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(54) **RULER BAND GUIDE FOR THE LATERAL GUIDANCE OF A SHEET**

(57) The present invention relates to a ruler band guide, specifically featuring an inverted L-shape, for the lateral guidance of a metal sheet over a flat cutting matrix, as part of an operation of the cold cutting of the outline of said sheet, which may later be heat-stamped in a subsequent operation to adopt its final 3D configuration. This invention is also applicable when the subsequent process of its final 3D configuration is by cold forming.

In particular, the provision of one or more ruler band guides enables the efficient lateral guidance of the sheet to be cut, greatly reducing the chafing of the respective lateral edges of the sheet against the lateral guidance systems, and also reducing the detachment of material; ultimately, improving the quality of the final product obtained from this sheet for its subsequent transformation process.

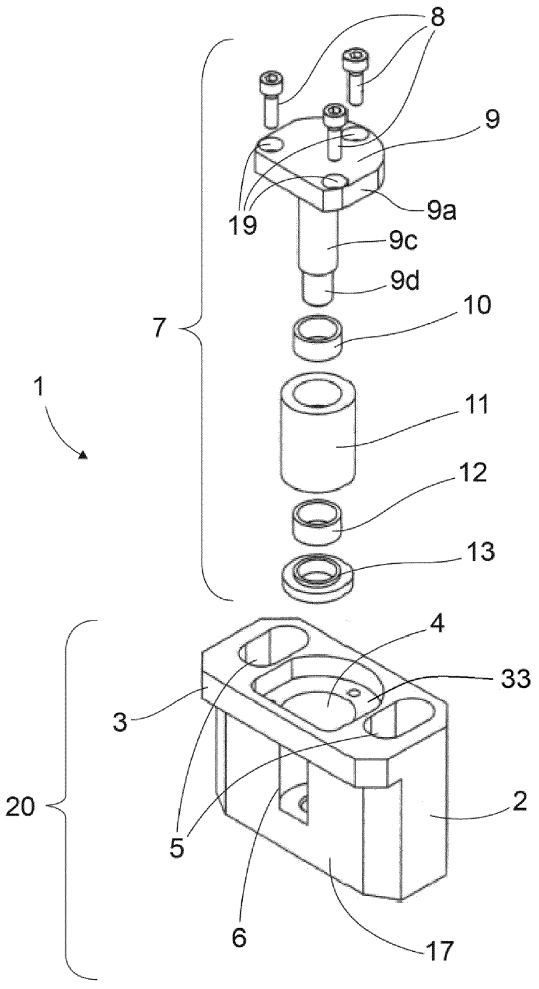

Fig. 1

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Description

[0001] The present invention relates to a ruler band guide, specifically featuring an inverted L-shape, for the lateral guidance of a metal sheet over a flat cutting matrix, as part of an operation of the cold cutting of the outline of said sheet, which may later be heat-stamped in a subsequent operation to adopt its final 3D configuration. This invention is also applicable when the subsequent process of its final 3D configuration is by cold forming (instead of heat-stamping).

[0002] In particular, the provision of one or more ruler band guides, preferably a minimum of one at each side of the metal sheet at the matrix inlet, enables the efficient lateral guidance of the sheet to be cut, greatly reducing the chafing of the respective lateral edges of the sheet against the lateral guidance systems, and also reducing the detachment of material; ultimately, improving the quality of the final product obtained from this sheet for its subsequent transformation process.

Background of the invention

[0003] Currently, there exist a number of systems or devices for the band guidance (that is, the lateral guidance) of a sheet at a cold forming station, such as for example inverted L-shaped ruler guides destined for the guidance of the sheets of metallic material stored on reels.

[0004] Said sheets, or sheets of metallic material are manufactured from a specific material to enable a subsequent heat-stamping process, such as usibor steel or ductibor steel, (both are high-strength micro-alloys of boron aluminium-silicon). Furthermore, said metal sheets are exteriorly coated with aluminium, due to the requirements of the subsequent heat-stamping process.

[0005] The lateral guidance of said sheets is of the greatest importance for the cold cutting process. Generally, said lateral guidance is carried out by a minimum of one point of support on each side, but preferably, to achieve greater quality, more than one guidance element is positioned at each side, for example two guidance elements on each side, each guidance element being located at a separate point along the feed of the sheet.

[0006] In general, these are guidance elements made to measure, in accordance with the requirements of each cutting station, and with no known standard.

[0007] This type of band guide device has the drawback that the excess friction of the material sliding laterally over any type of guide, in particular inverted L-shaped ruler guides, generates undesired detachments of the material which adversely affect the tool and make it dirty, as they adhere to all the elements forming the same and also to the final product, directly affecting the quality of the same.

[0008] In view of the above, there is clearly a need to provide an inverted L-shaped ruler band guide for the lateral guidance of a sheet capable of being cold cut and which travels over a flat matrix, or over an intermediate sheet or similar, said ruler guide enabling a substantial reduction in the friction against the respective lateral edges of the sheet, and at the same time also reducing the possible detachments of material.

Description of the invention

[0009] The object of the present invention is to provide a ruler band guide for the lateral guidance of a sheet capable of being transformed at a cold cutting station (specifically travelling over a flat cutting matrix) and subsequently transformed at a hot or cold stamping station, one or more ruler band guides being disposed on the flat matrix or similar element, resolving the aforementioned drawbacks and presenting the advantages described below.

[0010] In accordance with this objective, the present invention is characterised in that it provides a ruler band guide of the type described above, comprising:

- a body featuring at least one longitudinal orifice, and
- a roller assembly, which is installable within the longitudinal orifice,

and wherein:

- the body is formed by a lower portion and a projecting upper portion, disposed transversally with regard to the lower portion, thus forming an inverted L-shaped configuration,
- the roller assembly comprises a rotating drum featuring an external cylindrical surface, and
- the lower portion of the body presents an opening (6) at the frontal side (17) in order that part of the drum may protrude through said opening, in such a way that the contact between the external surface of the drum and a lateral base of the sheet is point contact or almost point contact, reducing to a minimum the friction between both items (ruler guide - sheet).

[0011] Thanks to this specific and advantageous configuration of the ruler band guide, a tangential contact is achieved between the rotating drum and the lateral base of the sheet, this entailing various advantages in comparison with the previous known devices, among which we highlight the following: the reduction of friction to a minimum, the consequential reduction in detachments of the material when both parts enter into mutual contact, an improvement in the quality of the final product and a reduction in preventive maintenance of the tools, and a reduction in the sheet production time.

[0012] The rotating drum may also be called a roller.

[0013] Preferably, the body of the ruler band guide further presents one or more secondary longitudinal orifices shaped like slotted holes (preferably two or more), disposed on both sides of the roller housing (that is, of the central longitudinal orifice), whose function is to enable

the passage of respective attachment elements to locate the ruler guide in its working position, in accordance with the design of the matrix.

[0014] In accordance with a first possible embodiment of the invention, the ruler band guide presents a single longitudinal orifice to receive the roller assembly, the orifice being disposed in a central position in the upper portion of the body, and further presents two secondary longitudinal orifices disposed respectively one on each side of the central longitudinal orifice.

[0015] And in accordance with a second possible embodiment of the invention, the ruler band guide presents two different longitudinal orifices disposed in a central position, each configured to receive two identical roller assemblies, and further presents two secondary longitudinal orifices, disposed respectively one on each side of the central orifices.

[0016] Preferably, the two aforementioned secondary orifices are through-holes, that is, they pass through the entire height of the body of the ruler band guide.

[0017] Also, preferably, the aforementioned secondary orifices present at least one upper part which is slotted.

[0018] Also, preferably, the attachment elements are respective attachment bolts, for example of the ALLEN DIN 912 type.

[0019] Preferably, the body of the ruler band guide is manufactured from a single compact piece of steel. However, other materials equivalent to steel might also be used, without affecting the essential nature of the present invention.

[0020] With regard to the roller assembly, in accordance with a preferred embodiment of the invention, the drum is hollow, that is, it presents an external cylindrical surface featuring an internal orifice. In accordance with this preferred embodiment, the roller assembly further presents a drum shaft which is disposed through the interior of the internal orifice of the drum, and is positioned in a fixed position at the upper portion of the body, resting superiorly thereon.

[0021] In accordance with this preferred embodiment, the internal surface of the drum presents two recessed portions, disposed at the upper part and at the lower part respectively, configured to receive therein respective bearings. That is, in addition to the drum, the roller assembly presents respective bearings each disposed in said recessed surfaces at the upper and lower part of the internal surface of the drum. Said bearings present a ring-shaped configuration with a reduced thickness, with an internal diameter approximately equal to the internal diameter of the internal surface of the drum. A number of bearings different from two may be foreseen, in order to perform the same function of enabling the drum to rotate freely around the drum shaft, which is in a fixed position.

[0022] The roller assembly, in accordance with this preferred embodiment, further presents a lower supporting washer disposed at the lowest part of the assembly, which presents a perimetral surface suited for the lower base of the drum to rest thereon. Said washer is installed resting upon the internal surface of the longitudinal orifice. This washer presents a ring-shaped body, with a vertically protruding annular upper portion disposed at the edge of the internal orifice of the ring, said upper annular portion being configured to be inserted into the lower part of the internal orifice of the drum.

[0023] With particular reference to the drum shaft, this presents an upper portion with a broadened surface and a lower portion in the form of a shaft, where the upper portion, which performs the function of a cover, presents a number of orifices for the passage of respective attachment bolts, and where the lower portion, in the shape of a shaft, comprises three different areas. The lowest area of these three areas presents a smaller diameter than the remainder, and the function thereof is to be inserted into the longitudinal orifice in the lower portion of the body of the ruler guide. The broadened surface presents a body with an outline of a greater width than that of the shaft.

[0024] In order that the lowest area of the shaft may remain inserted in the interior of the longitudinal orifice in the lower portion of the lower body, and in turn, that the washer may be installed resting on the internal surface of the longitudinal orifice, the central longitudinal orifice presents an upper part and a lower part of a smaller diameter, the lower orifice of a smaller diameter being configured for the passage of the lowest part of the shaft. The stepped circumferential surface, where the change in diameter between the upper part and the lower part occurs, is where the lower base of the washer rests.

[0025] In order that the broadened upper portion of the drum shaft may be perfectly positioned in the upper portion of the body, aligned with the central longitudinal orifice, the central orifice(s) is/are extended superiorly, forming a broadened perimetral strip with a diameter greater than that of the remainder of the central orifice, said perimetral strip presenting an external outline equal to the outline of said broadened portion of the drum shaft, to enable the perfect seating of the lower base of the broadened portion of the drum shaft on said perimetral strip.

[0026] With regard to the second embodiment of the invention (that is, when two central orifices are foreseen to receive respective roller assemblies), the lower portion of the body presents at its lower base a channelled section for the installation of a cotter pin, whose function is to guide the entire assembly, ensuring a movement perpendicular to the direction of feed of the sheet, for the correct adjustment of the width of the band.

[0027] Preferably, the drum is manufactured from heat-treated steel material, to prevent wear due to friction.

Brief description of the figures

[0028] For the better understanding of the above, a set of drawings is attached wherein, schematically and solely

as a non-limitative example, a practical embodiment is portrayed.

Figure 1 is an exploded perspective view of a ruler band guide, portraying the different components, for a first embodiment of the invention.

Figure 2 is an exploded perspective view of a ruler band guide, for the second embodiment of the invention.

Figure 3 is a view from above of the assembled ruler band guide assembly of the present invention, for the first embodiment.

Figure 4 is a longitudinal cross-sectional view along A-A' of the assembled ruler band guide assembly of the present invention, for the first embodiment.

Figure 5 is a frontal view of the assembled ruler band guide assembly of the present invention, revealing its internal parts, for the first embodiment.

Figure 6 is a view from above of the assembled ruler band guide assembly of the present invention, for the second embodiment.

Figure 7 is a longitudinal cross-sectional view along B-B' of the assembled ruler band guide assembly of the present invention, for the second embodiment.

Figure 8 is a frontal view of the assembled ruler band guide assembly of the present invention, revealing its internal parts, for the second embodiment.

Figure 9 is a perspective view of several ruler band guides as per the first embodiment, installed fixedly upon one of the two sides of the flat matrix of a cold stamping station, where a sheet travels along said flat matrix.

Description of a preferred embodiment

[0029] An embodiment of the ruler band guide (1, 1') is described below, with reference to the attached figures 1 to 9.

[0030] The ruler band guide (1, 1') of the present invention is configured to be disposed fixedly or movably on the flat matrix (21) of a cold cutting station, the function thereof being the lateral guidance of a sheet (22) capable of being cut and which travels along said flat matrix (21).

[0031] At least two ruler band guides (1, 1') are disposed, one on each side, preferably facing each other, for the lateral guidance of a sheet (22), although more than one ruler band guide (1, 1') may be installed per side. In figure 9, one of the two sides may be observed, where two ruler band guides of the first type (1) have been foreseen, installed on the left-hand side of the matrix (21), and a certain distance apart. On the opposite side (right-hand side) of the cold cutting station (not portrayed), two ruler band guides (1) would also be located, facing those on the left-hand side. In this figure 9 it may be clearly seen how the contact between the left-hand lateral base of the sheet (22) and the two ruler band guides (1) occurs only tangentially (at the vertical line indicated by the letter "T" in the detail).

[0032] In general, each ruler band guide (1, 1') includes:

- a body (20, 20'), featuring at least one longitudinal orifice (4), and
- a roller assembly (7), which is installable within the longitudinal orifice (4), where:
  - the body (20, 20') is formed by a lower portion (2, 2') and a projecting upper portion (3, 3'), disposed transversally with regard to the lower portion (2, 2'), thus forming an inverted L-shaped configuration (preferably, the lower portion (2, 2') and the upper portion (3, 3') will form a single machined item),
  - the roller assembly (7) comprises a rotating drum (11) featuring an external cylindrical surface, and
  - the lower portion (2, 2') of the body (20, 20') presents an opening (6) at the frontal side (17) in order that part of the drum (11) may protrude through said opening (6), in such a way that the contact between the external surface of the drum (11) and the vertical surface of the lateral base of the sheet (32) is point contact or almost point contact, reducing to a minimum the friction between both items (ruler guide - sheet).

[0033] As may be observed in figures 1, 3, 4 and 5, the first embodiment of the ruler band guide (1) presents a single longitudinal orifice (4) located in a central position of the upper portion (3), which is sized to receive therein a roller assembly (7). At the sides of the central longitudinal orifice (4), it presents respective secondary longitudinal orifices (5), one on each side.

[0034] As may be observed in figures 2, 6, 7 and 8, the second embodiment of the ruler band guide (1') presents, conversely, two different longitudinal orifices (4) disposed in a central position and a certain distance apart, each of these configured to receive a roller assembly (7). In this case it also presents two secondary longitudinal orifices (5), disposed respectively one on each side of the central orifices (4).

[0035] As required for each particular case, a type of ruler band guide according to the first embodiment (1) or to the second embodiment (1') will be chosen.

[0036] With reference to the preferred embodiment of the roller assembly (7) portrayed in an exploded view in figures 1 and 2, it should be stressed that, in addition to the rotating drum (11)featuring a hollow cylindrical body,

it further presents a drum shaft (9), which is disposed mounted within the internal orifice of the drum (11) and is positioned resting on the upper portion of the body, and affixed to said portion by means of the attachment of a number of bolts (for example, of the Allen DIN-912 type)(8). In addition to the roller assembly (7) it presents two bearings (10, 12) and a lower supporting washer (13) at the lower part of the assembly (7).

[0037] As portrayed in figures 4 and 7, the internal surface of the drum (11) presents two recessed portions, disposed at the upper part and at the lower part respectively, configured to house therein respective bearings (10, 12).

[0038] As may be seen in figures 1 and 2, said bearings (10, 12) present a ring-shaped configuration with a reduced thickness, with an internal diameter slightly greater than the diameter of the drum shaft (9) and an external diameter slightly smaller than the diameter of the recessed portion of the internal surface of the drum (11). Said bearings (10, 12) present a configuration, and are positioned within the body of the ruler guide in such a way as to enable the drum (11) to rotate freely around the drum shaft (9), which is in a fixed position.

[0039] With regard to the lower supporting washer (13), this presents a ring-shaped body, with a vertically protruding annular upper portion disposed at the edge of the internal orifice of the ring, said upper annular portion being configured to be inserted into the lower part of the internal orifice of the drum (11). The external diameter of the washer (13) is slightly smaller than the diameter of the central longitudinal orifice (4) in order that the annular lower base of the washer (13) may be mounted resting upon the lower base of the central longitudinal orifice (4); see figure 4.

[0040] With particular reference to the drum shaft (9), disposed at the upper part of the roller assembly (7), in this preferred case it is made from a single piece, lathed and machined, and is constituted by an upper portion (9a) with a broadened surface, and a lower portion in the form of a shaft (9b, 9c, 9d). The upper portion (9a) features three orifices (19) for the passage of respective attachment bolts (8). The lower portion (9b, 9c, 9d) comprises three different areas (see figures 4 and 7); the lowest area (9d) presents a smaller diameter than the others, and the function thereof is to be inserted into the lower part of the longitudinal orifice (4). The central longitudinal orifice (4) presents an upper part and a lower part of a smaller diameter, this lower part of a smaller diameter being configured for the passage of the lowest portion of the shaft (9d). The upper broadened surface (9a) presents a body with an outline of a greater width than that of the lower portion in the form of a shaft (9b, 9c, 9d). In this specific example, the upper broadened portion (9a) presents a body with a certain thickness and a transversal cross-section formed by a semi-circular frontal surface which extends into an approximately rectangular rear surface. In this case, the rear corners are chamfered; see figures 3 and 6.

[0041] In order that the broadened upper portion (9a) of the drum shaft (9) may be perfectly positioned on the upper portion (3) and aligned with the central longitudinal orifice (4), the/each central orifice (4) is extended superiorly, forming a broadened perimetral strip (33) with a diameter greater than that of the remainder of the central orifice (see figures 1 and 2), said perimetral strip presenting an external outline equal to the outline of said broadened portion of the drum shaft (9a), to ensure the perfect seating of the lower base of the broadened portion of the drum shaft on said perimetral strip (33); see figure 4 or 7.

[0042] As may be seen in figures 5 and 8, the two secondary orifices (5) are through-holes; that is, that is, they pass through the entire height of the lower portion (2, 2') of the ruler band guide (1, 1') for the insertion of a number of attachment bolts (18) portrayed in figures 3 and 6. In this particular case, the aforementioned secondary orifices (5) present at least their upper surface slotted; see figures 3 and 6.

[0043] With regard to the second embodiment of the invention (that is, where two central orifices (4) are foreseen), the lower portion (2') of the body presents at its lower base (35) a channelled section (14), see figures 2 and 8; and the ruler guide further includes an element such as a cotter pin, whose function is to act as a guide (15), it being configured to be inserted into said channelled section (14).

[0044] In spite of the fact that reference has been made to a specific embodiment of the invention, it is evident to a person skilled in the art that the ruler band guide described is susceptible to numerous variations and modifications, and that all the details mentioned may be replaced by other technically equivalent elements without straying from the scope of protection defined by the attached claims.

Claims

1. A ruler band guide (1, 1') for the lateral guidance of a metal sheet (22) capable of being cut on a cold cutting matrix (21), the sheet (22) travelling over said matrix (21), which is flat, said sheet being subsequently capable of being transformed at a hot or cold stamping station, one or more ruler band guides (1, 1') being fixedly or movably disposed on the cutting matrix (21), **characterised in that** the ruler band guide (1, 1') comprises:

    - a body (20, 20') featuring at least one longitudinal orifice (4), and
    - a roller assembly (7), which is installable within the longitudinal orifice (4),

    and wherein:

    - the body (20, 20') is formed by a lower portion (2, 2') and a projecting upper portion (3, 3'), disposed transversally with regard

to the lower portion (2, 2'), thus forming an inverted L-shaped configuration,
- the roller assembly (7) comprises a rotating drum (11) featuring an external cylindrical surface, and
- the lower portion of the body presents an opening (6) at the frontal side (17) in order that part of the drum may protrude through said opening, in such a way that the contact between the external surface of the drum and a lateral base of the sheet is point contact or almost point contact, reducing to a minimum the friction between both items (ruler guide - sheet).

2. The ruler band guide (1, 1'), according to claim 1, wherein the body further comprises one or more secondary longitudinal orifice(s) (5) disposed on one or both sides of the longitudinal orifice (4), configured to enable the passage of respective attachment elements to fix the ruler guide (1, 1') to the flat matrix (21) or similar element.

3. The ruler band guide (1, 1'), according to claim 1 or 2, wherein the longitudinal orifice (4) is disposed in a central position of the upper portion (3, 3'), and wherein the body (20, 20') presents two different secondary longitudinal orifices (5) disposed respectively one on each side of the longitudinal orifice (4).

4. The ruler band guide (1, 1'), according to any one of claims 1 to 3, wherein the secondary longitudinal orifice(s) (5) are through-holes.

5. The ruler band guide (1, 1'), according to any one of claims 1 to 4, wherein the secondary longitudinal orifice(s) (5) present(s) at least the upper part slotted.

6. The ruler band guide (1, 1'), according to any one of claims 1 to 5, wherein the body (20, 20') presents two different longitudinal orifices (4), each disposed for the passage of a different roller assembly (7).

7. The ruler band guide (1, 1'), according to any one of claims 1 to 6, wherein the body (20, 20') is manufactured from a single piece of steel.

8. The ruler band guide (1, 1'), according to any one of claims 1 to 7, wherein the attachment means are attachment bolts.

9. The ruler band guide (1, 1'), according to any one of claims 1 to 8, wherein the roller assembly (7) comprises, in addition to the rotating drum (11), respective bearings (10) on either side of the drum (11), a lower supporting washer (13) disposed at the lowest point of the assembly (7), and a drum shaft (9) disposed at the uppermost part of the assembly (7).

10. The ruler band guide (1, 1'), according to any one of claims 1 to 9, wherein the lower portion (2, 2') of the body (20, 20') presents at its lower base (35) a channelled section (14), and the ruler guide (1, 1') further presents a guiding element (15) configured to be inserted into said channelled section (14).

11. The ruler band guide (1, 1'), according to claim 9, wherein the drum shaft (9) presents a broadened upper portion (9a) and a lower portion in the form of a shaft (9b, 9c, 9d), where the upper portion (9a) presents a number of orifices (19) for the passage of a number of attachment bolts (8), and where the lower portion (9b, 9c, 9d) comprises a lowest portion of a smaller diameter (9d) than the remainder of the lower portion (9b, 9c).

12. The ruler band guide (1, 1'), according to claim 1, wherein the drum (11) presents a cylindrical configuration with an internal orifice featuring an internal surface of a smaller diameter than that of the external surface of the bearings (10, 12) and also smaller than that of the external surface of the drum shaft (9c).

13. The ruler band guide (1, 1'), according to claims 1 and 11, wherein the central orifice(s) (4) present(s) an upper orifice and a lower orifice of a smaller diameter, the lower orifice of a smaller diameter being configured for the passage of the lowest portion of the shaft (9d).

14. The ruler band guide (1, 1'), according to claim 9, whereon the lower supporting washer (13) presents a ring-shaped body, with an annular upper portion disposed at the edge of the internal orifice of the ring, said upper annular portion being configured to be inserted into the lower part of the internal orifice of the drum (11).

15. The ruler band guide (1, 1'), according to claim 1, wherein the central orifice(s) (4) extend(s) superiorly, so forming a broadened perimetral strip with a diameter greater than that of the remainder of the central orifice, said perimetral strip presenting an external outline equal to the outline of said broadened portion of the drum shaft, to enable the perfect seating of the lower base of the broadened portion of the drum shaft on said perimetral strip.

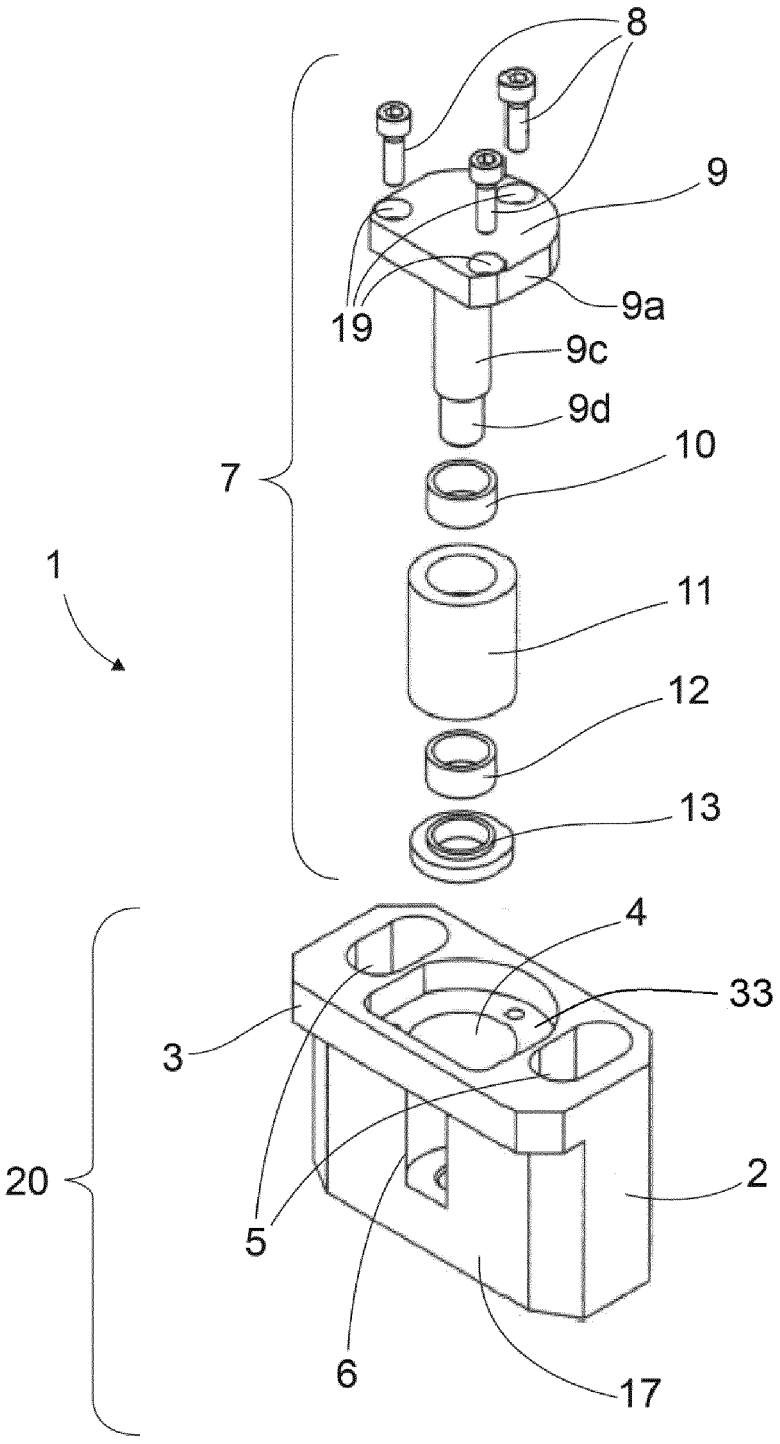

Fig. 1

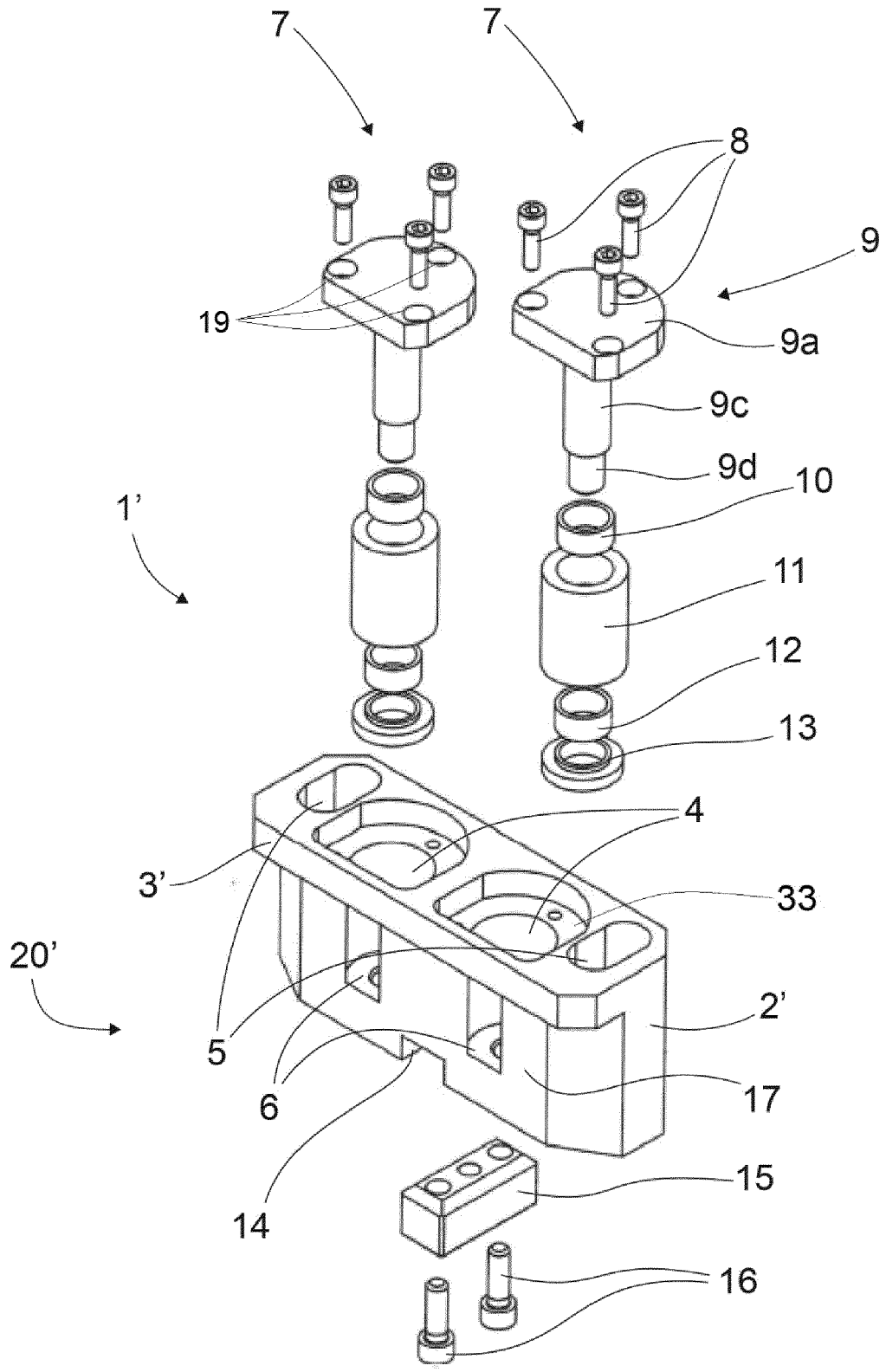

Fig. 2

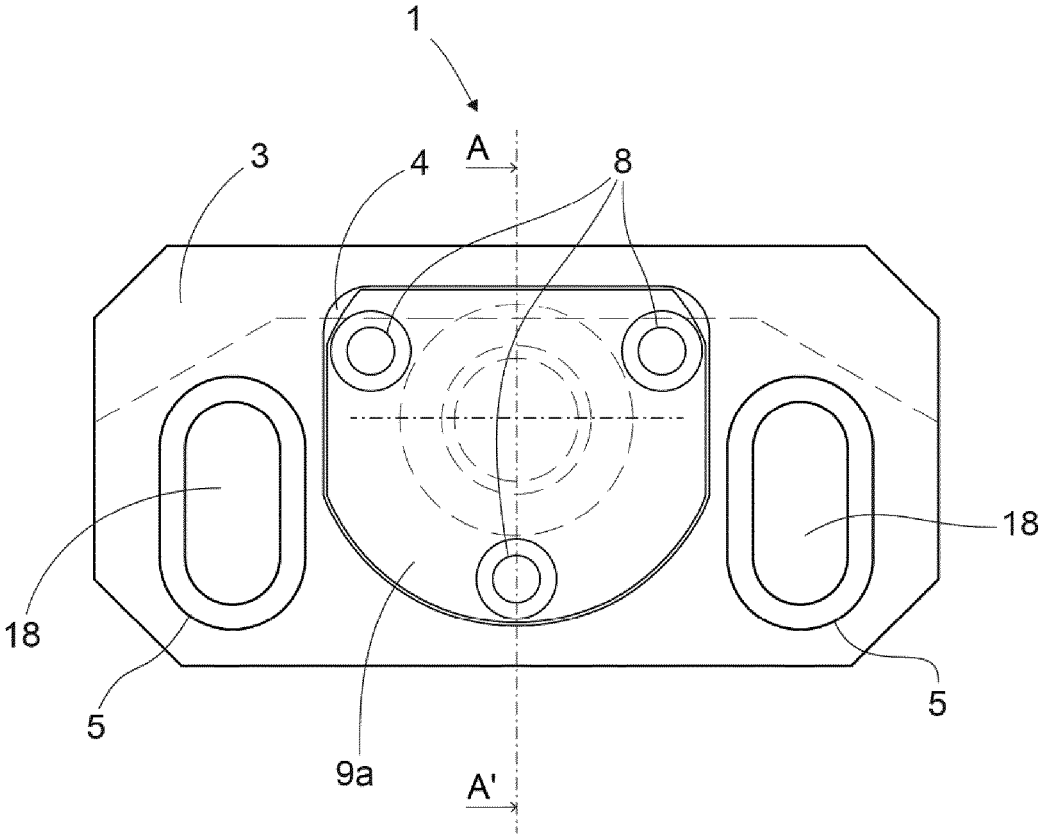

Fig. 3

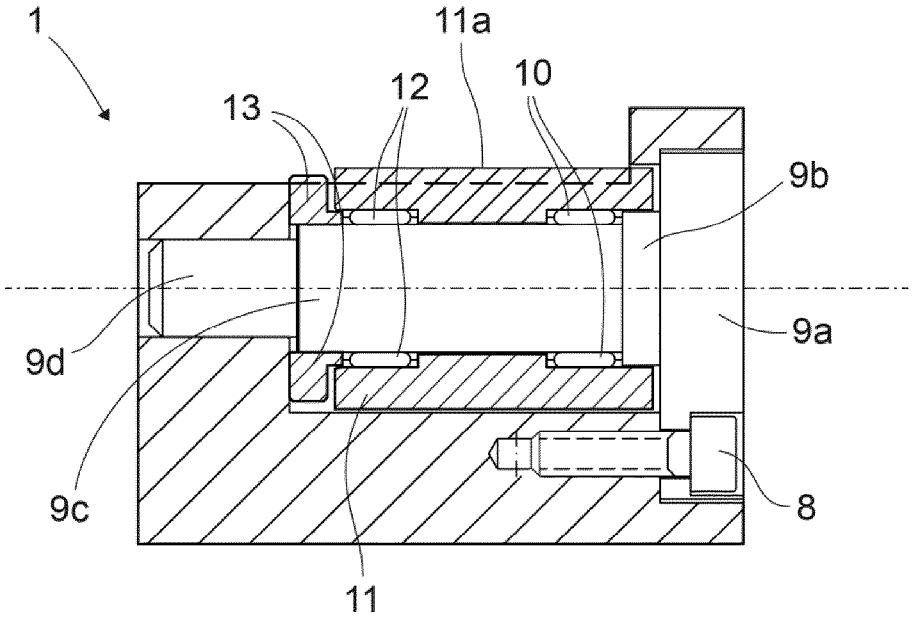

Fig. 4

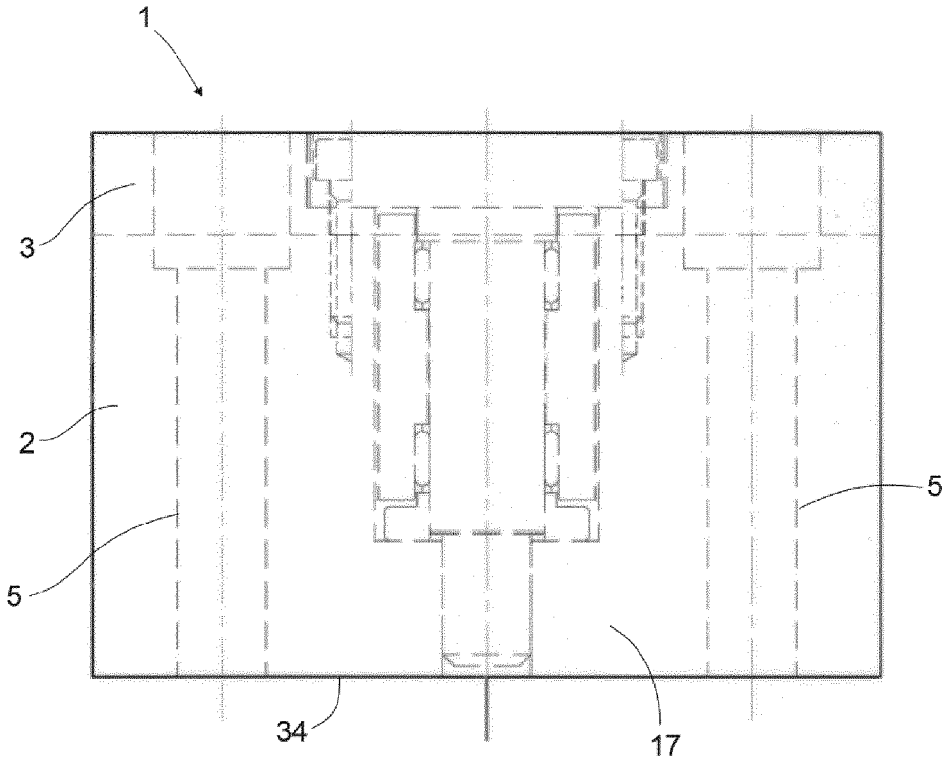

Fig. 5

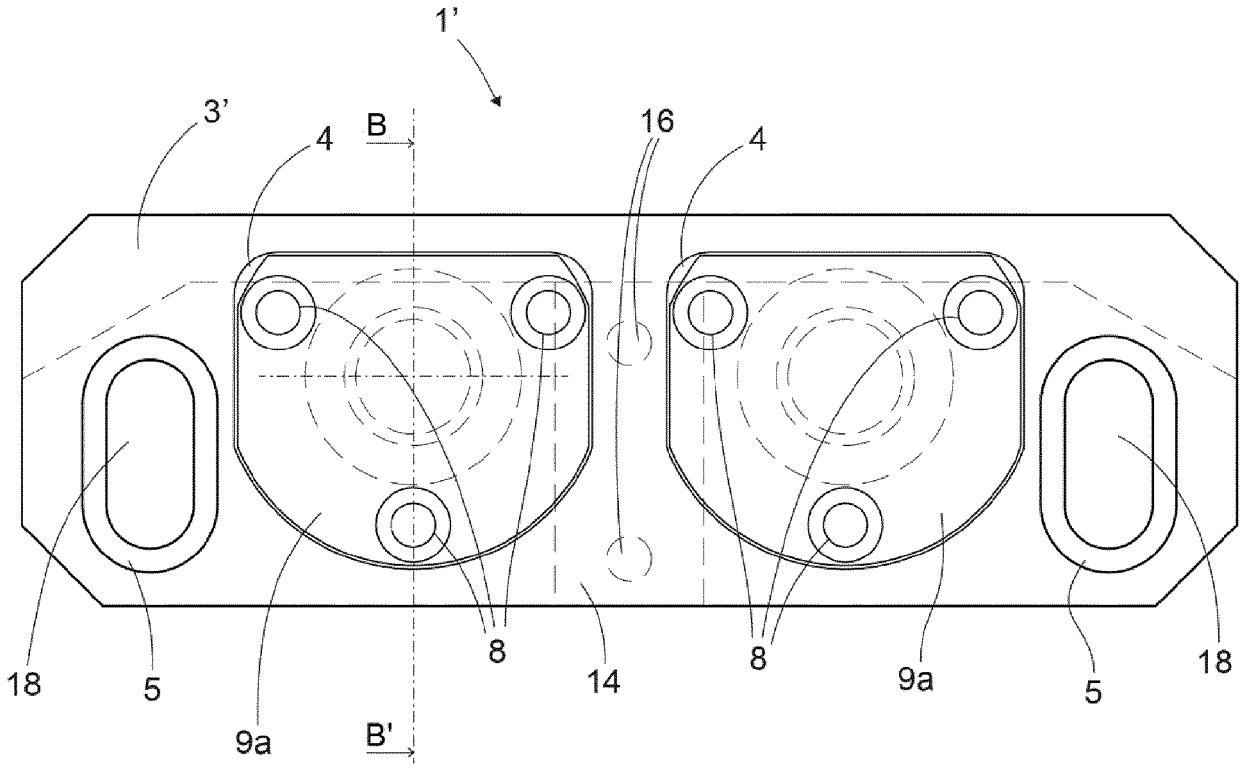

Fig. 6

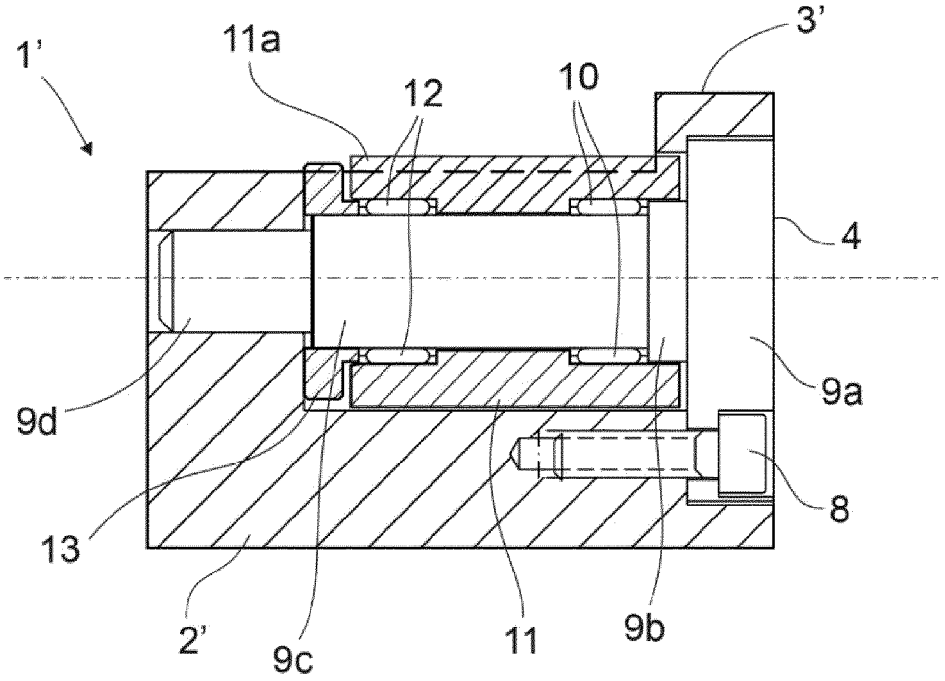

Fig. 7

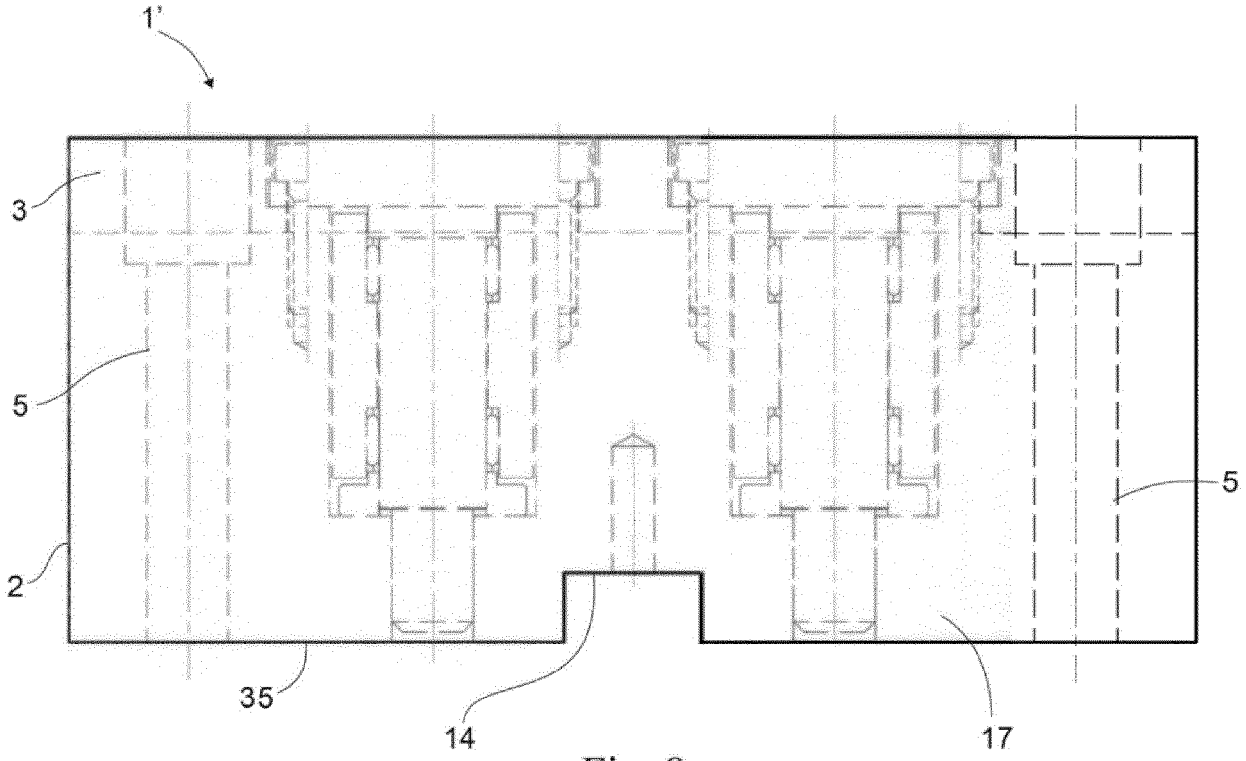

Fig. 8

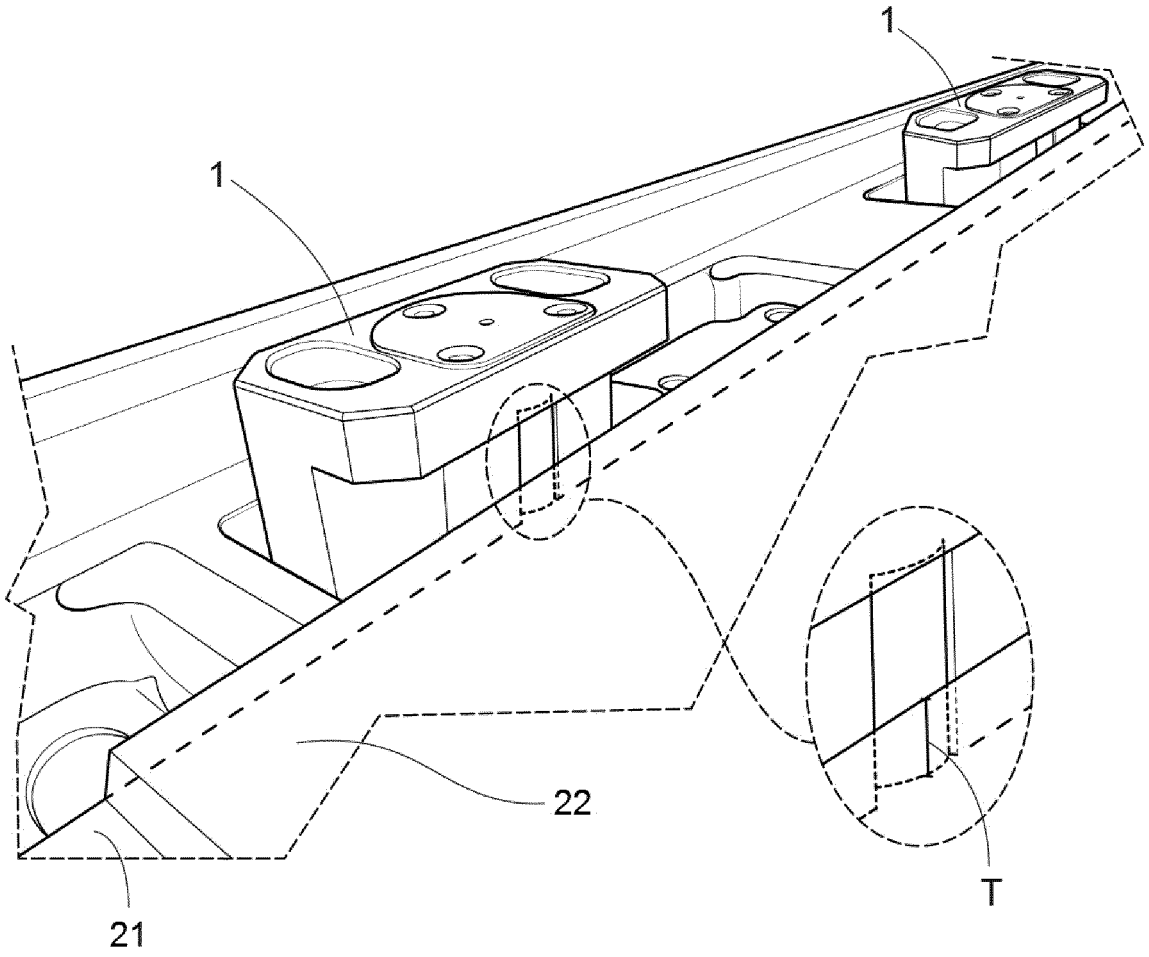

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 19 18 6508

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 204 220 636 U (INNER MONGOLIA ZHONGTUO ALUMINIUM CO LTD) 25 March 2015 (2015-03-25) * figures 1,4 * -----	1-15	INV. B21D43/02 B26D7/06
Y	US 2013/180308 A1 (BREEN SCOTT M [US] ET AL) 18 July 2013 (2013-07-18) * figures 39-47 * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B21D
B21L
B21C
B26D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 November 2019	Wimmer, Martin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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20-11-2019

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