning elements (31, 32) are movably associated to a support structure (4) of the stacking unit (1) on two opposite sides with respect to the insertion axis (X), preferably each tensioning element (31, 32) comprising an arm (34) bearing the fork head (33) at its free end and being rotationally connected to the support structure (4) for moving the head (33) between the activation and deactivation positions.
24. Stacking unit according to claim 22 or 23, wherein each tensioning element (31, 32) is associated to a carriage (36) translating on the support structure (4) parallel to the direction of tensioning (Y).
25. Stacking unit according to one or more of the claims from 21 to 24, wherein a movable blocking element (41, 42) is coupled to each tensioning element (31, 32), the movable blocking element being suitable to close itself against the tensioning element (31, 32) to keep the portion of the ladder engaged by the tensioning element (31, 32) in position when the latter (31, 32) is in the activation position, and to open with respect to the tensioning element to release the portion of ladder previously engaged by the tensioning element, when the latter is in the deactivation position, preferably each movable blocking element (41, 42) being constituted by a plate rotating around said axis of rotation (Z1, Z2) of the respective tensioning element.
26. Stacking unit according to claim 8 and claim 24, wherein the support base (15) of the actuating device (20) is associated to the support structure (4) of the stacking unit by means of the carriage (36) of one of the two tensioning elements (31; 32), the support base (15) being in turn movable with respect to said carriage (36) to make the movement of the divaricating elements (11, 12) at least partially independent of the movement of the tensioning element (31, 32).
27. Unit according to one or more of the previous claims, comprising means for positioning a pair of cross-

beams (T1; T2) at the insertion plane (m), preferably said positioning means coinciding with the tensioning means (31, 32).

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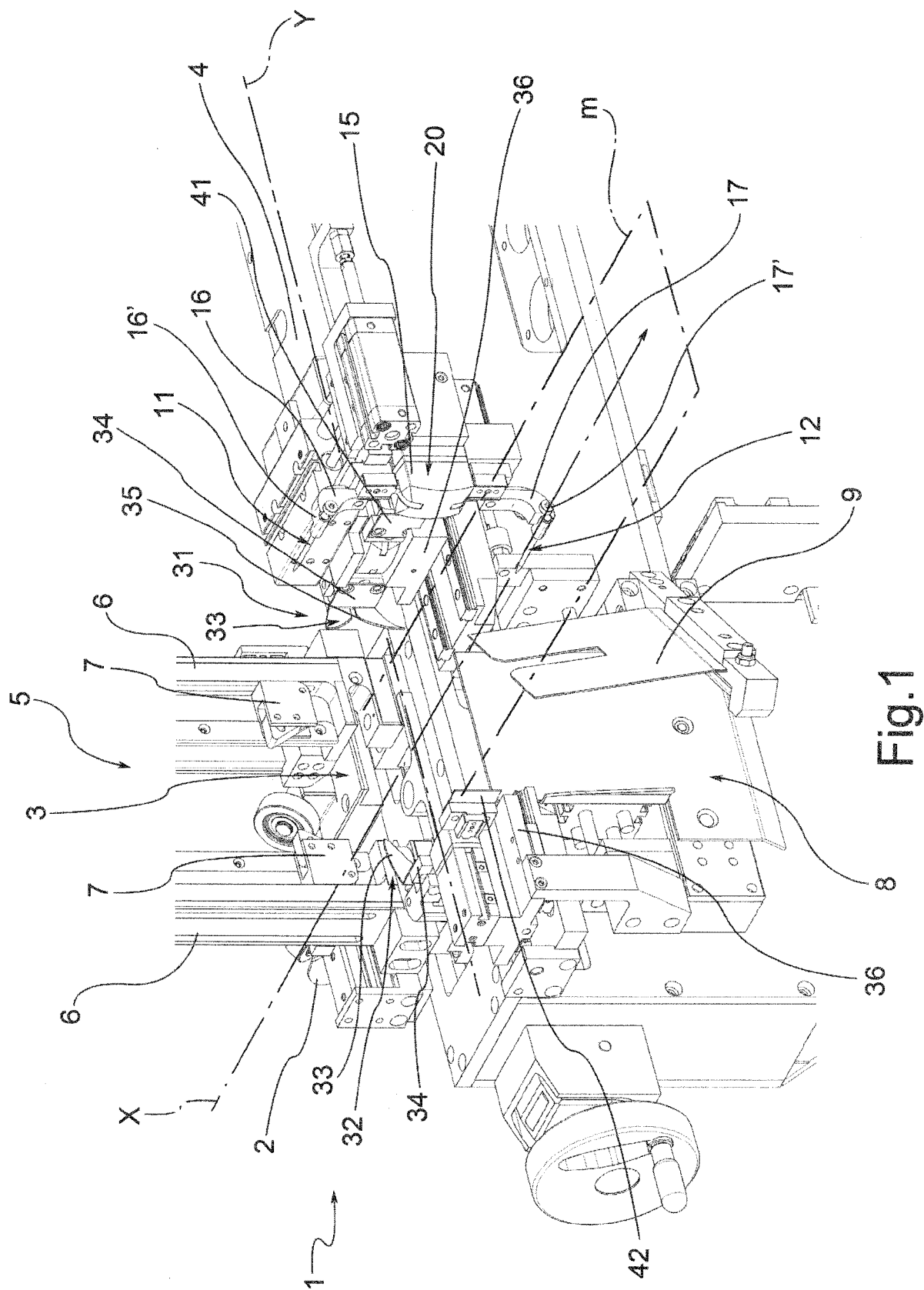
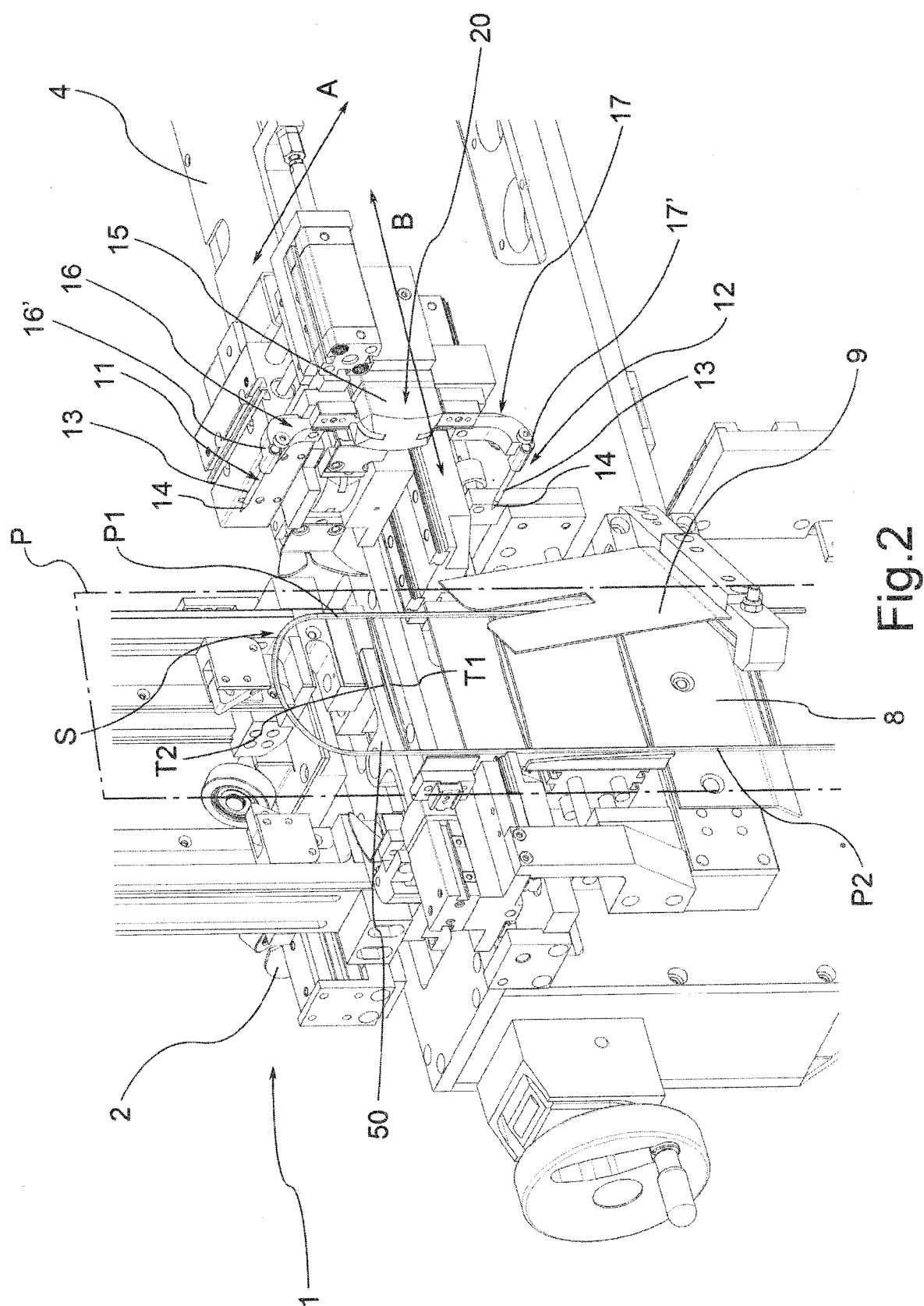


Fig.1



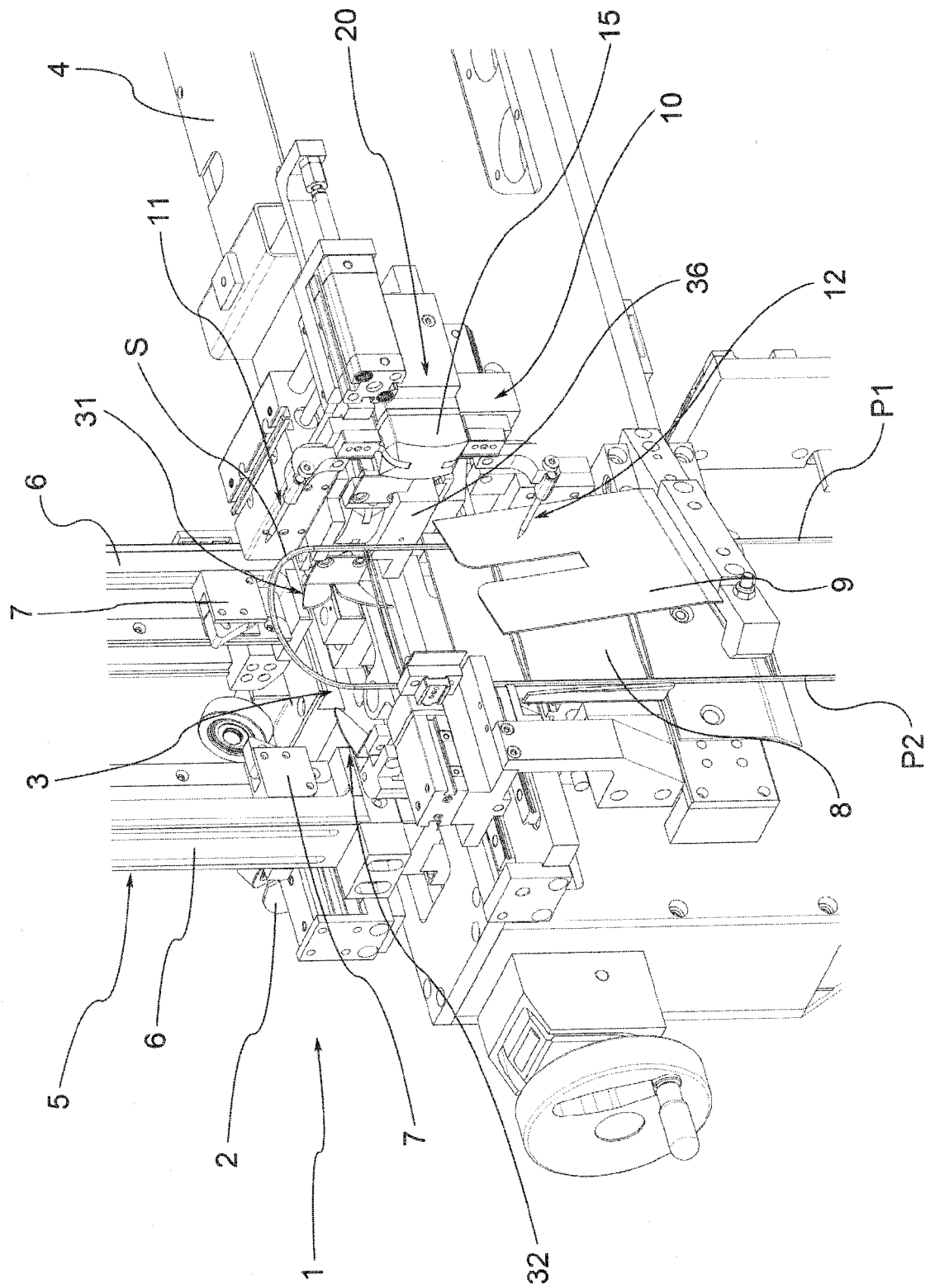


Fig.3

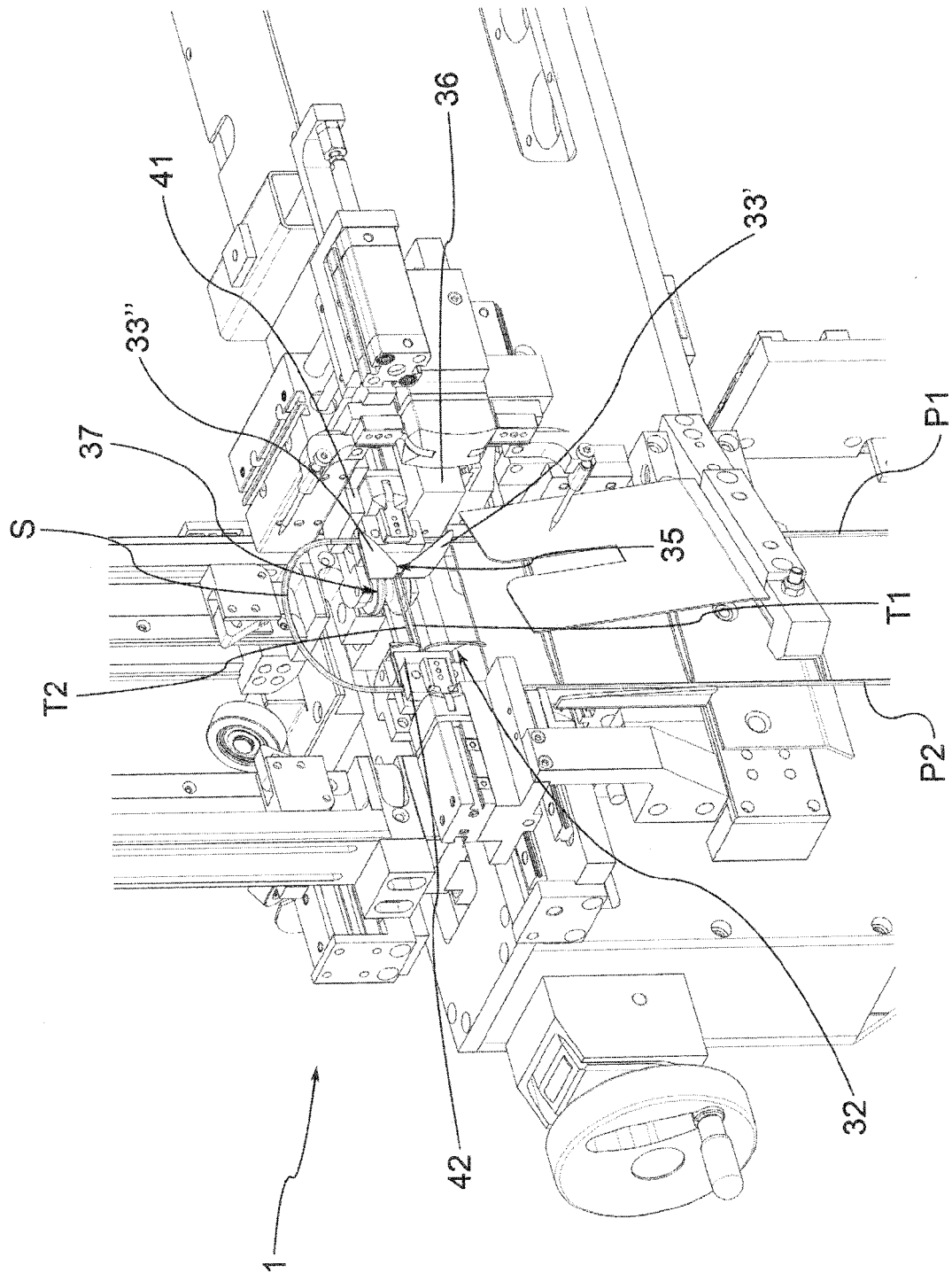


Fig.4

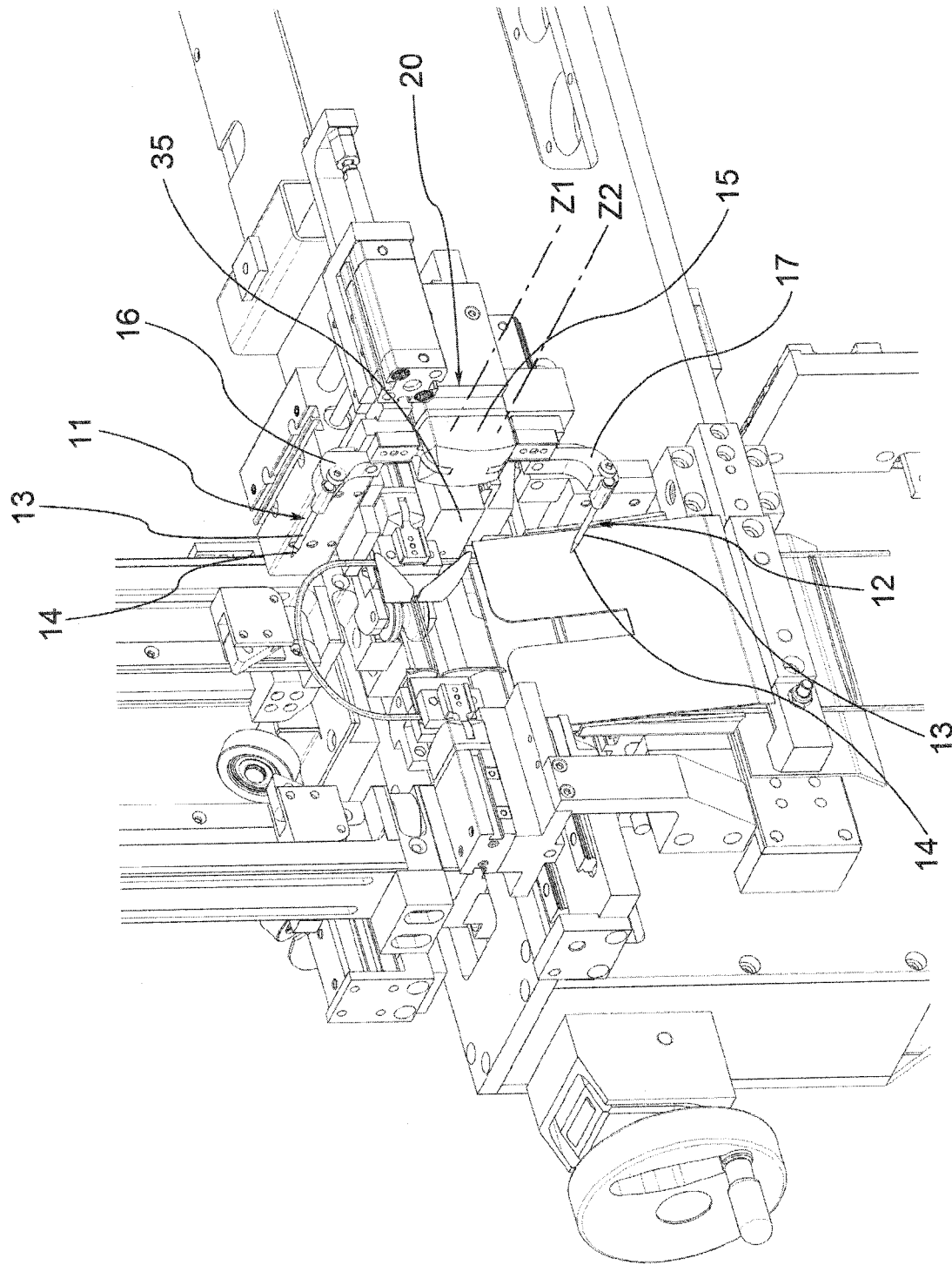


Fig.5

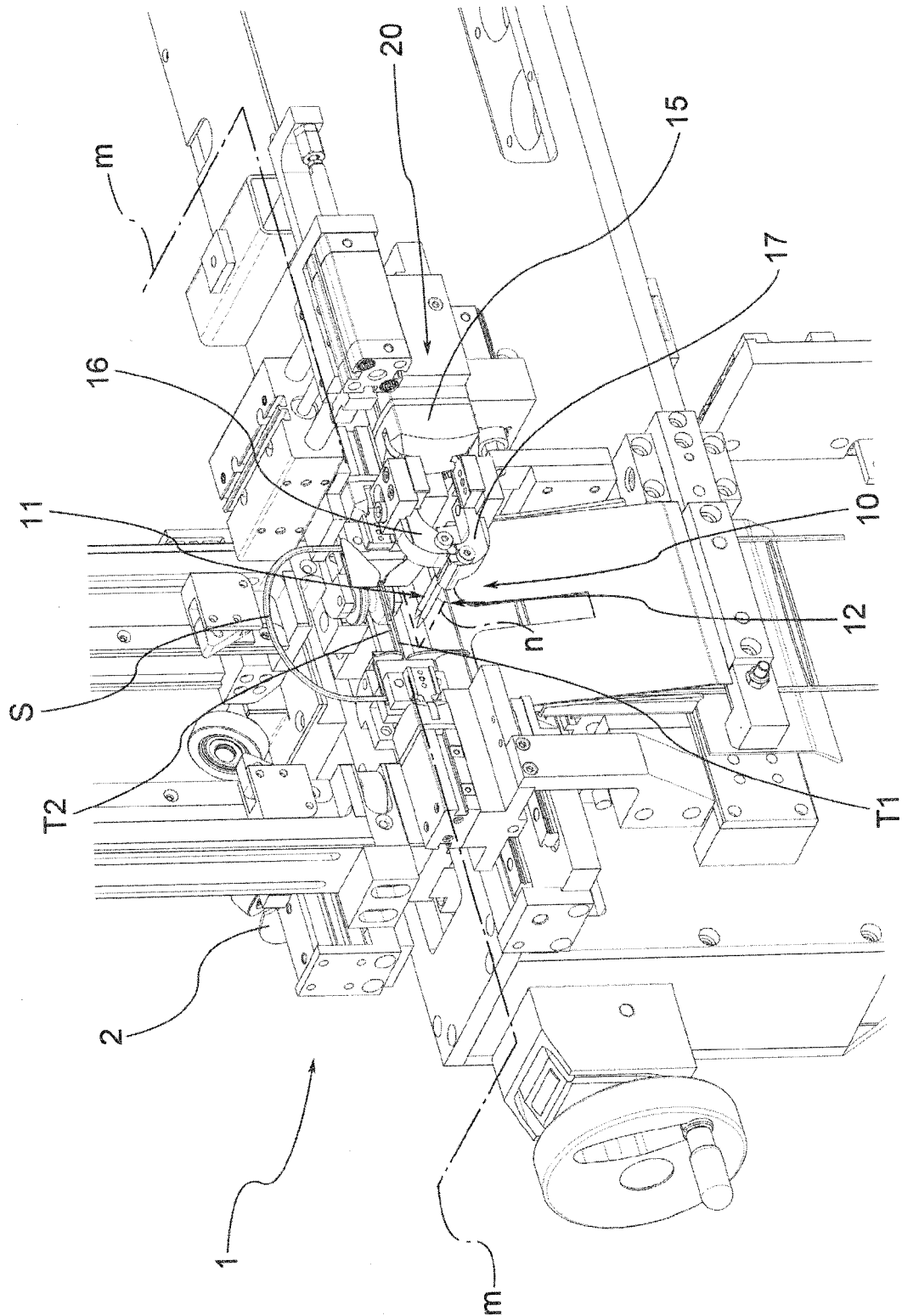


Fig. 6

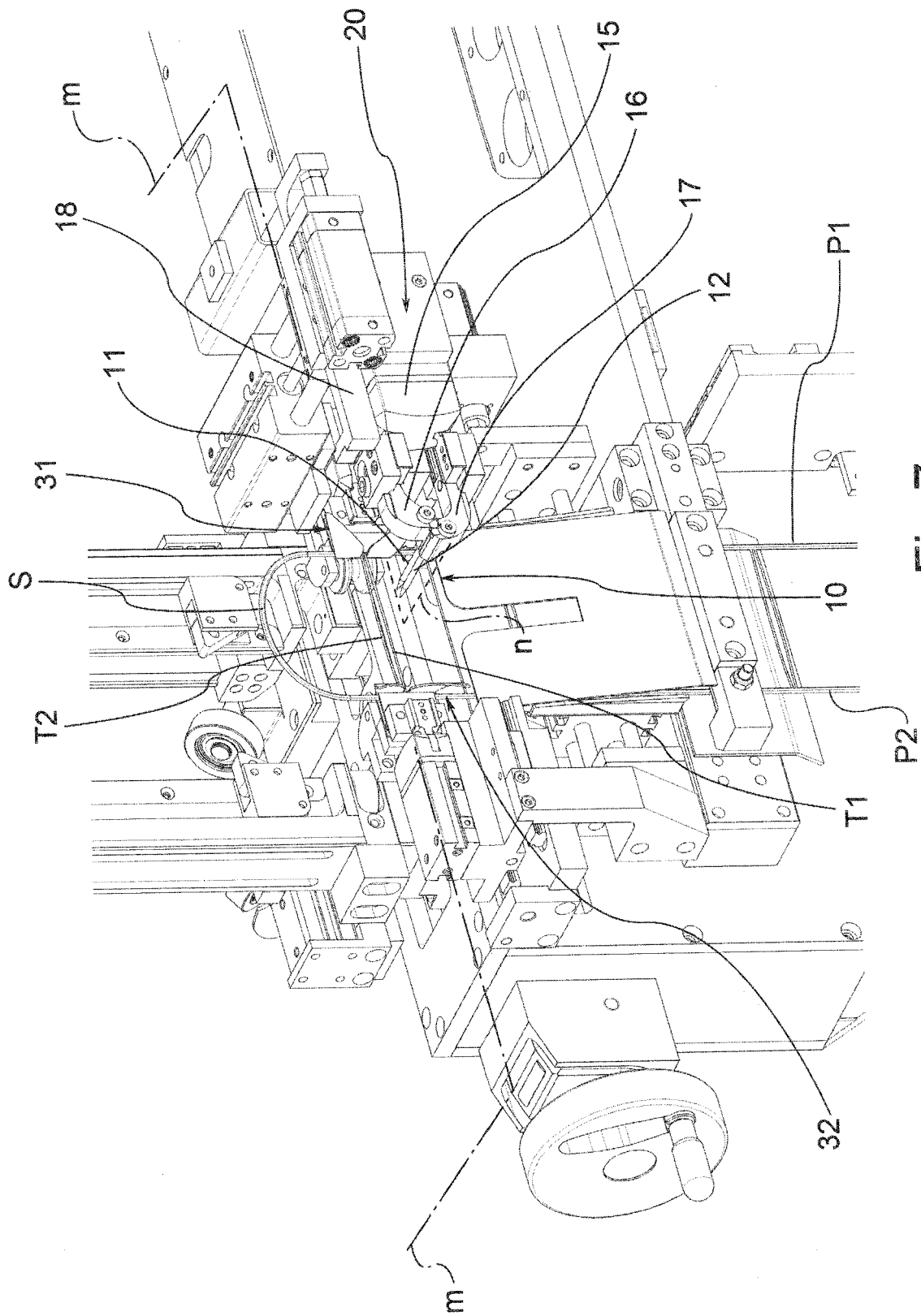


Fig.7

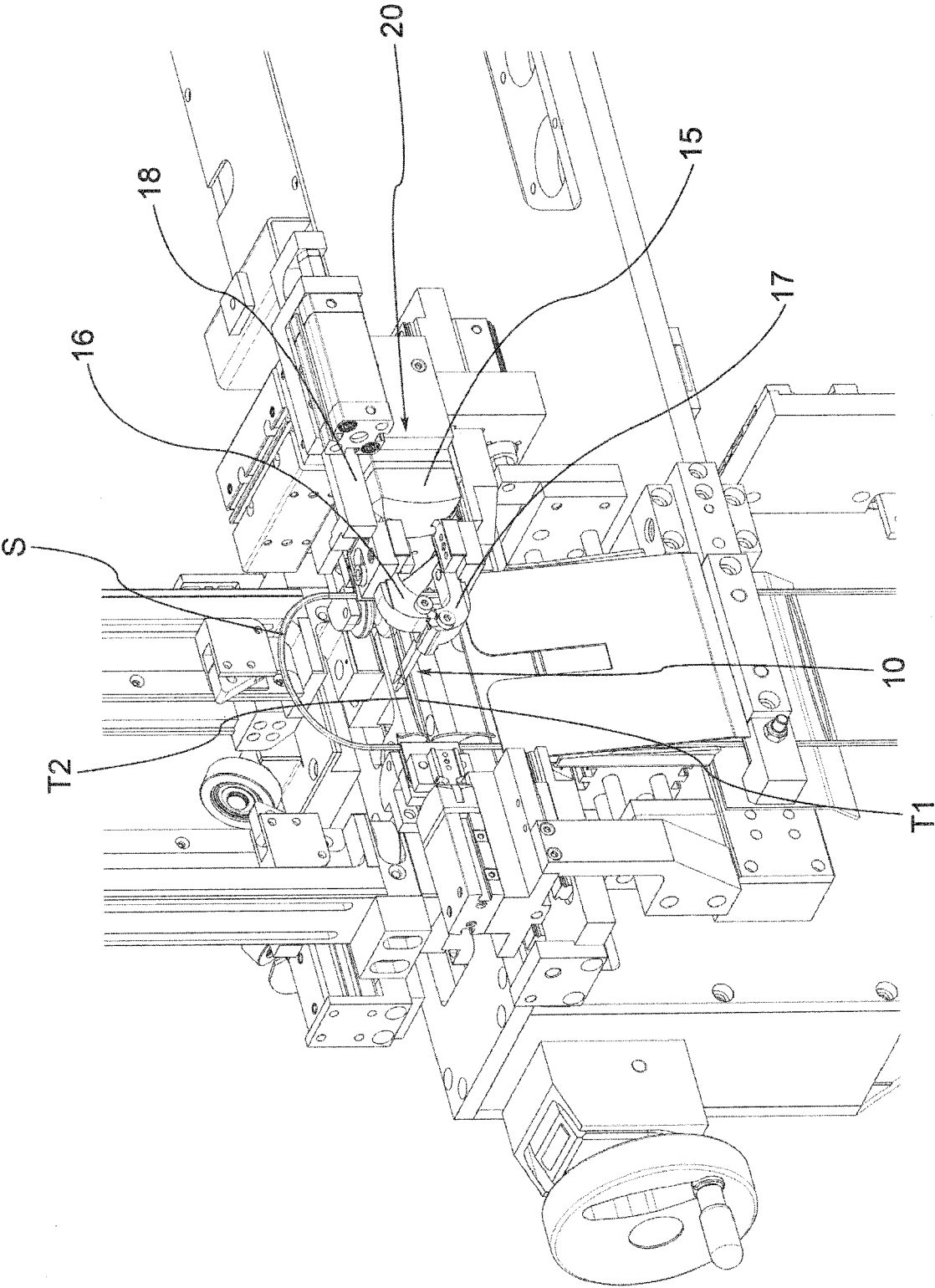


Fig.8

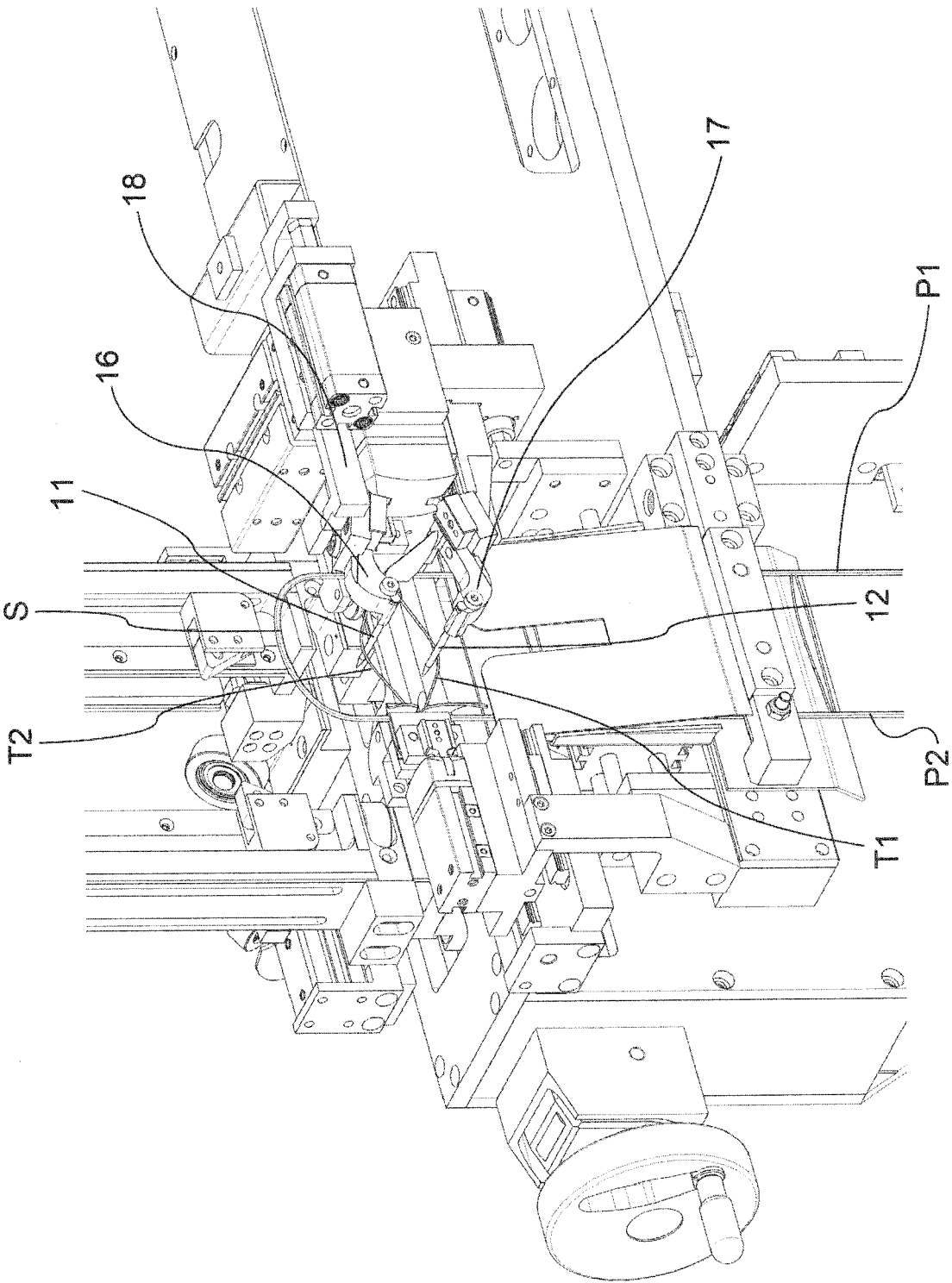


Fig.9

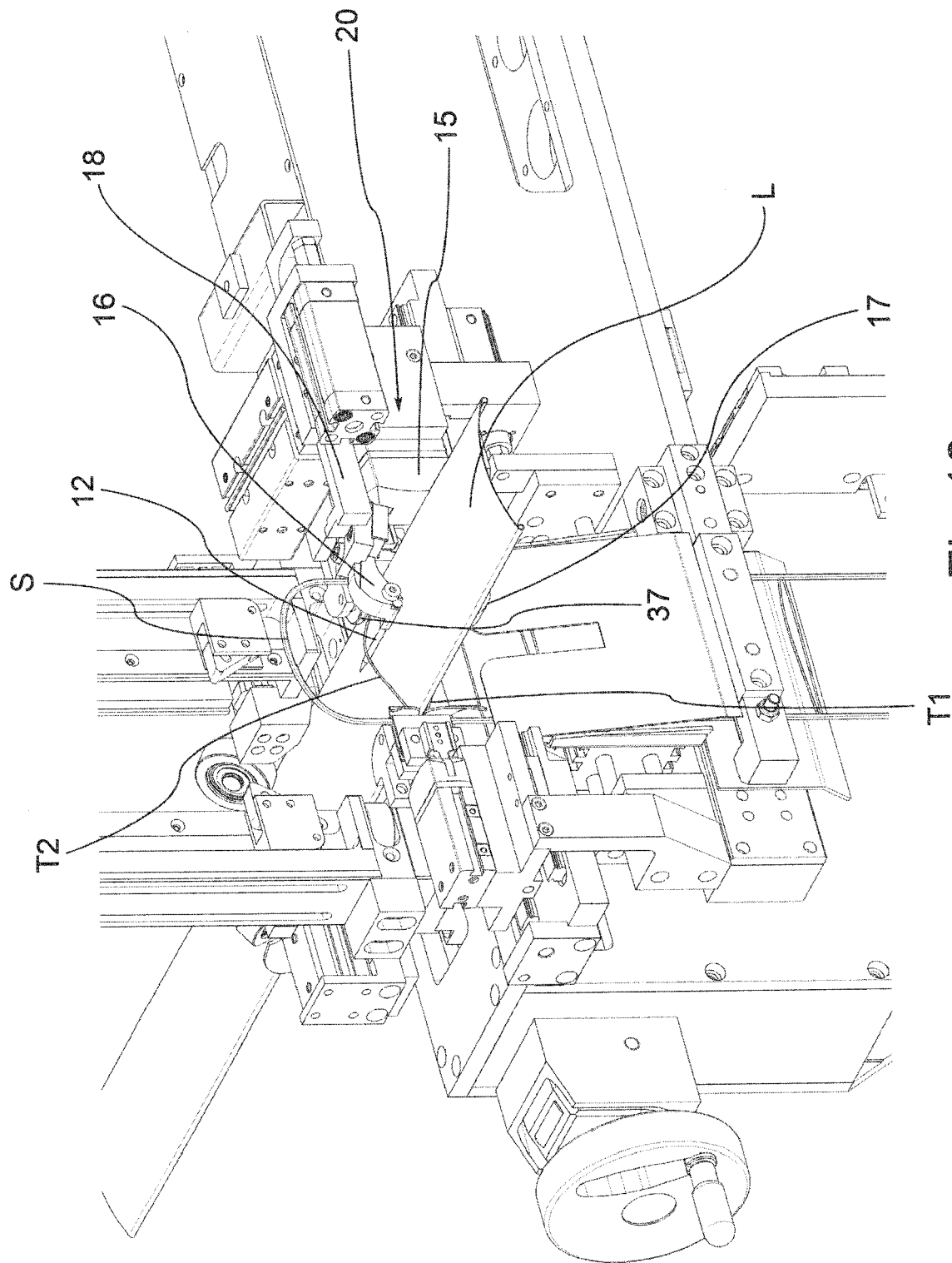


Fig.10

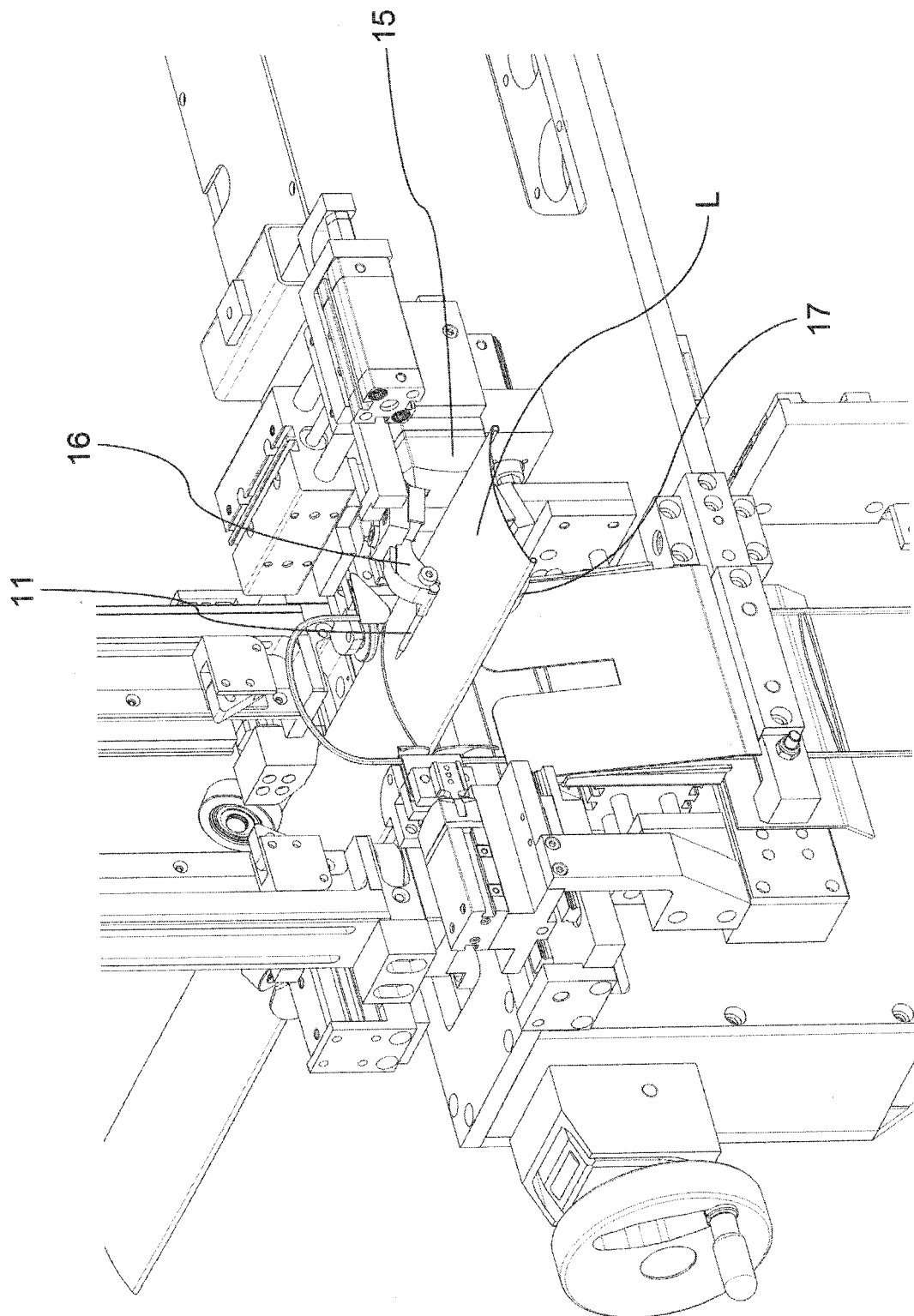


Fig.11

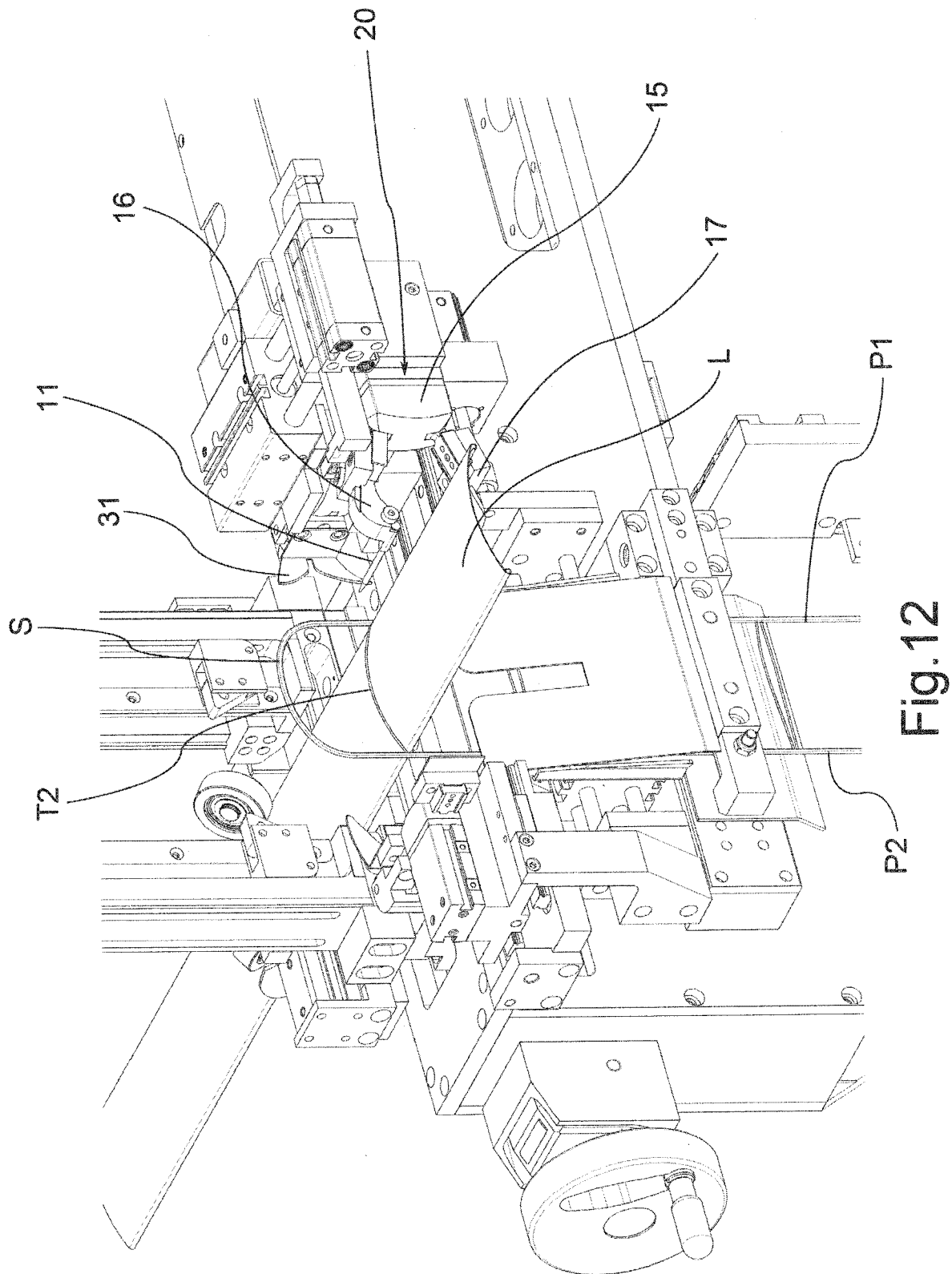


Fig.12

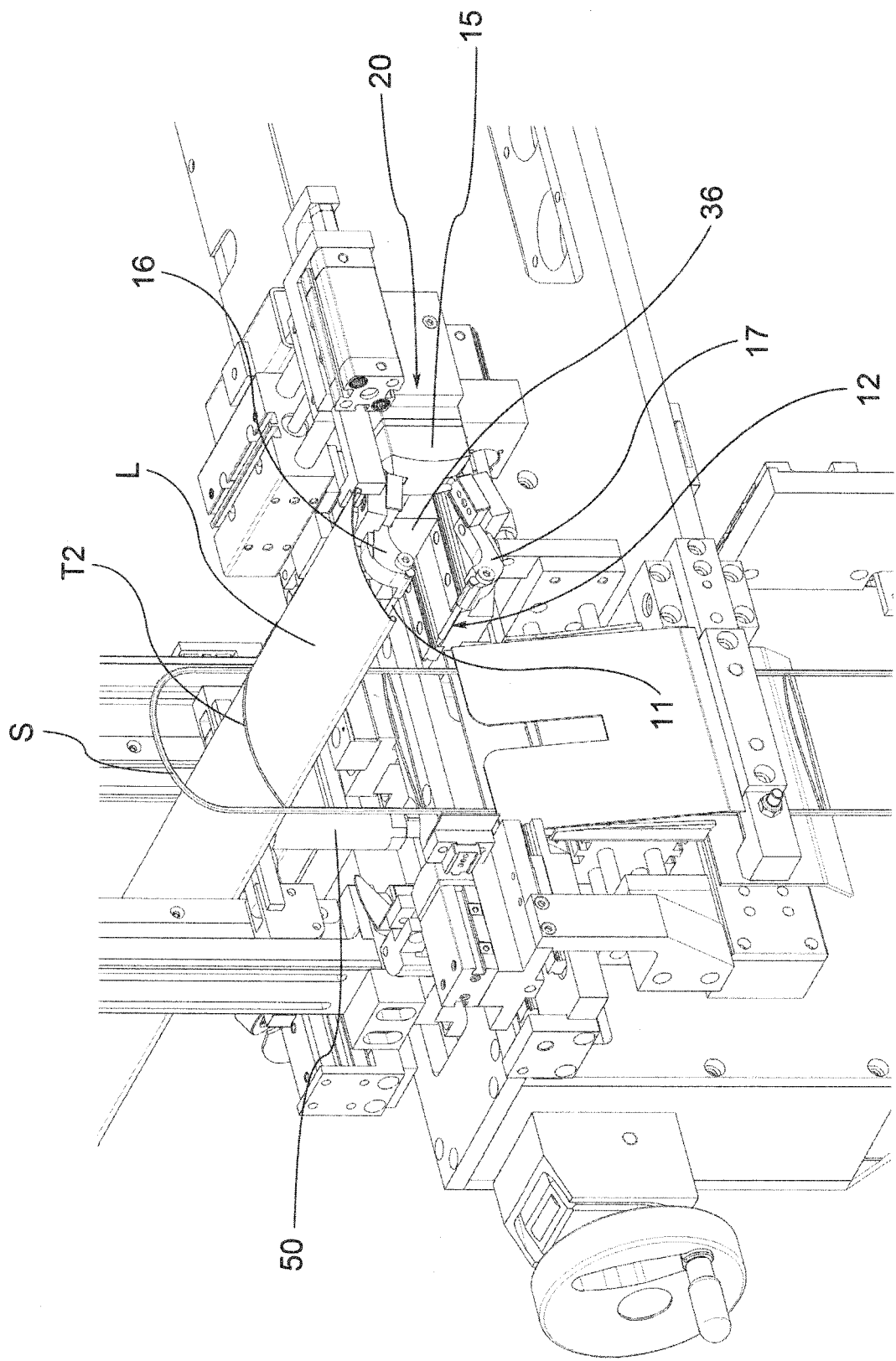


Fig.13

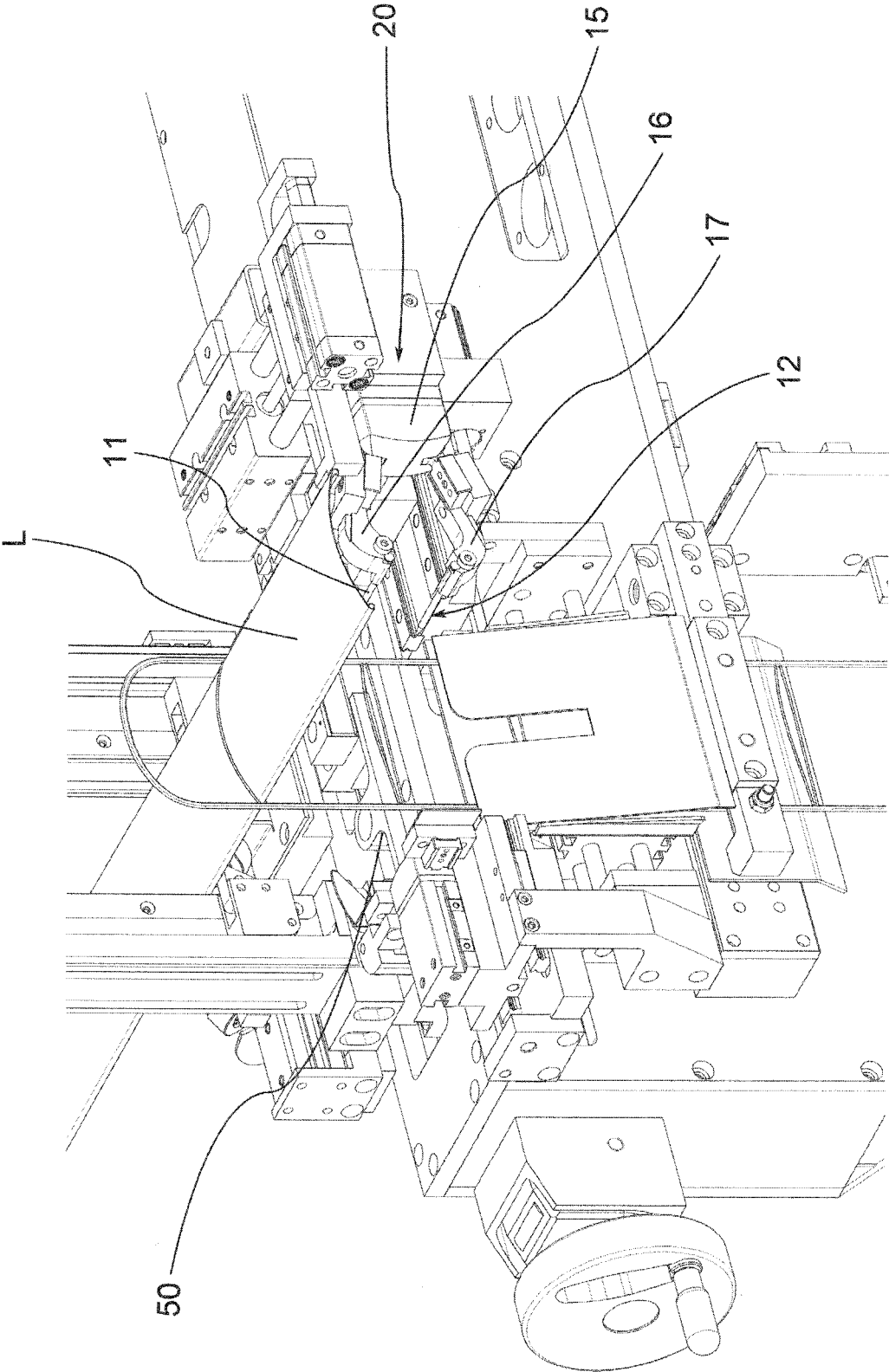


Fig.14

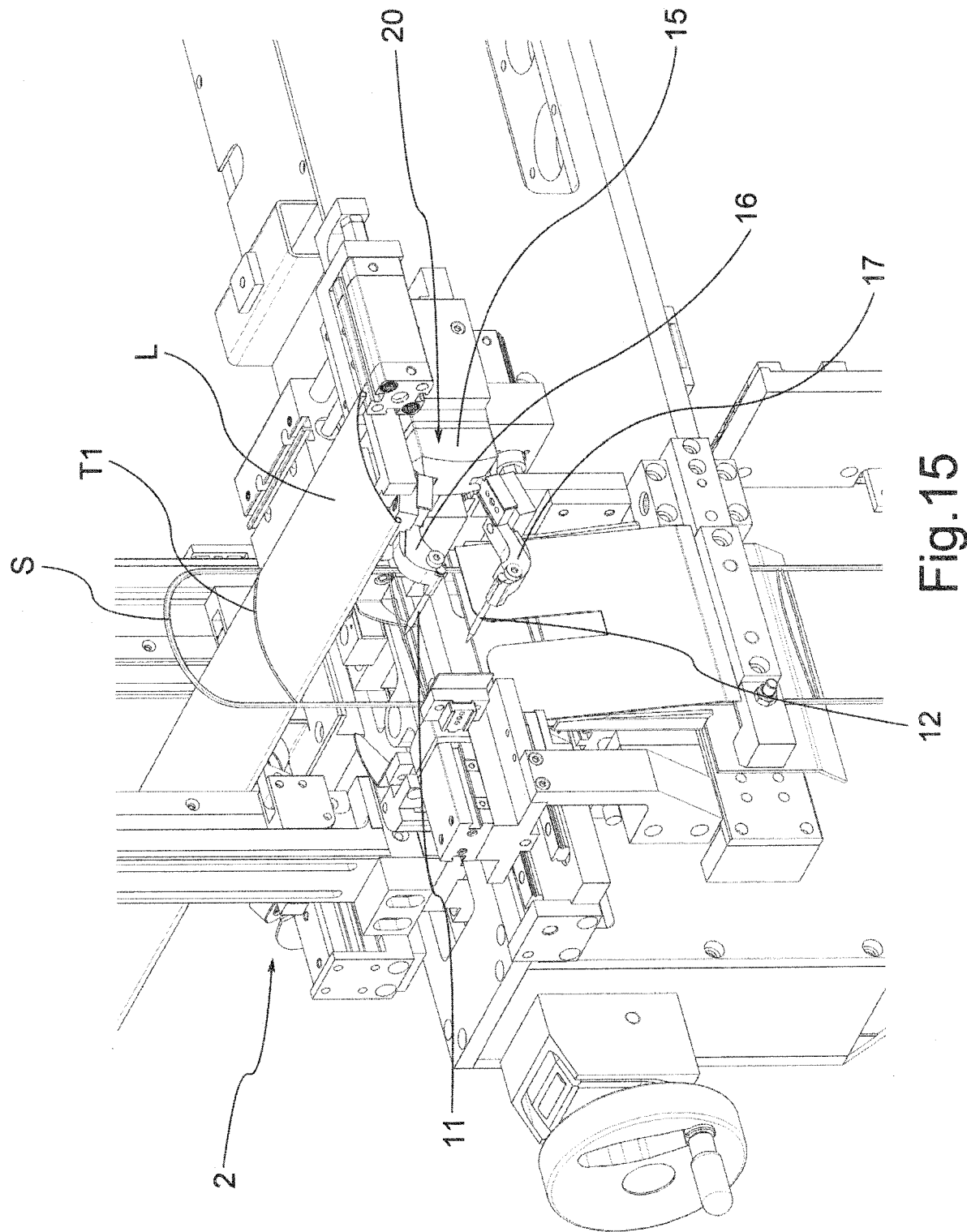


Fig.15

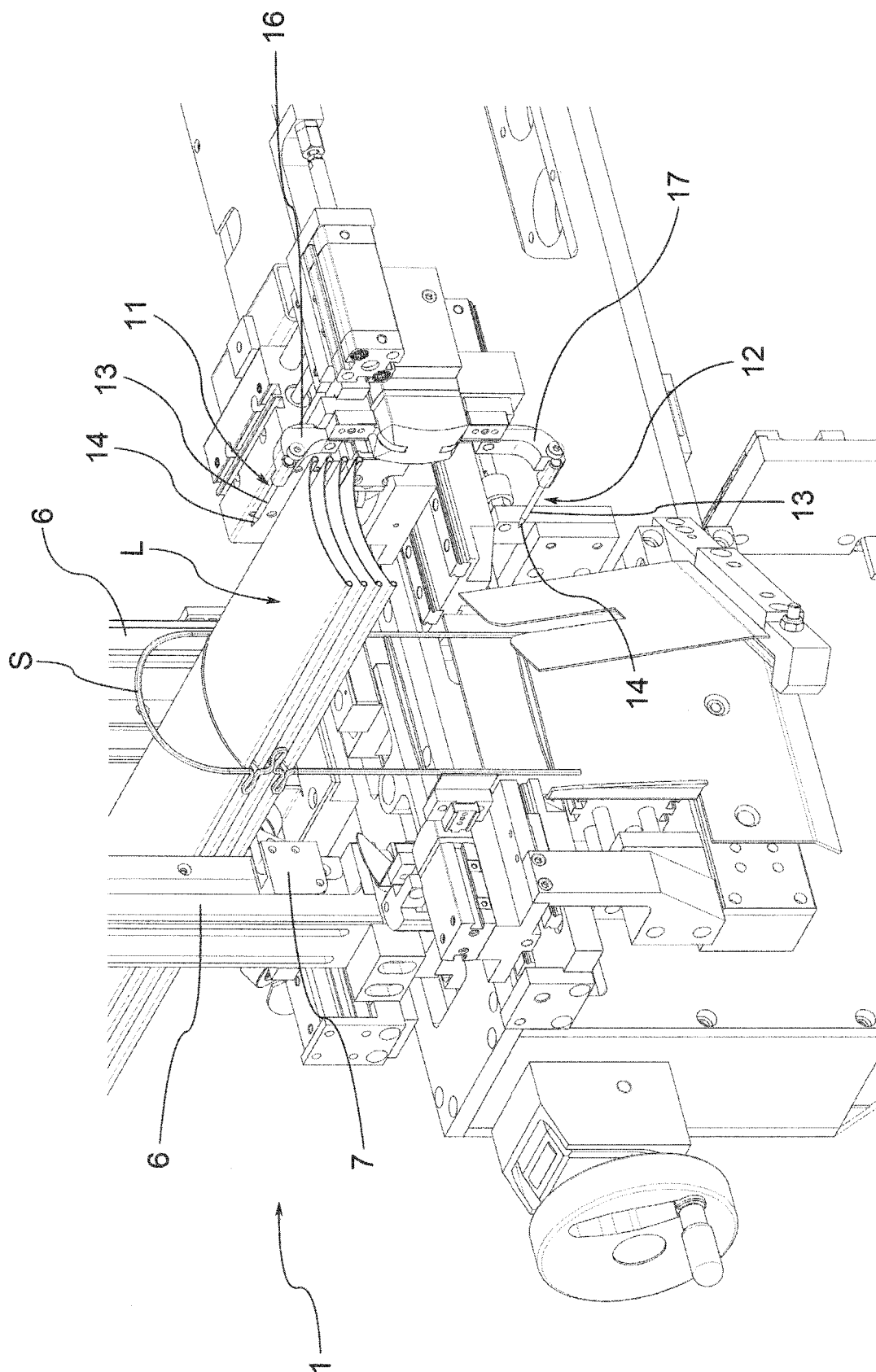


Fig.16



EUROPEAN SEARCH REPORT

Application Number
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			E06B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 February 2016	Examiner Knerr, Gerhard
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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