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(54) **OPERATING UNIT FOR A PROFILING LINE**

BEARBEITUNGSEINHEIT FÜR EINE PROFILIERUNGSANLAGE

DISPOSITIF POUR UNE LIGNE DE PROFILAGE

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EP 3 388 162 B1

Description

[0001] The present invention relates to an operating unit for a profiling line and to a method for profiling a profiled element according to the preambles of claims 1 and 9.

[0002] Such an operating unit and such a method are for example disclosed in JP-A-2003251413. In particular, the invention relates to an operating unit having shaped rollers for profiling lines for tubes having a polygonal section, for example rectangular or square.

[0003] As is known, a profiling line allows a tubular profiled element to be produced starting from a steel strip which is progressively bent back in line about a longitudinal axis thereof until it assumes a tubular conformation wherein the longitudinal edges of the strip are arranged alongside one another in the upper zone of the profiled element. For this purpose a profiling line substantially comprises a series of bending units, arranged in succession, each of which comprises two or more profiling rollers. The progressive bending of the profiled element takes place by making the strip pass through the rollers of the various bending units which, by contact, progressively deform it. The strip slides continuously through the bending units, being progressively deformed.

[0004] Still in line, i.e. while the profiled element is continuously advancing, the longitudinal edges are welded together. The profiled element is subsequently cut into portions of a pre-established length, according to known processes. The whole production is performed in line, i. e. while the profiled element is continuously advancing.

[0005] For realising a polygonal section tube, for example rectangular or square, the bending of the strip initially takes place by the operation of rollers that are located at the points in which the corners of the profiled element are to be realised. Such rollers are positioned above and below the strip, at the corners that will progressively form. On the lower or external side of the strip rotating rollers are positioned which exert an opposite pressure to the pressure exerted by the discs. Discs and rollers are aligned in succession along the longitudinal axis of the strip, supported by a support structure which can assume various configurations. When advancing the strip through the rollers and the discs a progressive bending is achieved about the longitudinal axis, up to obtaining a profiled element that is closed and tube-shaped. The closing of the tube takes place in a terminal portion of the line, along which the two opposite edges of the strip are brought side-by-side with one another and then welded in line, for example by induction or high-frequency welding, in a known way in the sector.

[0006] With reference to the production of quadrangular-section tubes, the terminal portion of the line which produces the closing of the profiled element generally comprises a plurality of rollers, arranged outside the profiled element. The rollers are positioned outside the profiled element as, physically, a sufficient space is not available to enable an internal location of sufficiently sturdy rollers. The orientation of the various rollers, which can be adjustable, varies progressively along the terminal portion of the line, for progressively guiding the profiled element to the closing step. The profiled element reaches such terminal portion when it has a substantially U-shaped bent section defined by a horizontal lower side, two sides that diverge from one another in an upwards direction, and two upper sides inclined upward so as to be converging towards each other. The two upper sides are destined to flank one another in a horizontal position, to define the upper side of the section.

[0007] The various rollers are grouped in operating units, also known as cages, each of which comprises a support frame for a determined number of rollers. For the profiling of rectangular- or square-section tubes, each cage generally comprises a lower roller, with a horizontal rotating axis, two lateral rollers, with rotating axes parallel to the sides of the profiled elements and diverging from one another in an upwards direction, and two upper rollers, which can be conical or cylindrical; in the last case with the rotating axes converging to each other in an upwards direction. Along an advancement direction of the line, the rotating axes of the lateral rollers of the various cages progressively incline towards a vertical direction. The rotating axes of the various upper rollers, or the taper thereof in a case where they are realised in a conical form, progressively incline towards a horizontal direction.

[0008] To enable obtaining the correct inclination of the various rollers, each cage must be provided with complex adjustment devices, which enable varying the inclination and the position of the rollers at least on a vertical plane. The activating of these adjustment devices can be considerably laborious, and often requires the use of complex set-up software.

[0009] Furthermore, the rollers at present used, associated to the respective cages, often do not realise a correct closure of the profiled element. In particular, the two upper sides are not always arranged perfectly coplanarly, with the edges perfectly flanked to one another, so that it is necessary to perform very accurate adjustments of the positions of the various rollers.

[0010] Furthermore, the rollers at present used do not enable precisely realising the fillet radii required between the sides of the profiled element. This is because, during the closing step of the profiled element, the upper edges of the profiled element can slide in an undesired way on the surfaces of the upper rollers.

[0011] Examples of prior art devices are disclosed in documents WO2007063060, US4660399 and JP2003251413. Such devices do not solve the above problems, with particular regard to the profiling of closed profiles.

[0012] The object of the present invention is to disclose an operating unit for a profiling line and a method for profiling which enables obviating the drawbacks summarised.

[0013] This object is attained by an operating unit according to the features of claim 1 and by a method ac-

cording to the features of claim 9. An advantage of the operating unit according to the present invention is that it facilitates the correct closing of the profiled element, drastically reducing the need to adjust the position of the various rollers.

[0014] Another advantage of the operating unit according to the present invention is that it enables very precisely obtaining the fillet radii required between the various sides of the profiled element.

[0015] A further advantage of the operating unit according to the present invention is that it significantly prevents or limits any tendency of the profiled element to twist about the longitudinal axis thereof.

[0016] Further characteristics and advantages of the present invention will become more apparent in the following detailed description of an embodiment of the present invention, illustrated by way of non-limiting example in the attached figures, in which:

- figure 1 shows a schematic view of two shaped rollers of the operating unit according to the present invention;
- figure 2 shows a cross-section view of a quadrangular-section profiled element;
- figure 3 shows a schematic view of a portion of the finishing portion of a profiling line, in which three operating units according to the present invention are present;
- figure 4 shows a front view of an operating unit according to the present invention;
- figure 5 shows a front view of an operating unit according to the present invention, in an alternative embodiment.

[0017] Figure 3 schematically illustrates a portion of the finishing portion of a profiling line. In particular three operating units (M) are illustrated, each provided with two shaped rollers (1) according to the present invention. The operating units (M) are aligned along a longitudinal direction (Y) which also defines the longitudinal axis of the profiled element (P).

[0018] The profiled element (P) that enters each operating unit presents, on a section carried out with a plane perpendicular to the longitudinal direction (Y), a lower side (B), two sides (S1, S2) and two upper sides (T1, T2) inclined upward so as to be converging towards each other (figure 2). The lower side (B) is substantially horizontal. The sides (S1, S2) can be divergent in an upwards direction, as in the represented case. Proceeding progressively along the finishing portion through the various operating units, the sides (S1, S2) assume a position progressively closer to the vertical axis, while the upper sides progressively approach a horizontal position.

[0019] As illustrated in figure 1, the shaped roller of the operating unit according to the present invention comprises a conical portion (2) and an end portion (3), concentric with respect to a rotating axis (Z). The rotating axis (Z) is preferably though not necessarily horizontal and is perpendicular to the longitudinal direction (Y). The conical portion (2) is provided with a vertex section (23), in which the diameter is minimal. The end portion (3) has a greater diameter than the vertex section (23). In this way, the end portion (3) defines a shoulder from the surface of the first conical portion (2).

[0020] The conformation of the shaped roller (1) of the operating unit according to the present invention provides important advantages. The conical portion (2) is predisposed to enter into contact with an upper side (T1) of the profiled element. As it enters into contact with the conical portion (2), such upper side (T1) assumes an inclination that is substantially coincident with the taper of the conical portion (2). On the contrary to what happens with the cylindrical rollers at present available, which have to be arranged with the rotating axis inclined and adjustable, the shaped rollers of the operating unit according to the present invention can be arranged with the rotating axis horizontal. Furthermore, the end portion (3), provided with a greater diameter with respect to the vertex section (23), defines a shoulder in contact with which the edge of the upper side (T1) is positioned, as schematically illustrated in figure 1. Owing to the end portion (3), the upper side (T1) does not slide on the surface of the conical portion (2) and can be bent thereby with a high degree of precision, enabling predetermined fillet radii to be realised with the side (S1).

[0021] The shaped rollers (1) of the various operating units have a taper that gradually decreases in the advancement direction of the profiled element, up to reaching a very small taper or becoming substantially cylindrical so as to bring the upper sides (T1, T2) into a position that is very close to a horizontal position. Generally, downstream of the finishing portion there is a welding group that, by means of an upper cylindrical roller or other means, makes the upper sides (T1, T2) substantially horizontal and ready for the subsequent welding.

[0022] The end portion (3) is preferably though not necessarily conical and is connected to the conical portion (2) at the vertex section (23). The conical conformation of the end portion (3), the inclination of which, with respect to the rotating axis (Z), is opposite with respect to that of the conical portion (2) enables reducing the peaks of pressure which can occur at the vertex section (23) and at the edge of the upper side (T1). Furthermore, the conical conformation of the end portion (3) facilitates overall the machining of the surface of the roller. The angle included between the tapers of the conical portion (2) and of the end portion (3) is preferably but not necessarily greater than or equal to a right angle. This enables obtaining the advantages connected with the conical conformation of the end portion (3), maintaining a solid rest for the edge of the upper side (T1).

[0023] Preferably, though not necessarily, the shaped roller has shoulders (21, 31), i.e. zones located at the ends of the roller, having a cylindrical shape.

[0024] The operating unit according to the present invention comprises two shaped rollers (1), positioned with

the end portions (3) thereof facing each other, i.e. positioned with the end portions facing towards the longitudinal direction (Y) and towards a vertical plane containing the longitudinal direction (Y). The two shaped rollers (1) have the rotating axes (Z) thereof aligned. This solution enables reducing the dimensions of the operating unit along the longitudinal axis (Y).

[0025] The shaped rollers (1) are arranged so that the upper sides (T1, T2) of the profiled element are in contact with the conical portion (2). As already mentioned, as they enter into contact with the conical portion (2) of the rollers (1), the upper sides (T1, T2) assume an inclination that is substantially coincident with the taper of the conical portion (2). As already mentioned, the shaped rollers (1) of the various operating units have a taper that gradually decreases in the advancement direction of the profiled element, so as to bring the upper sides (T1, T2) in a position progressively closer to the horizontal position.

[0026] The operating unit can be provided with adjustment means to allow the movement of the shaped rollers (1) along one or more horizontal directions and/or along a vertical direction. For example, the adjustment means can enable the nearing or distancing of the rollers (1) along a horizontal direction parallel to the rotating axes and/or a displacement of the rollers (1) along a direction parallel to the longitudinal axis (Y). The adjustment means are not illustrated in greater detail as they are known to a person skilled in the sector. The possibility of adjusting the position of the shaped rollers (1) enables varying the shape and section of the profiled element (P), and varying the progression of the bending of the profiled element (P).

[0027] The operating unit (M) according to the present invention can be further provided with a lower roller (11), arranged to come into contact with the lower side (B) of the profiled element. The lower roller (11) is inclined in accordance with the inclination that it is desired to obtain for the lower side (B) of the profiled element. In the illustrated case the lower roller (11) is cylindrical and is arranged with the rotating axis horizontal. Adjustment means can be predisposed to enable the movement of the lower roller (11) along one or more horizontal directions and/or along a vertical direction, in order to enable various sections of the profiled element (P) to be obtained. In this case too, the adjustment means are not illustrated in greater detail as they are known to a person skilled in the sector. Preferably, though not necessarily, a lower roller (11) is interposed between two consecutive operating units (M).

[0028] The operating unit (M) according to the present invention can further comprise a pair of lateral rollers (12, 13), arranged to come into contact with the sides (S1, S2) of the profiled element. The lateral rollers (12, 13) can have a conical or cylindrical conformation (respectively figures 4 and 5); in the latter case with an inclinable and adjustable rotating axis. As they enter into contact with the surface of the lateral rollers (12, 13), the sides (S1, S2) assume an inclination that substantially coincides with the taper of the lateral rollers (12, 13), in the first case, or substantially coincides with the inclination of the lateral rollers (12, 13) in the second case. Owing to the conformation of the shaped rollers of the operating unit according to the present invention, and in particular owing to the presence of the end portions (3), the action of the lateral rollers (12, 13) on the sides (S1, S2) of the profiled element is significantly more precise than in the present operating units. In fact, as already mentioned, each end portion (3) defines a reaction point for the edge of an upper side (T1, T2), which cannot therefore slide on the conical surface of the roller. This enables the lateral rollers (12,13) to press on the sides (S1, S2) in a uniform manner, given that the sides (S1, S2) cannot flex (this is because of the block of the upper sides (T1, T2) due to the end portions (3)). In this way, the sides (S1, S2) exactly copy the inclination of the surface of the lateral rollers (12, 13), enabling the precise realising of the predetermined radii of curvature on the corners of the profiled element (P).

[0029] The lateral rollers (12, 13) of the various operating units have a taper or inclination that gradually decreases in the advancement direction of the profiled element, up to becoming substantially cylindrical or vertical. This enables bringing the sides (S1, S2) into a substantially vertical position. Adjusting means (not illustrated as known to the skilled person in the sector) can be arranged to enable a displacement of the lateral rollers (12, 13) along one or more horizontal directions and along a vertical direction. The possibility of adjusting the position of the lateral rollers (12, 13) enables varying the shape and dimensions of the cross-section of the profiled element (P), and varying the progression of the bending of the sides (S1, S2), increasing the flexibility of the line and making it substantially universal (within a wide range of sections realisable for the profiled element).

[0030] The various rollers mentioned and described can be motorized or idle, in a known way for the technical expert in the sector, according to the effective production needs.

Claims

1. An operating unit for a profiling line, arranged to receive at the inlet a profiled element that has a cross section defined by a lower side (B), two sides (S1, S2) and two upper sides (T1, T2) sloped upward so as to be converging towards each other, the operating unit comprising:

   two shaped rollers (1), each one including a conical portion (2) and an end portion (3), concentric respect to a rotating axis (Z);
   wherein the conical portion (2) is equipped with a vertex section (23) in which the diameter of the roller (1) is minimal, wherein the end portion (3) is connected to the conical portion (2) at the

vertex section (23), and
wherein the end portion (3) has greater diameter than the vertex section (23) that defines a shoulder from the surface of the first conical portion (2);
characterized in that:

the two shaped rollers (1) are positioned with the rotating axes (Z) thereof aligned and with the end portions (3) facing each other, and are positioned in such a way that the upper sides (T1, T2) of the profiled element are in contact with the conical portion (2);
the end portions (3) are arranged to come into contact with the end edges of the upper sides (T1, T2).

2. The operating unit according to claim 1, including adjustment means to allow the movement of the shaped rollers (1) along one or more horizontal directions and/or along a vertical direction.

3. The operating unit according to claim 1, including a lower roller (11), arranged to come into contact with the lower side (B) of the profiled element.

4. The operating unit according to claim 1, including two lateral rollers (12,13), arranged to come into contact with the sides (S1,S2) of the profiled element.

5. The operating unit according to claim 4, wherein the lateral rollers (S1,S2) are conical.

6. The operating unit according to claim 4, wherein the lateral rollers (S1,S2) are cylindrical, with a rotating axis that is sloped and adjustable relative to the vertical axis.

7. The operating unit according to claim 1, wherein the end portion (3) is conical and connected to the conical portion (2) at the vertex section (23).

8. The operating unit according to claim 7, wherein the angle included between the tapers of the conical portion (2) and of the end portion (3) is greater than or equal to a right angle.

9. Method for profiling a profiled element, wherein the profiled element has a cross section defined by a lower side (B), two sides (S1, S2) and two upper sides (T1, T2) sloped upward so as to be converging towards each other, which comprises the following steps:

forwarding the profiled element to a profiling line which comprises a operating unit featuring two shaped rollers (1), each one including a conical portion (2) and an end portion (3), concentric respect to a rotating axis (Z);
wherein the conical portion (2) is equipped with a vertex section (23) in which the diameter of the roller is minimal, wherein the end portion (3) is connected to the conical portion (2) at the vertex section (23), and
wherein the end portion (3) has greater diameter than the vertex section (23) that defines a shoulder from the surface of the first conical portion (2);
wherein the end portions (3) are arranged to come into contact with the end edges of the upper sides (T1, T2);
wherein the profiled element is forwarded to the operating unit with the upper sides placed in contact with the conical portion (2) and with the edges of the upper sides (T1,T2) placed in contact with the end portions (3);
characterised in that the two shaped rollers (1) are positioned with the rotating axes (Z) thereof aligned and with the end portions (3) facing each other, and are positioned in such a way that the upper sides (T1, T2) of the profiled element are in contact with the conical portion (2).

10. Method according to claim 9, wherein the operating unit comprises a lower roller (11), arranged to come into contact with the lower side (B) of the profiled element, and wherein the profiled element is forwarded to the operating unit with the lower side (B) placed in contact with the lower roller (11).

11. Method according to claim 9, wherein the operating unit comprises two lateral rollers (12,13), arranged to come into contact with the sides (S1,S2) of the profiled element, and wherein the profiled element is forwarded to the operating unit with each side (S1,S2) placed in contact with a lateral roller (12,13).

Patentansprüche

1. Betriebseinheit für eine Profilierungsanlage, die so angeordnet ist, dass sie am Eingang ein profiliertes Element aufnimmt, das einen Querschnitt aufweist, der durch eine Unterseite (B), zwei Seiten (S1, S2) und zwei Oberseiten (T1, T2) definiert ist, die nach oben geneigt sind, so dass sie aufeinander konvergieren, wobei die Betriebseinheit umfasst:

zwei geformte Walzen (1), von denen eine jede einen konischen Abschnitt (2) und einen Endabschnitt (3) enthält, die konzentrisch zu einer Drehachse (Z) sind;
wobei der konische Abschnitt (2) mit einem Scheitelpunktteil (23) ausgestattet ist, in dem der Durchmesser der Walze (1) minimal ist, wo-

bei der Endabschnitt (3) am Scheitelpunktteil (23) mit dem konischen Abschnitt (2) verbunden ist, und
wobei der Endabschnitt (3) einen größeren Durchmesser als der Scheitelpunktteil (23) aufweist, der eine Schulter von der Oberfläche des ersten konischen Abschnitts (2) aus definiert;
dadurch gekennzeichnet, dass:

die zwei geformten Walzen (1) so positioniert sind, dass deren Drehachsen (Z) ausgerichtet sind und die Endabschnitte (3) einander zugewandt sind, und so positioniert sind, dass die Oberseiten (T1, T2) des profilierten Elements mit dem konischen Abschnitt (2) in Kontakt stehen;
die Endabschnitte (3) so angeordnet sind, dass sie mit den Endkanten der Oberseiten (T1, T2) in Kontakt kommen.

2. Betriebseinheit nach Anspruch 1, enthaltend Einstellmittel, um die Bewegung der geformten Walzen (1) in einer oder mehreren horizontalen Richtungen und/oder in vertikaler Richtung zu ermöglichen.

3. Betriebseinheit nach Anspruch 1, enthaltend eine untere Walze (11), die so angeordnet ist, dass sie mit der Unterseite (B) des profilierten Elements in Kontakt kommt.

4. Betriebseinheit nach Anspruch 1, enthaltend zwei seitliche Walzen (12, 13), die so angeordnet sind, dass sie mit den Seiten (S1, S2) des profilierten Elements in Kontakt kommen.

5. Betriebseinheit nach Anspruch 4, wobei die seitlichen Walzen (S1, S2) konisch sind.

6. Betriebseinheit nach Anspruch 4, wobei die seitlichen Walzen (S1, S2) zylindrisch sind, wobei deren Drehachse geneigt und relativ zur vertikalen Achse einstellbar ist.

7. Betriebseinheit nach Anspruch 1, wobei der Endabschnitt (3) konisch ist und mit dem konischen Abschnitt (2) am Scheitelpunktteil (23) verbunden ist.

8. Betriebseinheit nach Anspruch 7, wobei der Winkel, der zwischen den Verjüngungen des konischen Abschnitts (2) und des Endabschnitts (3) enthalten ist, größer oder gleich einem rechten Winkel ist.

9. Verfahren zum Profilieren eines profilierten Elements, wobei das profilierte Element einen Querschnitt aufweist, der durch eine Unterseite (B), zwei Seiten (S1, S2) und zwei Oberseiten (T1, T2) definiert ist, die nach oben geneigt sind, so dass sie aufeinander konvergieren, das die folgenden Schritte umfasst:

Weiterleiten des profilierten Elements an eine Profilierungsanlage, die eine Betriebseinheit umfasst, die zwei geformte Walzen (1) aufweist, von denen eine jede einen konischen Abschnitt (2) und einen Endabschnitt (3) enthält, die konzentrisch zu einer Drehachse (Z) sind;
wobei der konische Abschnitt (2) mit einem Scheitelpunktteil (23) ausgestattet ist, in dem der Durchmesser der Walze minimal ist, wobei der Endabschnitt (3) am Scheitelpunktteil (23) mit dem konischen Abschnitt (2) verbunden ist, und
wobei der Endabschnitt (3) einen größeren Durchmesser als der Scheitelpunktteil (23) aufweist, der eine Schulter von der Oberfläche des ersten konischen Abschnitts (2) aus definiert;
wobei die Endabschnitte (3) so angeordnet sind, dass sie mit den Endkanten der Oberseiten (T1, T2) in Kontakt kommen;
wobei das profilierte Element zu der Betriebseinheit weitergeleitet wird, wobei die Oberseiten in Kontakt mit dem konischen Abschnitt (2) gebracht werden und die Kanten der Oberseiten (T1, T2) in Kontakt mit den Endabschnitten (3) gebracht werden;
dadurch gekennzeichnet, dass die zwei geformten Walzen (1) so positioniert sind, dass deren Drehachsen (Z) ausgerichtet sind und die Endabschnitte (3) einander zugewandt sind, und so positioniert sind, dass die Oberseiten (T1, T2) des profilierten Elements mit dem konischen Abschnitt (2) in Kontakt stehen.

10. Verfahren nach Anspruch 9, wobei die Betriebseinheit eine untere Walze (11) umfasst, die so angeordnet ist, dass sie mit der Unterseite (B) des profilierten Elements in Kontakt kommt, und wobei das profilierte Element zur Betriebseinheit weitergeleitet wird, wobei die Unterseite (B) in Kontakt mit der unteren Walze (11) gebracht wird.

11. Verfahren nach Anspruch 9, wobei die Betriebseinheit zwei seitliche Walzen (12, 13) umfasst, die so angeordnet sind, dass sie mit den Seiten (S1, S2) des profilierten Elements in Kontakt kommen, und wobei das profilierte Element zur Betriebseinheit weitergeleitet wird, wobei eine jede Seite (S1, S2) in Kontakt mit einer seitlichen Walze (12, 13) gebracht wird.

Revendications

1. Unité de fonctionnement pour une ligne de profilage, disposée pour recevoir en entrée un élément profilé présentant une section transversale formée par un

côté inférieur (B), deux côtés (S1, S2) et deux côtés supérieurs (T1, T2) inclinés vers le haut de sorte à converger les uns vers les autres, l'unité de fonctionnement comprenant :

deux rouleaux façonnés (1), comportant chacun une partie conique (2) et une partie d'extrémité (3), concentriques par rapport à un axe de rotation (Z) ;
dans laquelle la partie conique (2) est munie d'une section de sommet (23) où le diamètre du rouleau (1) est minimal, dans laquelle la partie d'extrémité (3) est raccordée à la partie conique (2) au niveau de la section de sommet (23), et dans laquelle la partie d'extrémité (3) a un diamètre supérieur à la section de sommet (23) qui forme un épaulement depuis la surface de la première partie conique (2) ;
caractérisée en ce que :

les deux rouleaux façonnés (1) sont positionnés avec leurs axes de rotation (Z) alignés et avec les parties d'extrémité (3) se regardant l'une l'autre, et sont positionnés de sorte que les côtés supérieurs (T1, T2) de l'élément profilé sont en contact avec la partie conique (2) ;
les parties d'extrémité (3) sont disposées pour venir en contact avec les bords d'extrémité des côtés supérieurs (T1, T2).

2. Unité de fonctionnement selon la revendication 1, comportant des moyens de réglage pour autoriser le mouvement des rouleaux façonnés (1) dans une ou plusieurs directions horizontales et/ou dans une direction verticale.

3. Unité de fonctionnement selon la revendication 1, comportant un rouleau inférieur (11), disposé pour venir en contact avec le côté inférieur (B) de l'élément profilé.

4. Unité de fonctionnement selon la revendication 1, comportant deux rouleaux latéraux (12, 13), disposés pour venir en contact avec les côtés (S1, S2) de l'élément profilé.

5. Unité de fonctionnement selon la revendication 4, dans laquelle les rouleaux latéraux (S1, S2) sont coniques.

6. Unité de fonctionnement selon la revendication 4, dans laquelle les rouleaux latéraux (S1, S2) sont cylindriques, avec un axe de rotation incliné et réglable par rapport à l'axe vertical.

7. Unité de fonctionnement selon la revendication 1, dans laquelle la partie d'extrémité (3) est conique et raccordée à la partie conique (2) au niveau de la section de sommet (23).

8. Unité de fonctionnement selon la revendication 7, dans laquelle l'angle inclus entre les effilements de la partie conique (2) et de la partie d'extrémité (3) est supérieur ou égal à un angle droit.

9. Procédé pour profiler un élément profilé, dans lequel l'élément profilé présente une section transversale formée par un côté inférieur (B), deux côtés (S1, S2) et deux côtés supérieurs (T1, T2) inclinés vers le haut de sorte à converger les uns vers les autres, comprenant les étapes suivantes :

faire avancer l'élément profilé vers une ligne de profilage qui comprend une unité de fonctionnement avec deux rouleaux façonnés (1), comportant chacun une partie conique (2) et une partie d'extrémité (3), concentriques par rapport à un axe de rotation (Z) ;
dans lequel la partie conique (2) est munie d'une section de sommet (23) où le diamètre du rouleau est minimal, dans lequel la partie d'extrémité (3) est raccordée à la partie conique (2) au niveau de la section de sommet (23), et dans lequel la partie d'extrémité (3) a un diamètre supérieur à la section de sommet (23) qui forme un épaulement depuis la surface de la première partie conique (2) ;
dans lequel les parties d'extrémité (3) sont disposées pour venir en contact avec les bords d'extrémité des côtés supérieurs (T1, T2) ;
dans lequel l'élément profilé avance vers l'unité de fonctionnement avec les côtés supérieurs placés en contact avec la partie conique (2) et avec les bords des côtés supérieurs (T1, T2) placés en contact avec les parties d'extrémité (3) ;
caractérisé en ce que les deux rouleaux façonnés (1) sont positionnés avec leurs axes de rotation (Z) alignés et avec les parties d'extrémité (3) se regardant l'une l'autre, et sont positionnés de sorte que les côtés supérieurs (T1, T2) de l'élément profilé sont en contact avec la partie conique (2).

10. Procédé selon la revendication 9, dans lequel l'unité de fonctionnement comprend un rouleau inférieur (11), disposé pour venir en contact avec le côté inférieur (B) de l'élément profilé, et dans lequel l'élément profilé avance vers l'unité de fonctionnement avec le côté inférieur (B) placé en contact avec le rouleau inférieur (11).

11. Procédé selon la revendication 9, dans lequel l'unité de fonctionnement comprend deux rouleaux latéraux (12, 13), disposés pour venir en contact avec

les côtés (S1, S2) de l'élément profilé, et dans lequel l'élément profilé avance vers l'unité de fonctionnement avec chaque côté (S1, S2) placé en contact avec un rouleau latéral (12, 13).

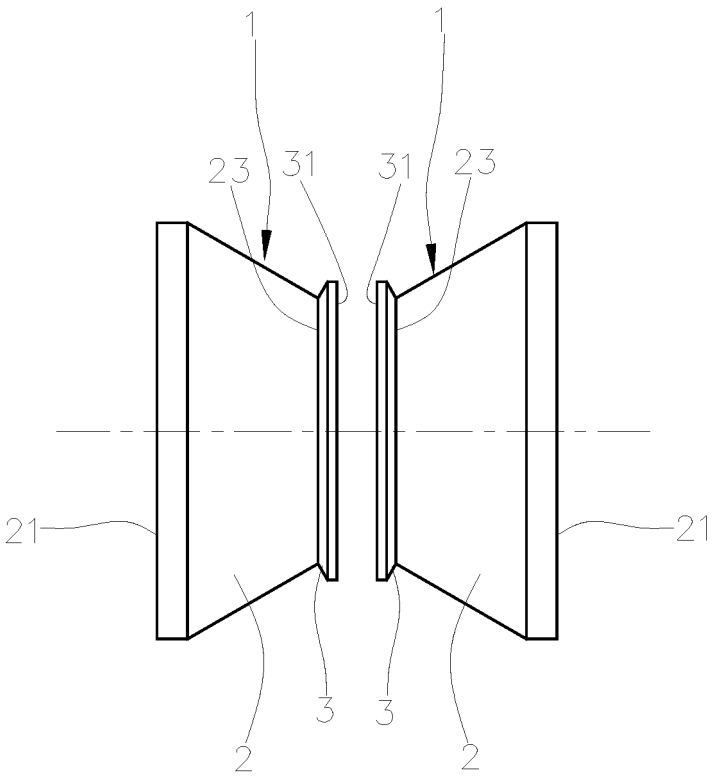

Fig.1

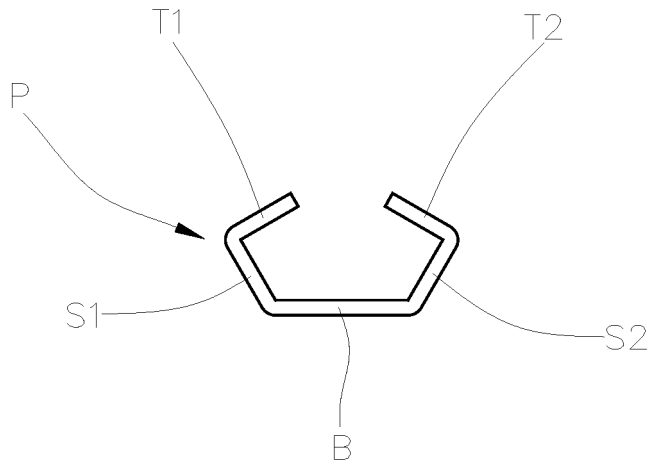

Fig.2

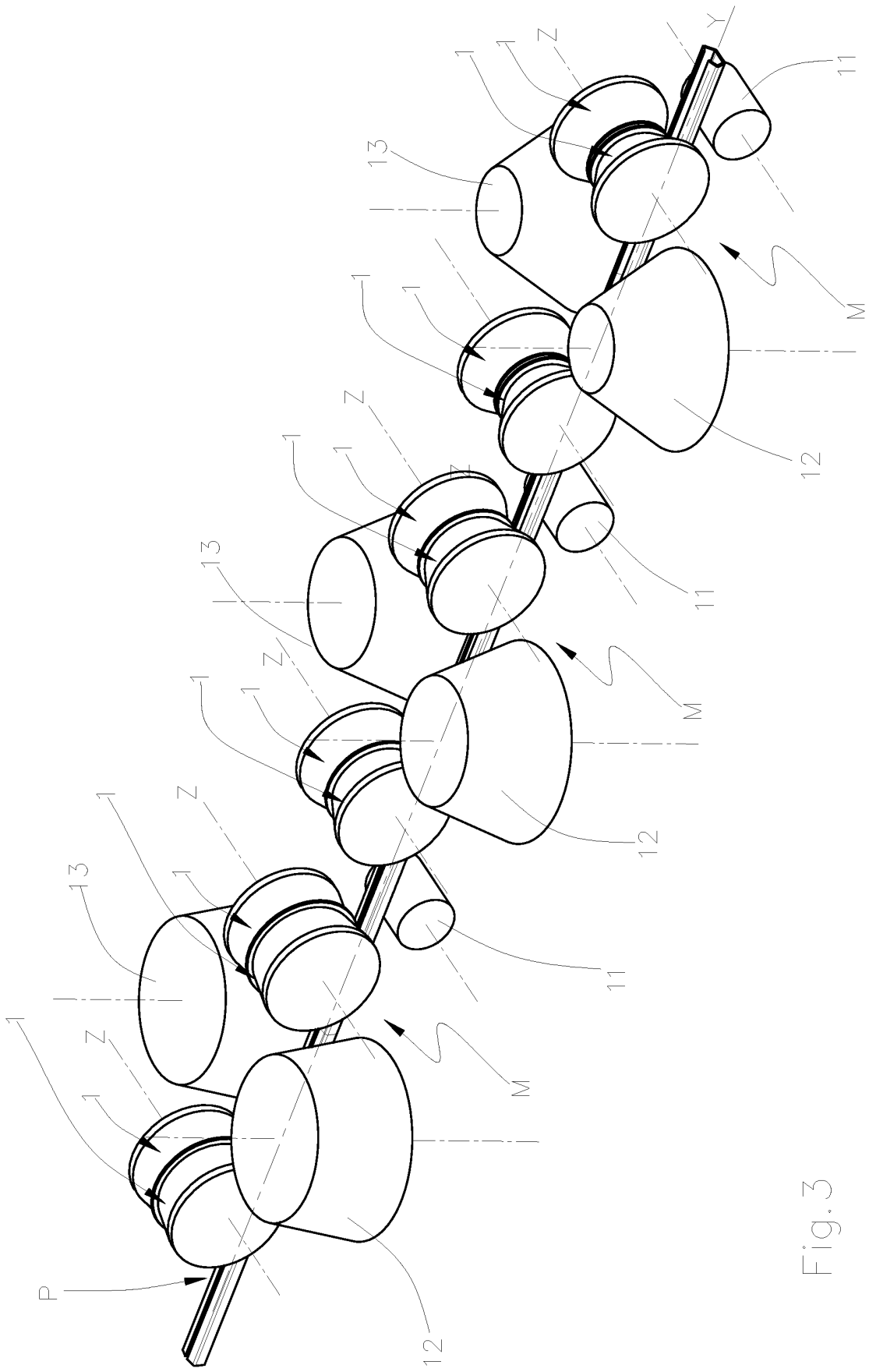

Fig.3

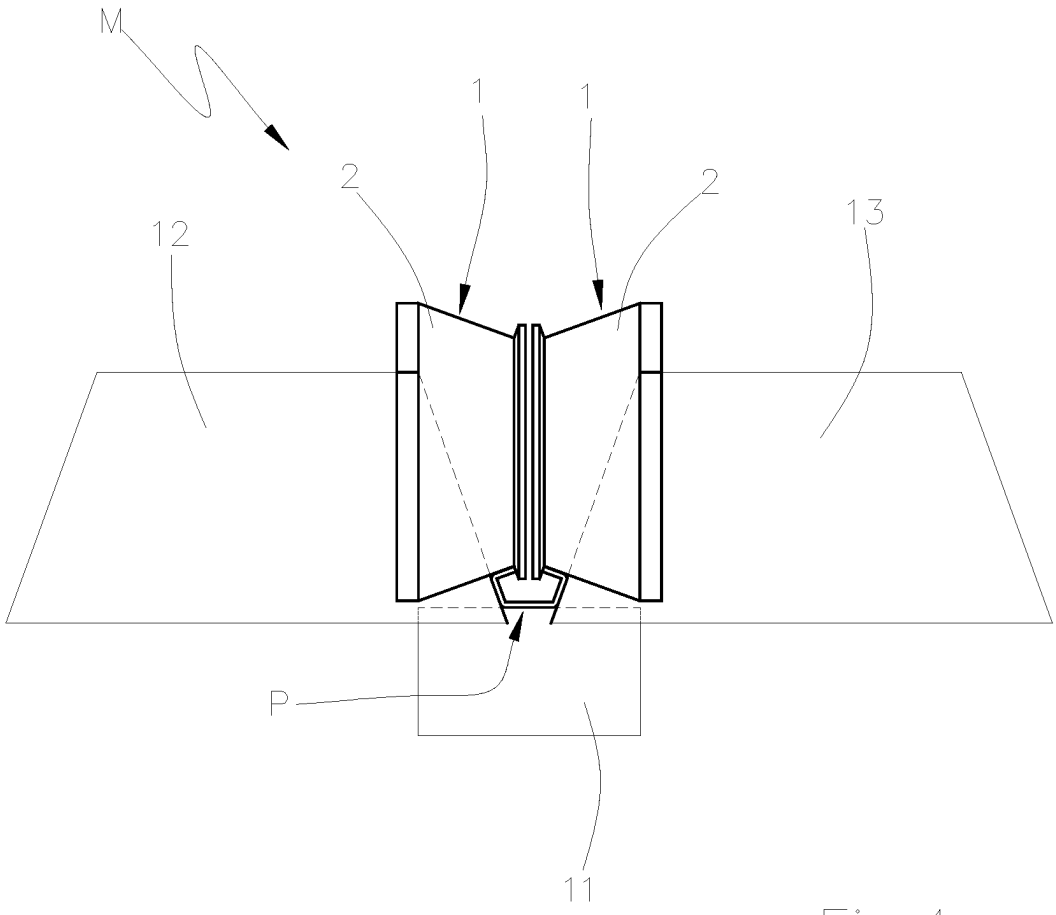

Fig.4

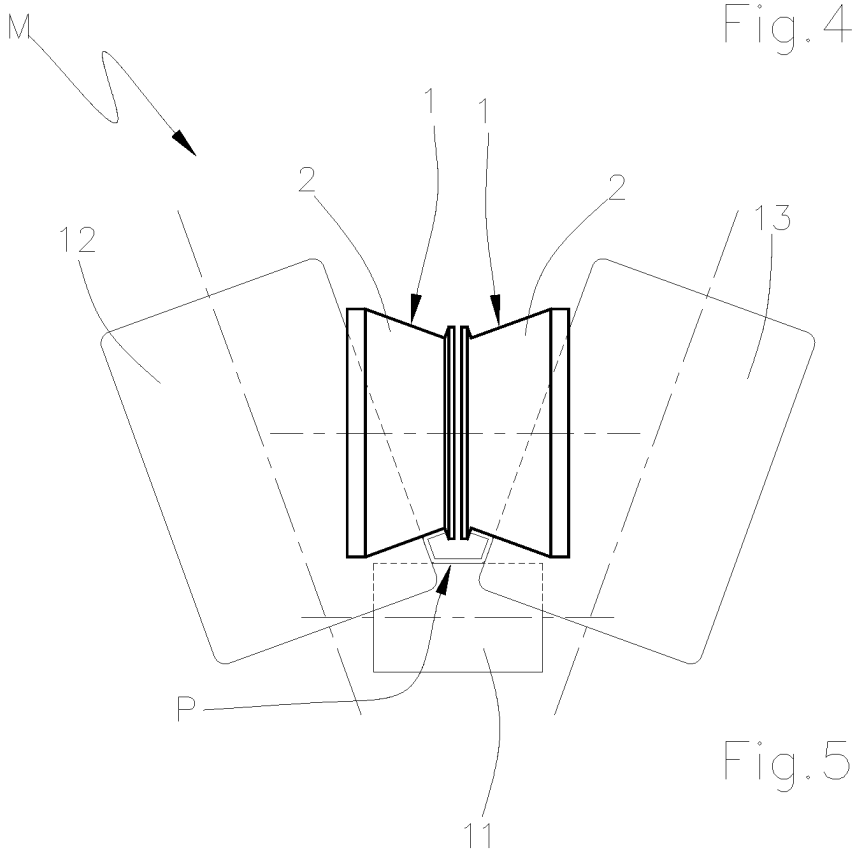

Fig.5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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