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(54) EDGE-BANDING MACHINE PROVIDED WITH A MILLING DEVICE AND OPERATION METHOD OF SAID EDGE-BANDING MACHINE

KANTENANLEIMMASCHINE MIT EINER FRÄSVORRICHTUNG UND BETRIEBSVERFAHREN DER KANTENANLEIMMASCHINE

MACHINE DE PLAQUAGE DE CHANTS MUNIE D'UN DISPOSITIF DE FRAISAGE ET PROCÉDÉ DE FONCTIONNEMENT D'UNE TELLE MACHINE DE PLAQUAGE DE CHANTS

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Description

Field of application

[0001] The present invention relates to an edge-banding machine, according to the preamble of claim 1, provided with a milling device and an operation method of said edge-banding machine. Such an edge-banding machine and process obtained by said machine are known from the document DE 3732810 C1.

[0002] The edge-banding machine of the invention is intended to be used to carry out the application of cladding edges on panels made of different materials such as wood, chipboard, plywood, MDF, etc.

[0003] In particular, the subject machine is adapted to perform the trimming of the cladding edges by linearly cutting the ends of such edges, and to perform the rounding of the cladding edges by carrying out an angular joining and rounding process at the ends of the cladding edges to seamlessly join the orthogonal sides of the panels.

[0004] The machine the invention is advantageously adapted to apply a cladding edge to one side of the panel at each passage of the panel through the edge-banding machine.

Background art

[0005] In the wood processing industry, in particular in the furniture industry, it is common practice to refine the panels by the application of edging strips that form the cladding edges of the panels and which are then processed by rounding the edges thereof according to the desired profiles. For this purpose, edge-banding machines have been introduced on the market which are adapted to apply the cladding edges on the sides of the panels and are provided with operating units adapted to perform the necessary finishing operations of the same edges.

[0006] In particular, edge-banding machines of the unilateral type are known, which are adapted to apply an edge to one side of the panel at each passage of the panel through the edge-banding machine.

[0007] More in detail, edge-banding machines of the known type comprise a support frame provided with a sliding guide extending between an inlet port and an outlet port, and driving means (obtained for example with a sliding belt) adapted to move the panels to advance along the sliding guide from the inlet port to the outlet port.

[0008] The edge-banding machine further comprises a storage station adapted to accommodate an edging tape to be applied to the panels and which will form the cladding edge. More specifically, such storage station comprises a rotatable support which carries the wrapped edging tape and is operable to rotate to unwrap the edging tape along the sliding lane to apply the edging tape to the side of the panel.

[0009] The edge-banding machine comprises a grinding unit placed along the sliding lane downstream of the inlet port and provided with one or more cutters adapted to act on the side of the panel to eliminate the irregularities thereof.

[0010] The edge-banding machine also comprises a gluing unit located downstream of the grinding group and adapted to deposit a layer of glue (e.g. heat-melting type) on the side of the panel and compress, by means of two or more rollers, the edging tape on the layer of glue for gluing the tape to the side of the panel. The grinding unit is provided with a cutting tool adapted to cut the edging tape at the rear end of the panel.

[0011] The edging tape glued to the panel using the above gluing unit has a greater length than the panel and a greater width than the thickness of the same panel, so that the edging tape protrudes with respect to the ends and the longitudinal sides of the side of the panel.

[0012] The edge-banding machine further comprises an end milling unit arranged downstream of the gluing unit and provided with a circular saw adapted to cut the portions of the edging tape that protrude beyond the ends of the side of the panel, linearly cutting the edging tape ends substantially flush with the ends of the side of the panel.

[0013] The edge-banding machine also comprises a trimming unit arranged downstream of the end milling unit and adapted to cut the portions of the edging tape that protrude beyond the longitudinal sides of the side of the panel.

[0014] The edge-banding machine also comprises a rounding unit arranged downstream of the trimming unit and provided with a cutter adapted to round the ends of the edging tape for seamlessly connecting the outer surface of the edging tape with the adjacent orthogonal side of the panel.

[0015] In particular, the cutter of the rounding unit is peripherally provided with multiple cutting teeth, each of which has an arched profile with a radius of curvature equal to the thickness of the edging tape for properly joining the two sides at 90 degrees of the panel.

[0016] Operationally, with reference to unilateral edge-banding machines, it is necessary to perform a passage of the panel through the machine operating units for each side of the panel.

[0017] More in detail, in each passage, an operator must introduce the panel into the edge-banding machine at the inlet port of the latter, in such a way that the driving means of the edge-banding machine move the panel to the operating units arranged along the sliding lane up to an outlet port.

[0018] In the first two passages of the panel through the edge-banding machine, the cladding edges are applied on the two longitudinal sides of the panel mutually parallel to and opposite.

[0019] During these first two passages, the end milling unit is actuated to cut in a rectilinear manner the ends of the edging tape flush with the ends of the corresponding side of the panel, while the rounding unit is disabled.

[0020] In the last two passages of the panel through the edge-banding machine, the cladding edges are applied on the two end faces of the panel orthogonal to said longitudinal sides of the same panel.

[0021] During these last two passages, the end milling unit is disabled while the rounding unit is actuated to round the ends of the edging tape applied to the end side of the panel, in such a way as to seamlessly join the outer surface of such an edging tape with the outer surface of the edging tape applied to the adjacent longitudinal side of the panel.

[0022] The edge-banding machines of known type briefly described above have proved to be not free from drawbacks in practice.

[0023] A first drawback of the above edge-banding machines of known type is due to the fact of necessarily comprising two distinct operating units (the end milling unit and the rounding unit) for working the ends of the edges during the first two passages and during the last two passages of the panel in the edge-banding machine, with consequent high cost and considerable dimensions of the same edge-banding machines.

[0024] A further drawback of the above edge-banding machines of known type is due to the fact that the circular saw of the end milling unit has a relatively large diameter (of the order of tens of centimeters) and, therefore, when it is driven in rotation (at speeds of the order of ten thousand revolutions per minute), the saw edge moves at a very high tangential speed, thereby generating a strong and high-pitched noise.

[0025] A further drawback of the above edge-banding machines of known type is due to the fact that the circular saw of the end milling unit, when it cuts the edging tape, produces numerous scraps that are projected into the air, with consequent danger for the operators, i.e. requiring the installation of protective panels with a consequent increase of costs of the edge-banding machine.

Disclosure of the invention

[0026] In this situation, the problem underlying the present invention is therefore that of overcoming the drawbacks associated with known solutions by providing a milling device for an edge-banding machine which is able to perform both end milling operations and rounding operations of the cladding edges applied to the panel.

[0027] Another object of the present invention is to provide a milling device for an edge-banding machine which allows implementing edge-banding machines having a reduced cost.

[0028] Another object of the present invention is to provide a milling device for an edge-banding machine which allows implementing edge-banding machines having contained overall dimensions.

[0029] Another object of the present invention is to provide a milling device for an edge-banding machine which allows implementing relatively noise-free edge-banding machines.

[0030] Another object of the present invention is to provide a milling device for an edge-banding machine which is constructively simple and cost-effective to implement.

[0031] Another object of the present invention is to provide a milling device for an edge-banding machine which is operatively safe and reliable.

Brief description of the drawings

[0032] The technical features of the invention, according to the aforesaid aims, can clearly be seen in the content of the claims below, and its advantages will become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which illustrate a preferred embodiment, which is purely exemplary and not limiting, in which:

- figure 1 shows a perspective view of an example of edge-banding machine in which the milling device is intended to be used;
- figure 2 shows a lateral view of the edge-banding machine shown in figure 1;
- figure 3 shows a perspective view of the milling device object of the present invention;
- figure 4 shows a top plan view of the milling device object of the present invention;
- figure 5 shows a perspective view of a detail of the milling device shown in figures 3 and 4, relating to a milling head of the milling device itself;
- figure 6 shows a detail of the milling head of the milling device, relative to a milling tool, according to a first embodiment of the present invention;
- figure 7 shows a plan view of the milling tool shown in figure 6;
- figure 8 shows a sectional view of the milling tool shown in figure 7 along line VIII - VIII in figure 7;
- figure 9 shows a detail of the milling tool shown in figure 6 relative to a cutting profile of the milling tool itself;
- figure 10 shows the milling tool arranged in a retracted position for performing an end milling operation of the cladding edge of the panel;
- figure 11 shows the milling tool arranged in an advanced position for performing a rounding operation of the cladding edge of the panel;
- figure 12 shows a portion of the milling tool in retracted position during the end milling operation of the cladding edge of the panel;
- figure 13 shows a portion of the milling tool in retracted advanced position during the rounding operation of the cladding edge of the panel;
- figure 14 shows a detail of the milling head of the milling device, relative to the milling tool, according to a second embodiment of the present invention;
- figure 15 shows a plan view of the milling tool shown in figure 14;
- figure 16 shows a sectional view of the milling tool shown in figure 15 along line XVI - XVI in figure 15;

- figure 17 shows a detail of the milling tool shown in figure 14 relative to the cutting profile of such a milling tool.

Detailed description of an example of a preferred embodiment

[0033] With reference to the accompanying drawings, reference numeral 1 indicates as a whole a milling device object of the present invention.

[0034] The milling device 1 of the invention is intended to be advantageously mounted on an edge-banding machine 100 adapted to carry out the application of cladding edges on panels made, for example, of wood, chipboard, plywood, MDF (Medium-density fiberboard), etc.

[0035] In particular, each panel P is substantially shaped as a parallelepiped and has two major faces, generally coated, parallel and opposite each other and peripherally connected together by four sides L in twos parallel which define the thickness of panel P itself.

[0036] Each side L of panel P extends longitudinally between a front end edge and a rear end edge and is delimited in width by two longitudinal sides preferably parallel to each other.

[0037] The edge-banding machine 100 is adapted to apply a cladding edge B (e.g. PVC, ABS, melamine, wood, Formica, aluminum, etc.) on one or more sides L of panel P.

[0038] According to the embodiment shown in figures 1 and 2, the edge-banding machine 100 is in particular of the unilateral type, being adapted to apply a cladding edge B to one side only of panel P at every passage of panel P through the edge-banding machine 100 itself.

[0039] The edge-banding machine 100 comprises a support frame 101 intended to be rested on the ground and provided with a sliding lane 102 extending between an inlet port 103 and an outlet port 104, preferably according to a sliding direction S substantially rectilinear and in particular horizontal.

[0040] The edge-banding machine 100 further comprises feeding means 105 adapted to move panels P to advance along the sliding lane 102 from the inlet port 103 to the outlet port 104.

[0041] Preferably, the feeding means 105 comprise a track conveyor belt of conventional type per se, adapted to advance panels P individually and horizontally, in succession to each other from the inlet port 103 to the outlet port 104.

[0042] Advantageously, the edge-banding machine also comprises a storage station 106 adapted to accommodate an edging tape to be applied to sides L of panels P and that will form the cladding edge B of panels P themselves. More specifically, such storage station 106 comprises a rotatable support 107 which carries the wrapped edging tape (not shown) and is operable to rotate to unwrap the edging tape along the sliding lane 102 to apply the edging tape to side L of panel P. The edge-banding machine 100 advantageously comprises a grinding unit 108, of known type per se, placed along the sliding lane 102 downstream of the inlet port 103 and provided with one or more cutters (not shown) adapted to act on side L of panel P to eliminate the irregularities thereof.

[0043] The edge-banding machine 100 preferably comprises a gluing unit 109 placed downstream of the grinding unit 108 and comprising, in a conventional manner per se, a distribution device adapted to take an adhesive (such as heat-melting) from a containment tank and deposit a layer of such an adhesive on side L of panel P. The gluing unit 109 is also provided with two or more rollers adapted to compress the edging tape to the layer of glue to glue the edging tape to side L of panel P. The gluing unit 109 is also provided with a cutting tool adapted to cut the edging tape at the rear edge of side L of panel P, so that the portion of edging tape glued to side L of panel P forms a cladding edge B of panel P itself.

[0044] The cladding edge B glued to the corresponding side L of panel P by the gluing unit 109 has a greater length than side L of panel P and greater width than the thickness of panel P itself, so that the cladding edge B protrudes with respect to the end edges and the sides of side L of panel P.

[0045] Advantageously, the edge-banding machine 100 also comprises a trimming unit 110, of known type per se, arranged downstream of the gluing unit 109 and adapted to cut the portions of the cladding edge B protruding beyond the sides of side L of panel P substantially flush with the main sides of panel P itself.

[0046] The edge-banding machine 100 may advantageously be provided with further operating units of known type per se and not described in the present description.

[0047] The edge-banding machine 00 comprises a control unit 100, in particular provided with a PLC, adapted to control in an automated or semi-automated manner the operating units 108, 109, 110 of the edge-banding machine 100 itself.

[0048] The milling device 1 object of the present invention is intended to be mounted on the support frame 101 of the edge-banding machine 100 along the sliding lane 102, preferably downstream of the gluing unit 109 and in particular downstream also of the trimming unit 110.

[0049] Such a milling device 1 can be operated for milling the portions of the cladding edge B that protrude beyond the end edges of the corresponding side L of panel P, defining two ends E of the cladding edge B substantially aligned with the edges of the corresponding side L of panel P. In particular, the milling device 1 can be operated for selectively carrying out an end milling operation or a rounding operation.

[0050] In the end milling operation, the milling device 1 is adapted to cut in a substantially straight manner ends E of the cladding edge B substantially flush with the end edges of the corresponding side L of panel P, as shown in particular in the embodiment example in figure 12.

[0051] In the rounding operation, the milling device 1 is adapted to round edges E of the cladding edge B of panel P, in such a way as to seamlessly join the outer

surface of such a cladding edge B with the outer surface of the adjacent side L of panel P or, i.e. with the outer surface of the cladding edge B applied to such adjacent side L, as described in particular in the embodiment example in figure 13.

[0052] The milling device 1 comprises a support structure 2 intended to be mounted on the edge-banding machine 100, and in particular intended to be fixed to the support frame 101 of the edge-banding machine 100 itself.

[0053] The milling device 1 further comprises a milling head 3 mounted on the support frame 2 and provided with an operational zone 4 in which the cladding edge B of panel P advancing along the sliding lane 102 is susceptible to pass.

[0054] The milling device 1 also comprises a milling tool 5 mounted on the milling head 3 and comprising a rotation body 6 provided with a rotation axis X, preferably orthogonal to the sliding direction S of panels P and in particular horizontal.

[0055] More in detail, with reference to the examples shown in figures 6-8 and 14-16, the rotation body 6 of the milling tool 5 extends along the rotation axis X between a front side 7 thereof, intended to face towards the cladding edge B to be worked, and a rear side 8 thereof facing the direction opposite to the front side 7. Advantageously, the front side 7 and the rear side 8 of the rotation body 6 are substantially orthogonal to the rotation axis X of the rotation body 6 itself.

[0056] In addition, the rotation body 6 is peripherally provided with a cutting profile 9 extending around the rotation axis X between the front side 7 and the rear side 8 and intended to act at the operational zone 4 for milling the cladding edge B of panel P.

[0057] The milling device also comprises driving means 10 mechanically connected to the milling tool 5 and 10 drive adapted to bring in rotation the rotation body 6 of the latter about the rotation axis X to allow the cutting profile 9 of the rotation body 6 to mill the cladding edge B of panel P.

[0058] The driving means 10 comprise a first motor 11, preferably electric, mounted on the milling head 3 and provided with an output shaft to which the rotation body 6 of the milling tool 5 is connected to rotate the rotation body 6 about the rotation axis X, at a speed of for example 12000 rpm.

[0059] According to the idea at the basis of the present invention, the cutting profile 9 of the rotation body 6 of the milling tool 5 has a section with a rounding section 12 of curved shape with concavity facing towards the front side 7 of the rotation body 6, and an end milling section 13, substantially straight and extending between the rounding section 12 and the front side 7. The above section of the cutting profile is defined on a section plane radial and parallel to the rotation axis X and in particular containing the rotation axis X itself.

[0060] According to the invention, the milling device 1 comprises handling means 14 mechanically connected to the milling tool 5 and adapted to move such a milling tool 5 along the rotation axis X between a retracted position (shown in the example in figure 10) and an advanced position (shown in the example in figure 11).

[0061] According to the example in figure 10 and 12, when the milling tool 5 is in the retracted position, the end milling section 13 of the cutting profile 9 of the rotation body 6 is arranged in the operational zone 4 to act on the cladding edge B of panel P to linearly cut end E of such a cladding edge B, so as to carry out the above end milling operation.

[0062] In particular, when the milling tool 5 is in the retracted position, the rounding section 12 is arranged outside the operational zone 4 not to go in contact with the cladding edge B of panel P. According to the example in figure 11 and 13, when the milling tool 5 is in the advanced position, the rounding section 12 of the cutting profile 9 of the rotation body 6 is arranged in the operational zone 4 to act on the cladding edge B of panel P to round end E of the cladding edge B itself, so as to carry out the above rounding operation.

[0063] in this way, the subject milling device 1 is able to perform both end milling operations and rounding operations, avoiding the use of two separate end milling and rounding units in the edge-banding machine 100, with consequent reduction in costs and dimensions of the edge-banding machine 100 itself.

[0064] Advantageously, the rotation body 6 of the milling tool 5 is peripherally provided with a plurality of teeth 15 arranged around the rotation axis X and on which said cutting profile 9 is formed.

[0065] In particular, each tooth 15 is provided with a corresponding section with the rounding section 12 and the end milling section 13.

[0066] Preferably, the rotation body 6 is provided with a central hub 16 connected to the output shaft of the first motor 11 and from which teeth 15 extent radially.

[0067] Suitably, the rotation body 6 of the milling tool 5 is made of a rigid material, preferably metal, such as steel (such as HSS), sintered metal, etc.

[0068] With reference to the embodiment shown in figures 8 and 9, the end milling section 13 of the cutting profile 9 of the rotation body 6 of the milling tool 5 develops between a first end 17, suitably arranged at the front side 7 of the rotation body 6, and a second end 18 connected to the rounding section 12.

[0069] According to a first embodiment of the present invention shown in figures 6-9, the section of the cutting profile 9 is provided with a joining section 32 fitting connecting the rounding section 12 and the second end 18 of the end milling section 13.

[0070] Advantageously, with reference to the example shown in figure 9, said joining section 32 is inclined with respect to the rotation axis X of the rotation body 6, extending in approach to the rotation axis X from the rounding section 12 towards the end milling section 13.

[0071] In particular, the joining section 32 is inclined with respect to the rotation axis X of the rotation body 6

by a joining angle β of between 6° and 10°, and preferably of about 8°.

[0072] Advantageously, the joining section 32 is substantially straight and in particular has a length of about 1 mm and 3 mm and preferably of about 1 mm.

[0073] According to a second embodiment of the invention shown in figures 14-17, the second end 18 of the end milling section 13 of the section of the cutting profile 9 is seamlessly joined to the rounding section 12.

[0074] Advantageously, the end milling section 13 of the cutting profile 9 is inclined with respect to the rotation axis X of the rotation body 6 by an end milling angle α of between 0° and 15°, and preferably greater than 0°.

[0075] In particular, the end milling section 13 develops from its first end 17 to its second end 18 away from the rotation axis X with inclination equal to said end milling angle α.

[0076] The above end milling angle α (in particular greater than 0°) prevents the end milling section 13 of the cutting profile 9 of the milling tool 5 from going into contact with the main side of panel P during the milling operations, preventing damage to such a main side.

[0077] According to the first embodiment of the present invention, shown in particular in the example in figure 9, the end milling angle α is of between 0° and 3° and is preferably greater than 0° and, in particular, equal to about 1°.

[0078] According to the second embodiment of the present invention, shown in particular in the example in figure 17, the end milling angle α is of between 6° and 10° and is preferably equal to about 8°.

[0079] Preferably, the end milling section 13 of the cutting profile 9 has a length of at least about 5 millimeters and in particular of between about 5 mm and 6 mm.

[0080] With reference to the embodiment shown in figures 3 and 4, the support structure 2 of the milling device 1 comprises a translation guide 19 orthogonal to the rotation axis X of the milling tool 5, and in particular parallel to the sliding direction S of the sliding lane 102 along which they panels P to be edged advance.

[0081] The milling device 1 comprises a movable carriage 20 slidably mounted on the translation guide 19 and carrying said milling head 3 mounted.

[0082] The milling device 1 also comprises a second motor (not shown) mounted on the support structure 2 and mechanically connected to the movable carriage 20 to actuate the latter to slide along the translation guide 19. In particular, the second motor is connected to the movable carriage 20 through flexible transmission means, which advantageously consist of a chain wrapped as a ring on a driving wheel, a tension wheel and two return wheels.

[0083] The second motor advantageously consists of an asynchronous motor and is controlled by an inverter connected to the control unit of the edge-banding machine 100 having an electronic positioning system which allows controlling the rotation of the rotor of the second motor, and thus ultimately that allows controlling the position of the movable carriage 20 (and thus of the milling head 3) along the translation guide 19.

[0084] Preferably, the handling of panels P by the feeding means 105 of the edge-banding machine 100 is assisted by an encoder, also connected to the control unit and able to produce a pulse signal capable of controlling the inverter of the second motor so that the movable carriage 20 moves perfectly synchronized with panels P. Accordingly, the second motor controls the translation of the milling head 3 at the same speed as panels P to follow the latter in their stroke along the sliding lane 102 of the edge-banding machine 100.

[0085] Advantageously, the milling head 3 is rotatably mounted on the movable carriage 20, via a tilting shaft 21, around a transversal axis Y orthogonal to the translation guide 19 and parallel to the rotation axis X of the milling tool 5.

[0086] Preferably, the milling device 1 comprises a third motor 22 integral with the movable carriage 20, mechanically connected to the milling head 3 for controlling the latter to rotate around the tilting shaft 21, and electrically coupled with the second motor to synchronize according to predetermined operational steps the rotation of the milling head 3 with its translation along the translation guide 19 above the movable carriage 20.

[0087] In particular, the third motor 22 consists of a reduction unit with worm screw controlled by an inverter connected to the control unit of the edge-banding machine 100 and provided with a pulse positioner for a correct angular positioning of the milling head 3.

[0088] Advantageously, in order to keep the milling tool 5 during the milling of the cladding edges B of panel P constantly at a precise distance from edges B, the milling head 3 comprises a front coupler 23 and a vertical coupler 24, the latter consisting in particular of an idle disc free to rotate with axis parallel to the rotation axis X of the rotation body 6 of the milling tool 5. Preferably, the milling head 3 comprises actuating means 25, 26 adapted to keep the two couplers 23, 24 constantly resting onto panel P and thus ensure the correct working position of the milling tool 5.

[0089] In particular, the milling device 1 is provided with a support 27 fixed to the tilting shaft 21 and provided with a coupling guide 28, orthogonal to the tilting shaft 21 and to the translation guide 19, and on which coupling guide 28 the milling head 3 is slidably mounted.

[0090] The actuating means 25, 26 advantageously comprise a first pneumatic actuator 25 which is mounted on support 27 and is actuated by the control unit to move the milling head 3 along the coupling guide 28 up to push the vertical coupler 24 in abutment on the main side of panel P. The actuating means 25, 26 advantageously comprise a second pneumatic actuator 26 to move the front coupler 23 transversely with respect to the sliding direction S of panel P up to bringing such front coupler 23 in abutment against the cladding edge B of panel P itself. Advantageously, the milling head 3 comprises a support body 29 mechanically connected to the support

structure 2 of the milling device 1 and provided with a positioning guide substantially straight and parallel to the rotation axis X of the rotation body 6 of the milling tool 5.

[0091] In particular, the support body 29 of the milling head 3 is slidably mounted on the coupling guide 28 of support 27 of the milling device 1.

[0092] Moreover, the milling head 3 comprises a displacement body 30 slidably constrained to the positioning guide of the support body 29 and carrying the milling tool 5 rotatably mounted around the rotation axis X.

[0093] In particular, the above displacement body 30 carries mounted the first motor 11 of the driving means 10 adapted to bring in rotation the rotation body 6 of the milling tool 5.

[0094] The handling means 14 of the milling device 1 are connected to the displacement body 30 and are designed to displace the latter along the positioning guide of the support body 29 for moving the milling tool 5 between the retracted position and the advanced position.

[0095] Preferably, the handling means 14 comprise a linear actuator 31, in particular pneumatic, mounted on the support body 29 of the milling head 3 and connected to the displacement body 30 to move the latter along the positioning guide.

[0096] According to a different embodiment, the handling means 14 may comprise an electric motor or an electromagnet.

[0097] According to an embodiment variant of the present invention, the handling means 14 are arranged to move along the rotation axis X the support structure 2 of the trimmer head milling device 1 or support 27 of the milling head 3 in order in both cases to move the milling tool 5 between the retracted position and the advanced position.

[0098] An object of the present invention is also an operation method of a milling device 1 of the type described above.

[0099] Hereinafter, for simplicity of description, reference will be made to the same nomenclature introduced thus far, although it is to be understood that the present method can also be achieved with devices not provided with all the features above.

[0100] The method object of the present invention provides for actuating the rotation body 6 of the milling tool 5 to rotate about the rotation axis X, in particular by the driving means 10 of the milling device 1.

[0101] The method also provides for positioning the milling tool 5, selectively, in the retracted position or in the advanced position, in particular by the handling means 14 of the milling device 1.

[0102] With reference to the example in figure 12, when milling tool 5 is in the retracted position, the rotation body 6 acts on the cladding edge B of panel P with the end milling section 13 of the cutting profile 9 for linearly cutting one end E of the cladding edge B itself, in order to carry out an end milling operation of the cladding edge B.

[0103] In particular, when the milling tool 5 is in the retracted position, the rounding section 12 of the cutting profile 9 of the rotation body 6 is arranged outside the operational zone 4 of the milling head 3 not to go in contact with the cladding edge B of panel P.

[0104] With reference to the example in figure 13, when milling tool 5 is in the advanced position, the rotation body 6 acts on the cladding edge B of panel P with the rounding section 12 of the cutting profile 9 for rounding end E of the cladding edge B itself, thus carrying out a rounding operation of the cladding edge B.

[0105] In particular, the above method is carried out in an edge-banding operation of panel P preferably obtained by the edge-banding machine 100.

[0106] This method allows carrying out an end trimming step of the cladding edge B of panel P or a rounding step of the cladding edge B, depending on the position (retracted or advanced, respectively) controlled to the milling tool 5.

[0107] The edge-banding process provides for passing panel P through the edge-banding machine 100 from the inlet port 103 to the outlet port 104 of the latter along the sliding lane 102. At each passage of panel P, the operating units 108, 109, 110 of the edge-banding machine 100 apply a cladding edge B to one of sides L of panel P.

[0108] More in detail, in each passage, an operator must introduce panel P into the edge-banding machine 100 at the inlet port 103 of the latter, in such a way that the feeding means 105 of the edge-banding machine 100 advance panel P along the sliding lane 102 of the same edge-banding machine 100.

[0109] The edge-banding process comprises a step of grinding side L of panel P to be edge-banded, by means of the above grinding unit 108 of the edge-banding machine, in order in particular to eliminate irregularities on side L.

[0110] A gluing step is then provided for a portion of the edging tape on side L of panel P, in particular obtained through the above gluing unit 109, in such a way as to attach a cladding edge B to side L of panel P.

[0111] In particular, the cladding edge B applied in this gluing step protrudes beyond the end edges and beyond the sides of side L of panel P.

[0112] The edge-banding process comprises, in particular after the gluing step, a trimming step, obtained in particular through the trimming unit 110 of the edge-banding machine 100, to remove the portions of the cladding edge B protruding from the sides of side L of panel P.

[0113] The edge-banding process includes a trimming step for linearly trimming the cladding edge B at the end edges of panel P, and/or a rounding step of the cladding edge B to perform an angular joining and rounding processing and at the end edges of panel P.

[0114] Such end trimming and rounding steps are both carried out by the milling device 1 by the operation method object of the present invention.

[0115] Functionally, a photocell detects the arrival of panel P at the milling device 1, notifying it to the control unit of the edge-banding machine 100, which actuates the milling device 1.

[0116] More in detail, the control unit controls the driving means 10 (and in particular the first motor 11) to bring in rotation the rotation body 6 of the milling too01 5 of the milling device 1.

[0117] Moreover, the control unit controls the second motor of the milling device 1 to actuate the movable carriage 20 (with the milling head 3 thereon) to slide along the translation guide 19 to follow panel P advancing along the sliding lane 102.

[0118] In addition, the control unit controls the third motor 22 of the milling device 1 to bring in rotation the milling head 3 at the front end edge of side L of panel P so that the milling tool 5 cuts the cladding edge B at such a front edge.

[0119] The control unit then controls the milling device 1 to work the cladding edge B at the rear end edge of side L of panel P, through movements of translation and rotation of the milling head 3 similar to those described above for the processing of the front end edge of side L of panel P.

[0120] The activation of the (rotation and translation) movements of the milling head 3 to perform processing at the rear end edge is achieved due to a sensor connected to the control unit that detects the length of panel P and therefore allows knowing when the latter has gone past the milling device 1.

[0121] If the edge-banding process involves performing the end milling step, the milling device 1 is set, in particular through the control unit controlled by the operator, to arrange the milling tool 5 in said retracted position in order to cut the cladding edge B by the (straight) end milling section 13 of the cutting profile 9 of the rotation body 6 of the milling device 5.

[0122] If the edge-banding process involves performing the rounding step, the milling device 1 is set, in particular through the control unit controlled by the operator, to arrange the milling tool 5 in the advanced position in order to cut the cladding edge B by the (arched) rounding section 12 of the cutting profile 9 of the rotation body 6 of the milling device 5.

[0123] In particular, the operation method of the milling device 1 can provide for setting or set the latter to carry out a rounding operation of the cladding edge B at the front edge of side L of panel P and an end trimming operation of the cladding edge B at the rear edge of side L of panel P, or vice versa.

[0124] The invention thus conceived thus achieves the intended purposes.

Claims

1. Edge-banding machine (100), comprising:

- a support frame (101) provided with a sliding lane (102) extending between an inlet port (103) and an outlet port (104) according to a sliding direction (S) substantially rectilinear;
- advancement means (105) designed to move panels (P) to advance along said sliding lane (102) from the inlet port (102) to the outlet port (104); each said panel (P) being provided with two main faces parallel and opposite to each other and connected together along the perimeter on four sides (L), each said side (L) extending longitudinally between a front end edge and a rear end edge and being delimited in width by two longitudinal parallel sides;
- a gluing unit (109) mounted on said support frame (101) along said sliding lane (102) and designed to glue an edging tape on one of said sides (L) of said panel (P) to form a cladding edge (B);
- a trimming unit (110) arranged downstream of said gluing unit (109) and designed to cut the portions of said cladding edge (B) protruding beyond the longitudinal sides of the side (L) of said panel (P);
- a milling device (1) mounted on the support frame (101) of said edge-banding machine (100) along said sliding lane (102) downstream of said gluing unit (109), and designed to mill the portions of said cladding edge (B) which protrude beyond the end edges of the corresponding side (L) of said panel (P), thereby defining two ends (E) of said cladding edge (B) aligned with the edges of the corresponding side (L) of said panel (P);
- a control unit (100) adapted to control in an automated or semi-automated manner said gluing unit (109) and said trimming unit (110);

wherein said milling device (1) comprises:

- a support structure (2) fixed to the support frame (101) of said the edge-banding machine (100);
- a milling head (3) mounted on said support structure (2) and provided with an operational zone (4) in which a cladding edge (B) of a panel (P) is susceptible of passing;
- a milling tool (5) mounted on said milling head (3) and comprising a rotation body (6), which is provided with a rotation axis (X) orthogonal to said sliding direction (S), it extends with respect to said rotation axis (X) between a front side (7) and a rear side (8), and it is provided peripherally with a cutting profile (9) developing around said rotation axis (X), extending between said front side (7) and said rear side (8) and intended to act at said operational zone (4) of the milling head to mill the cladding edge (B) of said panel (P);
- driving means (10) mechanically connected to said milling tool (5) and adapted to bring said rotation body (6) into rotation around said rota-

tion axis (X); wherein said driving means (10) comprise a first motor (11) mounted on said milling head (3) and provided with an output shaft to which the rotation body (6) of said milling tool (5) is connected to rotate said rotation body (6) about said rotation axis (X);

wherein said milling head (3) comprises:

- a support body (29) mechanically connected to said support structure (2) and provided with a positioning guide substantially straight and parallel to said rotation axis (X);
- a displacement body (30) slidably constrained to said positioning guide and carrying said milling tool (5) mounted rotatably around said rotation axis (X);

wherein said handling means (14) comprise at least a linear actuator (31), are connected to said displacement body (30) and are designed to displace said displacement body (30) along said positioning guide to move said milling tool (5) between said retracted position and said advanced position;
said edge-banding machine (100) being **characterized in that** the cutting profile (9) of said rotation body (6) is provided with a section, defined on a radial section plane and parallel to said rotation axis (X), having a rounding section (12), of arched shape with the concavity facing towards said front side (7), and a straight end milling section (13) extending between said rounding section (12) and said front side (7) and inclined with respect to said rotation axis (X) by an end milling angle (α) comprised between 0° and 15°; wherein the end milling section (13) of the cutting profile (9) of the rotation body (6) of said milling tool (5) develops between a first end (17) arranged at the front side (7) of said rotation body (6), and a second end (18) connected to said rounding section (12);
said milling device (1) comprising handling means (14) mechanically connected to said milling tool (5) and, by means of said control unit (100), arranged to move said milling tool (5) along said rotation axis (X) between:

- a retracted position, in which the end milling section (13) of the cutting profile (9) of said rotation body (6) is arranged in said operational zone (4) to act on the cladding edge (B) of said panel (P) to linearly cut one end (E) of said cladding edge (B),
- and an advanced position, in which the rounding section (12) of the cutting profile (9) of said rotation body (6) is arranged in said operational zone (4) to act on the cladding edge (B) of said panel (P) to round the end (E) of said cladding edge (B);

and **in that** the support structure (2) of said milling device (1) comprises a translation guide (19) orthogonal to the rotation axis (X) of said milling tool (5) and parallel to the sliding direction (S) of said sliding lane (102);
wherein said milling device (1) comprises:

- a movable carriage (20) slidably mounted on said translation guide (19) and carrying said milling head (3) mounted;
- a second motor mounted on said support structure (2) and mechanically connected to said movable carriage (20) to actuate said movable carriage (20) to slide along said translation guide (19).

2. Edge-banding machine (100) according to claim 1, **characterized in that** said end milling angle (α) is comprised between 0° and 3°.

3. Edge-banding machine (100) according to claim 1, **characterized in that** said end milling angle (α) is comprised between 6° and 10°.

4. Edge-banding machine (100) according to any one of the preceding claims, **characterized in that** the section of said cutting profile (9) is provided with a connecting section (32) placed in connection between said rounding section (12) and said end milling section (13) and inclined with respect to said rotation axis (X) extending towards said rotation axis (X) from said rounding section (12) to said end milling section (13).

5. Edge-banding machine (100) according to claim 4, **characterized in that** said connecting section (32) is inclined with respect to said rotation axis (X) by a connecting angle (α) comprised between 6° and 10°.

6. Edge-banding machine (100) according to claim 4 or 5, **characterized in that** said connecting section (32) is straight.

7. Edge-banding machine (100) according to any one of the preceding claims, **characterized in that** the end milling section (13) of said cutting profile (9) is at least 5 millimeters in length.

8. Edge-banding machine (100) according to any one of the preceding claims, **characterized in that** the rotation body (6) of said milling tool (5) is peripherally provided with a plurality of teeth (15) arranged around said rotation axis (X) and on which teeth (15) said cutting profile is obtained (9).

9. Edge-banding machine (100) according to any one of the preceding claims, **characterized in that**:

- said milling head (3) is rotatably mounted on said movable carriage (20), via a tilting shaft (21), around a transversal axis (Y) orthogonal to said translation guide (19) and parallel to the rotation axis (X) of said milling tool (5);
- said milling device (1) comprises a third motor (22) mounted on said movable carriage (20), mechanically connected to said milling head (3) to control said milling head (3) to rotate around said transversal axis (Y), and electrically coupled with said second motor so as to synchronize the rotation of said milling head (3) around said transversal axis (Y) with the translation of said milling head (3) along said translation guide (19) above said movable carriage (20).

10. Edge-banding process using the edge-banding machine (100) according to any one of the preceding claims, wherein said edge-banding process comprises the step of passing said panel (P) through said edge-banding machine (100) from said inlet port (103) to said outlet port (104) along said sliding lane (102), wherein, at each passage of panel (P), said operating units (109, 110) of the edge-banding machine (100) apply a cladding edge (B) to one of sides (L) of said panel (P);
wherein at each passage of panel (P), said edge-banding process comprises:

- a gluing step for a portion of an edging tape on the side (L) of said panel (P), obtained through said gluing unit (109), in such a way as to attach a cladding edge (B) to the side (L) of said panel (P), wherein the cladding edge (B) applied in said gluing step protrudes beyond the end edges and beyond the longitudinal sides of the side (L) of said panel (P);
- after said gluing step, a trimming step, obtained through said trimming unit (110), to remove the portions of said cladding edge (B) protruding from the longitudinal sides of the side (L) of said panel (P);
- a trimming step for linearly trimming the cladding edge (B) at the end edges of said panel (P), and/or a rounding step of the cladding edge (B) to perform an angular joining and rounding processing at the end edges of panel (P);

wherein said end trimming and rounding steps are both carried out by said milling device (1) by an operation method of said milling device (1), such method providing for:

- said control unit controls the second motor of said milling device (1) to actuate said movable carriage 20 to slide along said translation guide (19) to follow panel (P) advancing along said sliding lane (102);
- the operation of the rotation body (6) of said milling tool (5) to rotate around said rotation axis (X); wherein said control unit controls the first motor (11) of said driving means (10) to bring in rotation the rotation body (6) of said milling tool (5);
- selective positioning of said milling tool (5):

  - in a retracted position, in which said rotation body (6) of said milling tool (5) acts on said cladding edge (B) with the end milling section (13) of said cutting profile (9), to linearly cut one end (E) of said cladding edge (B),
  - in an advanced position, in which the rotation body (6) of said milling tool (5) acts on said cladding edge (B) with the rounding section (12) of said cutting profile (9), to round the end (E) of said cladding edge (B);

wherein:

- if said edge-banding process involves performing said end milling step, said milling device (1) is set, by means of said control unit (100), to arrange the milling tool (5) in said retracted position in order to cut the cladding edge (B) by the straight end milling section (13) of the cutting profile (9) of the rotation body (6) of said milling device (1);
- if said edge-banding process involves performing the rounding step, said milling device 1 is set, by means of said control unit (100), to arrange said milling tool (5) in the advanced position in order to cut the cladding edge (B) by the arched rounding section (12) of the cutting profile (9) of the rotation body (6) of said milling device (1).

11. Edge-banding process according to claim 10, **characterized in that**, when said milling tool (5) is in said retracted position, the rounding section (12) of the cutting profile (9) of said rotation body (6) is arranged outside the operational zone (4) of said milling head (3).

Patentansprüche

1. Kantenanleimmaschine (100), umfassend:

- einen Tragrahmen (101), der mit einer zwischen einer Eingangsöffnung (103) und einer Ausgangsöffnung (104) in einer Gleitrichtung (S) im Wesentlichen geradlinig verlaufenden Gleitbahn (102) ausgestattet ist;
- Vorschubmittel (105), die darauf ausgelegt sind, Platten (P) zu ihrer Beförderung entlang der genannten Gleitbahn (102) von der Eingangsöffnung (102) zu der Ausgangsöffnung (104) zu bewegen; wobei jede genannte Platte (P) mit zwei parallelen und einander gegenüberliegenden und entlang des Umfangs an vier Seiten (L) miteinander verbundenen Hauptseiten ausgestattet ist, wobei jede Seite (L) längs zwischen einer vorderen Endkante und einer hinteren Endkante verläuft und in der Breite von zwei längs verlaufenden parallelen Seiten begrenzt wird;
- eine Klebeeinheit (109), die an dem genannten Tragrahmen (101) entlang der genannten Gleitbahn (102) montiert und darauf ausgelegt ist, ein Kantenband an einer der genannten Seiten (L) der genannten Platte (P) zu verkleben, um eine Verkleidungskante (B) zu bilden;
- eine Kappeinheit (110), die der genannten Klebeeinheit (109) nachgeschaltet angeordnet und darauf ausgelegt ist, die über die Längsseiten der Seite (L) der genannten Platte (P) vorstehenden Abschnitte der genannten Verkleidungskante (B) abzuschneiden;
- eine Fräsvorrichtung (1), die an dem Tragrahmen (101) der genannten Kantenanleimmaschine (100) entlang der genannten Gleitbahn (102) der genannten Klebeeinheit (109) nachgeschaltet montiert und darauf ausgelegt ist, die Abschnitte der genannten Verkleidungskante (B) zu fräsen, die über die Kante der entsprechenden Seite (L) der genannten Platte (P) vorstehen und dadurch zwei Enden (E) der genannten Verkleidungskante (B) zu definieren, die mit den Kanten der entsprechenden Seite (L) der genannten Platte (P) ausgerichtet sind;
- ein Steuergerät (100), das geeignet ist, die genannte Klebeeinheit (109) und die genannte Kappeinheit (110) auf automatische oder halbautomatische Weise zu steuern;

wobei die genannte Fräsvorrichtung (1) Folgendes umfasst:

- eine Tragstruktur (2), die an dem Tragrahmen (101) der genannten Kantenanleimmaschine (100) befestigt ist;
- einen Fräskopf (3), der an der genannten Tragstruktur (2) montiert und mit einem Arbeitsbereich (4) ausgestattet ist, in dem eine Verkleidungskante (B) einer Platte (P) geeignet ist, zu passieren;
- ein Fräswerkzeug (5), das auf dem genannten Fräskopf (3) montiert ist und einen Rotationskörper (6) umfasst, der mit einer zu der genannten Gleitrichtung (S) orthogonalen Drehachse (X) ausgestattet ist, im Verhältnis zu der genannten Drehachse (X) zwischen einer Vorderseite (7) und einer Rückseite (8) verläuft und rundum mit einem um die genannte Drehachse (X) verlaufenden Schneidprofil (9) ausgestattet ist, das zwischen der genannten Vorderseite (7) und der genannten Rückseite (8) verläuft und dazu bestimmt ist, an dem genannten Arbeitsbereich (4) des Fräskopfes einzugreifen, um die Verkleidungskante (B) der genannten Platte (P) zu fräsen;
- Antriebsmittel (10), die mechanisch mit dem genannten Fräswerkzeug (5) verbunden und geeignet sind, den genannten Rotationskörper (6) um die genannte Drehachse (X) in Drehung zu versetzen; wobei die genannten Antriebsmittel (10) einen an dem genannten Fräskopf (3) montierten ersten Motor (11) umfassen, der mit einer Antriebswelle ausgestattet ist, mit der der Rotationskörper (6) des genannten Fräswerkzeugs (5) verbunden ist, um den genannten Rotationskörper (6) um die genannte Drehachse (X) zu drehen;

wobei der genannte Fräskopf (3) Folgendes umfasst:

- einen Stützkörper (29), der mechanisch mit der genannten Tragstruktur (2) verbunden und mit einer im Wesentlichen geraden und zu der genannten Drehachse (X) parallelen Positionierführung ausgestattet ist;
- einen Verschiebungskörper (30), der verschiebbar an der genannten Positionierführung gehalten wird und das drehbar um die genannte Drehachse (X) montierte genannte Fräswerkzeug (5) trägt;

wobei die genannten Handhabungsmittel (14) mindestens einen linearen Stellantrieb (31) umfassen, mit dem genannten Verschiebungskörper (30) verbunden und darauf ausgelegt sind, den genannten Verschiebungskörper (30) entlang der genannten Positionierungsführung zu versetzen, um das genannte Fräswerkzeug (5) zwischen der genannten zurückgezogenen und der genannten vorgeschobenen Position zu bewegen;

wobei die genannte Kantenanleimmaschine (100) **dadurch gekennzeichnet ist, dass** das Schneidprofil (9) des genannten Rotationskör-

pers (6) mit einem Abschnitt versehen ist, der in einer radialen Schnittebene definiert und zu der genannten Drehachse (X) parallel ist, der einen bogenförmigen Rundungsabschnitt (12) mit zu der genannten Vorderseite (7) gerichteter Konkavität aufweist und einen geraden Stirnfräsabschnitt (13), der zwischen dem genannten Rundungsabschnitt (12) und der genannten Vorderseite (7) verläuft und im Verhältnis zu der genannten Drehachse (X) um einen Stirnfräswinkel (α) zwischen 0° und 15° geneigt ist; wobei der Stirnfräsabschnitt (13) des Schneidprofils (9) des Rotationskörpers (6) des genannten Fräswerkzeugs (5) zwischen einem an der Vorderseite (7) des genannten Rotationskörpers (6) angeordneten ersten Ende (17) und einem mit dem genannten Abrundungsabschnitt (12) verbundenen zweiten Ende (18) verläuft;
wobei die genannte Fräsvorrichtung (1) Handhabungsmittel (14) umfasst, die mechanische mit dem genannten Fräswerkzeug (5) verbunden sind und mittels des genannten Steuergeräts (100) angeordnet werden, um das genannte Fräswerkzeug (5) entlang der genannten Drehachse (X) zu bewegen, zwischen:

- einer zurückgezogenen Position, in der der Stirnfräsabschnitt (13) des Schneidprofils (9) des genannten Rotationskörper (6) in dem genannten Arbeitsbereich (4) angeordnet ist, um auf der Verkleidungskante (B) der genannten Platte (P) einzugreifen und eine Ende (E) der genannten Verkleidungskante (B) linear abzuschneiden,
- und einer vorgeschobenen Position, in der der Rundungsabschnitt (12) des Schneidprofils (9) des genannten Rotationskörpers (6) in dem genannten Arbeitsbereich (4) angeordnet ist, um auf der Verkleidungskante (B) der genannten Platte (P) einzugreifen, um das Ende (E) der genannten Verkleidungskante (B) zu runden,

und dadurch, dass die Tragstruktur (2) der Fräsvorrichtung (1) eine zu der Drehachse (X) des genannten Fräswerkzeugs (5) orthogonale und zu der Gleitrichtung (S) der genannten Gleitbahn (102) parallele Verschiebungsführung (19) umfasst;
wobei die genannte Fräsvorrichtung (1) Folgendes umfasst:

- einen beweglichen Schlitten (20), der verschiebbar auf der genannten Verschiebungsführung (19) montiert ist und den genannten Fräskopf (3) montiert trägt;
- einen zweiten Motor, der an der genannten Tragstruktur (2) montiert und mechanisch mit dem genannten beweglichen Schlitten (20) verbunden ist, um den genannten beweglichen Schlitten (20) zu betätigen, damit dieser entlang der genannten Verschiebungsführung (19) gleitet.

2. Kantenanleimmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** der genannte Stirnfräswinkel (α) zwischen 0° und 3° beträgt.

3. Kantenanleimmaschine (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** der genannte Stirnfräswinkel (α) zwischen 6° und 10° beträgt.

4. Kantenanleimmaschine (100) nach einem beliebigen der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** der Querschnitt des genannten Schneidprofils (9) mit einem als Verbindung zwischen dem genannten Rundungsabschnitt (12) und dem genannten Stirnfräsabschnitt (13) platzierten Verbindungsabschnitt (32) ausgestattet ist, der im Verhältnis zu der genannten Drehachse (X) geneigt ist und von dem genannten Rundungsabschnitt (12) zu dem genannten Stirnfräsabschnitt (13) in Richtung der genannten Drehachse (X) verläuft.

5. Kantenanleimmaschine (100) nach Anspruch 4, **dadurch gekennzeichnet, dass** der genannte Verbindungsabschnitt (32) im Verhältnis zu der genannten Drehachse (X) um einen Verbindungswinkel (α) zwischen 6° und 10° geneigt ist.

6. Kantenanleimmaschine (100) nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** der genannte Verbindungsabschnitt (32) gerade ist.

7. Kantenanleimmaschine (100) nach einem beliebigen der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** der Stirnfräsabschnitt (13) des genannten Schneidprofils (9) in der Länge mindestens 5 Millimeter beträgt.

8. Kantenanleimmaschine (100) nach einem beliebigen der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass** der Rotationskörper (6) des genannten Fräswerkzeugs (5) am Rand mit einer Vielzahl von um die genannte Drehachse (X) angeordneten Zähnen (15) ausgestattet ist und auf diesen Zähnen (15) das genannte Schneidprofil (9) erzielt wird.

9. Kantenanleimmaschine (100) nach einem der vorangegangenen Ansprüche, **dadurch gekennzeichnet, dass**:

- der genannte Fräskopf (3), mit Hilfe einer kippbaren Welle (21), um eine Querachse (Y) orthogonal zu der genannten Verschiebungsführung

(19) und parallel zu der Drehachse (X) des genannten Fräswerkzeugs (5) drehbar auf dem genannten beweglichen Schlitten (20) montiert ist;

- die genannte Fräsvorrichtung (1) einen auf dem genannten beweglichen Schlitten (20) montierten dritten Motor (22) umfasst, der mechanisch mit dem genannten Fräskopf (3) verbunden ist, um den genannten Fräskopf (3) beim Drehen um die genannte Querachse (Y) zu steuern, und elektrisch mit dem genannten zweiten Motor gekoppelt ist, um die Drehung des genannten Fräskopfes (3) um die genannte Querachse (Y) mit der Verschiebung des genannten Fräskopfes (3) entlang der genannten Verschiebungsführung (19) über dem genannten beweglichen Schlitten (20) zu synchronisieren.

10. Betriebsverfahren der Kantenanleimmaschine, bei dem die Kantenanleimmaschine (100) gemäß einem beliebigen der vorangegangenen Ansprüche eingesetzt wird, bei dem das genannte Kantenanleimverfahren den Schritt des Durchlaufs der genannten Platte (P) durch die genannte Kantenanleimmaschine (100) von der genannten Eingangsöffnung (103) zu der genannten Ausgangsöffnung (104) entlang der genannten Gleitbahn (102) umfasst, wobei bei jedem Durchlauf der Platte (P) die genannten Arbeitseinheiten (109, 110) der Kantenanleimmaschine (100) eine Verkleidungskante (B) an einer der Seiten (L) der genannten Platte (P) anbringen;
wobei bei jedem Durchlauf der Platte (P) das genannte Kantenanleimverfahren Folgendes umfasst:

- einen Klebeschritt für einen Abschnitt des Kantenbands an der Seite (L) der genannten Platte (P), der über die genannte Klebeeinheit (109) so erzielt wird, dass eine Verkleidungskante (B) an der Seite (L) der genannten Platte (P) angebracht wird, wobei die bei dem genannten Klebeschritt angebrachte Verkleidungskante (B) über die Endkanten und über die Längsseiten der Seite (L) der genannten Platte (P) vorsteht;
- nach dem genannten Klebeschritt einen Kappschritt, der über die genannte Kappeinheit (110) erzielt wird, um die Abschnitte der genannten Verkleidungskante (B) zu entfernen, die von den Längsseiten der Seite (L) der genannten Platte (P) vorstehen;
- einen Kappschritt zum linearen Abschneiden der Verkleidungskante (B) an den Endkanten der genannten Platte (P) und/oder einen Rundungsschritt der Verkleidungskante (B), um ein winkliges Füge- und Rundungsverfahren an den Endkanten der Platte (P) auszuführen;

wobei die genannten Kapp- und Rundungsschritte beide von der genannten Fräsvorrichtung (1) durch ein Betriebsverfahren der genannten Fräsvorrichtung (1) ausgeführt werden, wobei dieses Verfahren dafür sorgt:

- dass das genannte Steuergerät den zweiten Motor der genannten Fräsvorrichtung (1) steuert, um den genannten beweglichen Schlitten (20) in Bewegung zu versetzen, damit dieser entlang der genannten Verschiebungsführung (19) gleitet und der entlang der genannten Gleitbahn (102) beförderten Platte (P) folgt;
- dass der Rotationskörper (6) des genannten Fräswerkzeugs (5) um die genannte Drehachse (X) herum in Drehung versetzt wird; wobei das genannte Steuergerät den ersten Motor (11) der genannten Antriebsmittel (10) steuert, um den Rotationskörper (6) des genannten Fräswerkzeugs (5) in Drehung zu versetzen;
- das genannte Fräswerkzeug (5) wahlweise zu positionieren:

  - in einer zurückgezogenen Position, in der der genannte Rotationskörper (6) des genannten Fräswerkzeugs (5) auf der genannten Verkleidungskante (B) mit dem Stirnfräsabschnitt (13) des genannten Schneidprofils (9) eingreift, um ein Ende (E) der genannten Verkleidungskante (B) linear abzuschneiden,
  - in einer vorgeschobenen Position, in der der genannte Rotationskörper (6) des genannten Fräswerkzeugs (5) auf der genannten Verkleidungskante (B) mit dem Rundungsabschnitt (12) des genannten Schneidprofils (9) eingreift, um das Ende (E) der genannten Verkleidungskante (B) zu runden,

wobei:

- wenn das genannte Kantenanleimverfahren das Ausführen des genannten Stirnfrässchritts beinhaltet, die genannte Fräsvorrichtung (1) mit Hilfe des genannten Steuergeräts (100) eingestellt wird, um das Fräswerkzeug (5) in der genannten zurückgezogenen Position anzuordnen und die Verkleidungskante (B) von dem geraden Stirnfräsabschnitt (13) des Schneidprofils (9) des Rotationskörpers (6) der genannten Fräsvorrichtung (1) abzuschneiden;
- wenn das genannte Kantenanleimverfahren das Ausführen des genannten Rundungsschritts beinhaltet, die genannte Fräsvorrichtung (1) mit Hilfe des genannten Steuergeräts (100) eingestellt wird, um das Fräswerkzeug (5) in der genannten vorgeschobenen Position anzuordnen, um die Verkleidungskante (B) von dem bogenförmigen Rundungsabschnitt (12)

des Schneidprofils (9) des Rotationskörpers (6) der genannten Fräsvorrichtung (1) abzuschneiden.

11. Kantenanleimverfahren nach Anspruch 10, **dadurch gekennzeichnet, dass**, wenn das genannte Fräswerkzeug (5) sich in der genannten zurückgezogenen Position befindet, der Rundungsabschnitt (12) des Schneidprofils (9) des genannten Rotationskörpers (6) außerhalb des Arbeitsbereichs (4) des genannten Fräskopfes (3) angeordnet ist.

Revendications

1. Machine de plaquage de chants (100), comprenant :

- un châssis de support (101) pourvu d'une bande coulissante (102) s'étendant entre un orifice d'entrée (103) et un orifice de sortie (104) suivant une direction de coulissement (S) sensiblement rectiligne ;
- des moyens d'avancement (105) conçus pour déplacer les panneaux (P) afin de les faire avancer le long de ladite bande coulissante (102) de l'orifice d'entrée (102) à l'orifice de sortie (104) ; chacun desdits panneaux (P) étant pourvu de deux faces principales parallèles et opposées l'une à l'autre et reliées ensemble le long du périmètre au niveau de quatre côtés (L), chacun desdits côtés (L) s'étendant de façon longitudinale entre un bord d'extrémité avant et un bord d'extrémité arrière et étant délimité en largeur par deux côtés parallèles longitudinaux ;
- une unité de collage (109) montée sur ledit châssis de support (101) le long de ladite bande coulissante (102) et conçue pour coller une bande de de chant sur un desdits côtés (L) dudit panneau (P) pour former un bord de revêtement (B) ;
- une unité de coupe (110) disposée en aval de ladite unité de collage (109) et conçue pour couper les parties dudit bord de revêtement (B) faisant saillie au-delà des côtés longitudinaux du côté (L) dudit panneau (P) ;
- un dispositif de fraisage (1) monté sur le châssis de support (101) de ladite machine de plaquage de chants (100) le long de ladite bande coulissante (102) en aval de ladite unité de collage (109), et conçu pour fraiser les parties dudit bord de revêtement (B) qui font saillie au-delà des bords d'extrémité du côté correspondant (L) dudit panneau (P), définissant ainsi deux extrémités (E) dudit bord de revêtement (B) alignées avec les bords du côté correspondant (L) dudit panneau (P) ;
- une unité de commande (100) apte à contrôler ladite unité de collage (109) et ladite unité de coupe (110) de manière automatique ou semi-automatique ;

dans laquelle ledit dispositif de fraisage (1) comprend :

- une structure de support (2) fixée au châssis de support (101) de ladite machine de plaquage de chants (100) ;
- une tête de fraisage (3) montée sur ladite structure de support (2) et pourvue d'une zone opérationnelle (4) dans laquelle un bord de revêtement (B) d'un panneau (P) est susceptible de passer ;
- un outil de fraisage (5) monté sur ladite tête de fraisage (3) et comprenant un corps de pivotement (6) qui est muni d'un axe de rotation (X) orthogonal à ladite direction de coulissement (S), il s'étend par rapport audit axe de rotation (X) entre un côté avant (7) et un côté arrière (8) et il est pourvu d'un profil de coupe (9) périphérique se développant autour dudit axe de rotation (X), s'étendant entre ledit côté avant (7) et ledit côté arrière (8) et destiné à agir au niveau de ladite zone opérationnelle (4) de la tête de fraisage pour fraiser le bord de revêtement (B) dudit panneau (P) ;
- des moyens d'actionnement (10) reliés de façon mécanique audit outil de fraisage (5) et aptes à entraîner en rotation ledit corps de pivotement (6) autour dudit axe de rotation (X) ; dans laquelle lesdits moyens d'actionnement (10) comprennent un premier moteur (11) monté sur ladite tête de fraisage (3) et pourvu d'un arbre de sortie auquel le corps de pivotement (6) dudit outil de fraisage (5) est relié pour faire tourner ledit corps de pivotement (6) autour dudit axe de rotation (X) ;

dans laquelle ladite tête de fraisage (3) comprend :

- un corps de support (29) relié de façon mécanique à ladite structure de support (2) et pourvu d'un guide de positionnement sensiblement droit et parallèle audit axe de rotation (X) ;
- un corps de déplacement (30) fixé de manière coulissante audit guide de positionnement et portant ledit outil de fraisage (5) monté de manière rotative autour dudit axe de rotation (X) ;

dans laquelle lesdits moyens de manipulation (14) comprennent au moins un actionneur linéaire (31), sont reliés audit corps de déplacement (30) et sont conçus pour déplacer ledit corps de déplacement (30) le long dudit guide de positionnement pour mettre en mouvement ledit outil de fraisage (5) entre ladite position rétractée et ladite position avancée ;

ladite machine de plaquage de chants (100)

étant **caractérisée en ce que** le profil de coupe (9) dudit corps de pivotement (6) est pourvu d'une section, définie sur un plan de coupe radial et parallèle audit axe de rotation (X), ayant une section d'arrondissage (12), en forme d'arc avec la concavité faisant face audit côté avant (7), et une section de fraisage d'extrémité (13) droite s'étendant entre ladite section d'arrondissage (12) et ledit côté avant (7) et inclinée par rapport audit axe de rotation (X) d'un angle de fraisage d'extrémité (α) compris entre 0° et 15° ; dans laquelle la section de fraisage d'extrémité (13) du profil de coupe (9) du corps de pivotement (6) dudit outil de fraisage (5) se développe entre une première extrémité (17) disposée au niveau du côté avant (7) dudit corps de pivotement (6), et une seconde extrémité (18) reliée à ladite section d'arrondissage (12) ;
ledit dispositif de fraisage (1) comprenant des moyens de manipulation (14) reliés de façon mécanique audit outil de fraisage (5) et, au moyen de ladite unité de commande (100), disposés pour mettre en mouvement ledit outil de fraisage (5) le long dudit axe de rotation (X) entre :

- une position rétractée, dans laquelle la section de fraisage d'extrémité (13) du profil de coupe (9) dudit corps de pivotement (6) est disposée dans ladite zone opérationnelle (4) pour agir sur le bord de revêtement (B) dudit panneau (P) afin de couper de façon linéaire une extrémité (E) dudit bord de revêtement (B),
- et une position avancée, dans laquelle la section d'arrondissage (12) du profil de coupe (9) dudit corps de pivotement (6) est disposée dans ladite zone opérationnelle (4) pour agir sur le bord de revêtement (B) dudit panneau (P) afin d'arrondir l'extrémité (E) dudit bord de revêtement (B) ;

et **en ce que** la structure de support (2) dudit dispositif de fraisage (1) comprend un guide de translation (19) orthogonal à l'axe de rotation (X) dudit outil de fraisage (5) et parallèle à la direction de coulissement (S) de ladite bande coulissante (102) ; dans laquelle ledit dispositif de fraisage (1) comprend :

- un chariot mobile (20) monté de façon coulissante sur ledit guide de translation (19) et portant ladite tête de fraisage (3) montée ;
- un second moteur monté sur ladite structure de support (2) et relié de façon mécanique audit chariot mobile (20) pour actionner ledit chariot mobile (20) afin qu'il glisse le long dudit guide de translation (19).

2. Machine de plaquage de chants (100) selon la revendication 1, **caractérisée en ce que** ledit angle de fraisage d'extrémité (α) est compris entre 0° et 3°.

3. Machine de plaquage de chants (100) selon la revendication 1, **caractérisée en ce que** ledit angle de fraisage d'extrémité (α) est compris entre 6° et 10°.

4. Machine de plaquage de chants (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la section dudit profil de coupe (9) est pourvue d'une section de raccordement (32) placée en connexion entre ladite section d'arrondissage (12) et ladite section de fraisage d'extrémité (13) et inclinée par rapport audit axe de rotation (X) s'étendant vers ledit axe de rotation (X) de ladite section d'arrondissage (12) à ladite section de fraisage d'extrémité (13).

5. Machine de plaquage de chants (100) selon la revendication 4, **caractérisée en ce que** ladite section de raccordement (32) est inclinée par rapport audit axe de rotation (X) d'un angle de raccordement (α) compris entre 6° et 10°.

6. Machine de plaquage de chants (100) selon la revendication 4 or 5, **caractérisée en ce que** ladite section de raccordement (32) est droite.

7. Machine de plaquage de chants (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la section de fraisage d'extrémité (13) dudit profil de coupe (9) est au moins 5 millimètres de long.

8. Machine de plaquage de chants (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le corps de pivotement (6) dudit outil de fraisage (5) est pourvu d'une pluralité de dents (15) de façon périphérique, disposées autour dudit axe de rotation (X) et sur lesquelles dents (15) ledit profil de coupe est obtenu (9).

9. Machine de plaquage de chants (100) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** :

- ladite tête de fraisage (3) est montée de manière rotative sur ledit chariot mobile (20), à travers un axe basculant (21), autour d'un axe transversal (Y) orthogonal audit guide de translation (19) et parallèle à l'axe de rotation (X) dudit outil de fraisage (5) ;
- ledit dispositif de fraisage (1) comprend un troisième moteur (22) monté sur ledit chariot mobile (20), relié de façon mécanique à ladite tête de fraisage (3) pour contrôler ladite tête de fraisage

(3) afin qu'elle pivote autour dudit axe transversal (Y), et couplé électriquement audit second moteur de manière à synchroniser la rotation de ladite tête de fraisage (3) autour dudit axe transversal (Y) avec la translation de ladite tête de fraisage (3) le long dudit guide de translation (19) au-dessus dudit chariot mobile (20).

10. Procédé de plaquage de chants qui utilise la machine de plaquage de chants (100) selon l'une quelconque des revendications précédentes, dans lequel ledit procédé de plaquage de chants comprend l'étape consistant à faire passer ledit panneau (P) à travers ladite machine de plaquage de chants (100) dudit orifice d'entrée (103) audit orifice de sortie (104) le long de ladite bande coulissante (102), dans laquelle, lors de chaque passage du panneau (P), lesdites unités fonctionnelles (109, 110) de la machine de plaquage de chants (100) appliquent un bord de revêtement (B) sur un des côtés (L) dudit panneau (P) ; dans lequel, lors de chaque passage du panneau (P), ledit procédé de plaquage de chants comprend :

- une étape de collage pour une partie d'une bande de chant sur le côté (L) dudit panneau (P), obtenue par l'intermédiaire de ladite unité de collage (109), de manière à attacher un bord de revêtement (B) au côté (L) dudit panneau (P), dans laquelle le bord de revêtement (B) appliqué dans ladite étape de collage fait saillie au-delà des bords d'extrémité et au-delà des côtés longitudinaux du côté (L) dudit panneau (P) ;
- après ladite étape de collage, une étape de coupe, obtenue par l'intermédiaire de ladite unité de coupe (110), pour enlever les parties dudit bord de revêtement (B) faisant saillie desdits côtés longitudinaux du côté (L) dudit panneau (P) ;
- une étape de coupe pour couper de façon linéaire le bord de revêtement (B) au niveau des bords d'extrémité dudit panneau (P), et/ou une étape d'arrondissage du bord de revêtement (B) pour réaliser un rattachement angulaire et un traitement d'arrondissage au niveau des bords d'extrémité du panneau (P) ;

dans lequel lesdites étapes de coupe et d'arrondissage d'extrémité sont toutes les deux effectuées par ledit dispositif de fraisage (1) à travers un procédé opérationnel dudit dispositif de fraisage (1), ledit procédé prévoyant ce qui suit :

- ladite unité de commande contrôle le second moteur dudit dispositif de fraisage (1) pour actionner ledit chariot mobile (20) afin qu'il glisse le long dudit guide de translation (19) pour suivre le panneau (P) qui avance le long de ladite bande coulissante (102) ;
- le fonctionnement du corps de pivotement (6) dudit outil de fraisage (5) afin de pivoter autour dudit axe de rotation (X) ; dans lequel ladite unité de commande contrôle le premier moteur (11) desdits moyens d'actionnement (10) pour entraîner en rotation le corps de pivotement (6) dudit outil de fraisage (5) ;
- le positionnement sélectif dudit outil de fraisage (5) :

  - dans une position rétractée, dans laquelle ledit corps de pivotement (6) dudit outil de fraisage (5) agit sur ledit bord de revêtement (B) avec la section de fraisage d'extrémité (13) dudit profil de coupe (9), pour couper de façon linéaire une extrémité (E) dudit bord de revêtement (B),
  - dans une position avancée, dans laquelle ledit corps de pivotement (6) dudit outil de fraisage (5) agit sur ledit bord de revêtement (B) avec la section d'arrondissage (12) dudit profil de coupe (9), pour arrondir l'extrémité (E) dudit bord de revêtement (B) ;

dans lequel :

- si ledit procédé de plaquage de chants comprend la réalisation de ladite étape de fraisage d'extrémité, ledit dispositif de fraisage (1) est réglé, par l'intermédiaire de ladite unité de commande (100), afin de disposer l'outil de fraisage (5) dans ladite position rétractée afin de couper le bord de revêtement (B) par la section de fraisage d'extrémité (13) droite du profil de coupe (9) du corps de pivotement (6) dudit dispositif de fraisage (1) ;
- si ledit procédé de plaquage de chants comprend la réalisation de l'étape d'arrondissage, ledit dispositif de fraisage (1) est réglé, par l'intermédiaire de ladite unité de commande (100), afin de disposer ledit outil de fraisage (5) dans la position avancée pour couper le bord de revêtement (B) par la section d'arrondissage (12) arqué du profil de coupe (9) du corps de pivotement (6) dudit dispositif de fraisage (1).

11. Procédé de plaquage de chants selon la revendication 10, **caractérisé en ce que**, lorsque ledit outil de fraisage (5) se trouve dans ladite position rétractée, la section d'arrondissage (12) du profil de coupe (9) dudit corps de pivotement (6) est disposée à l'extérieur de la zone opérationnelle (4) de ladite tête de fraisage (3).

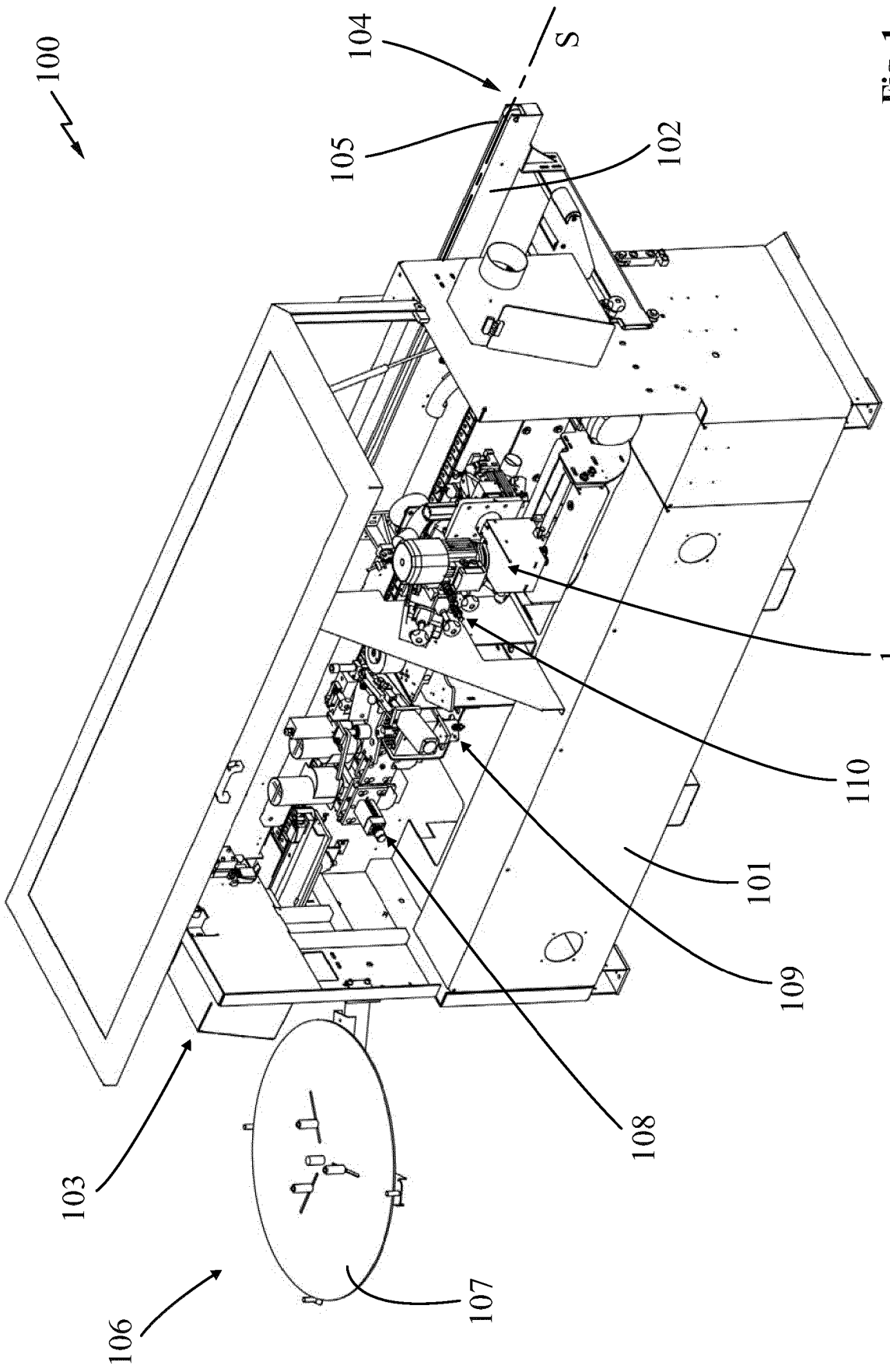

Fig. 1

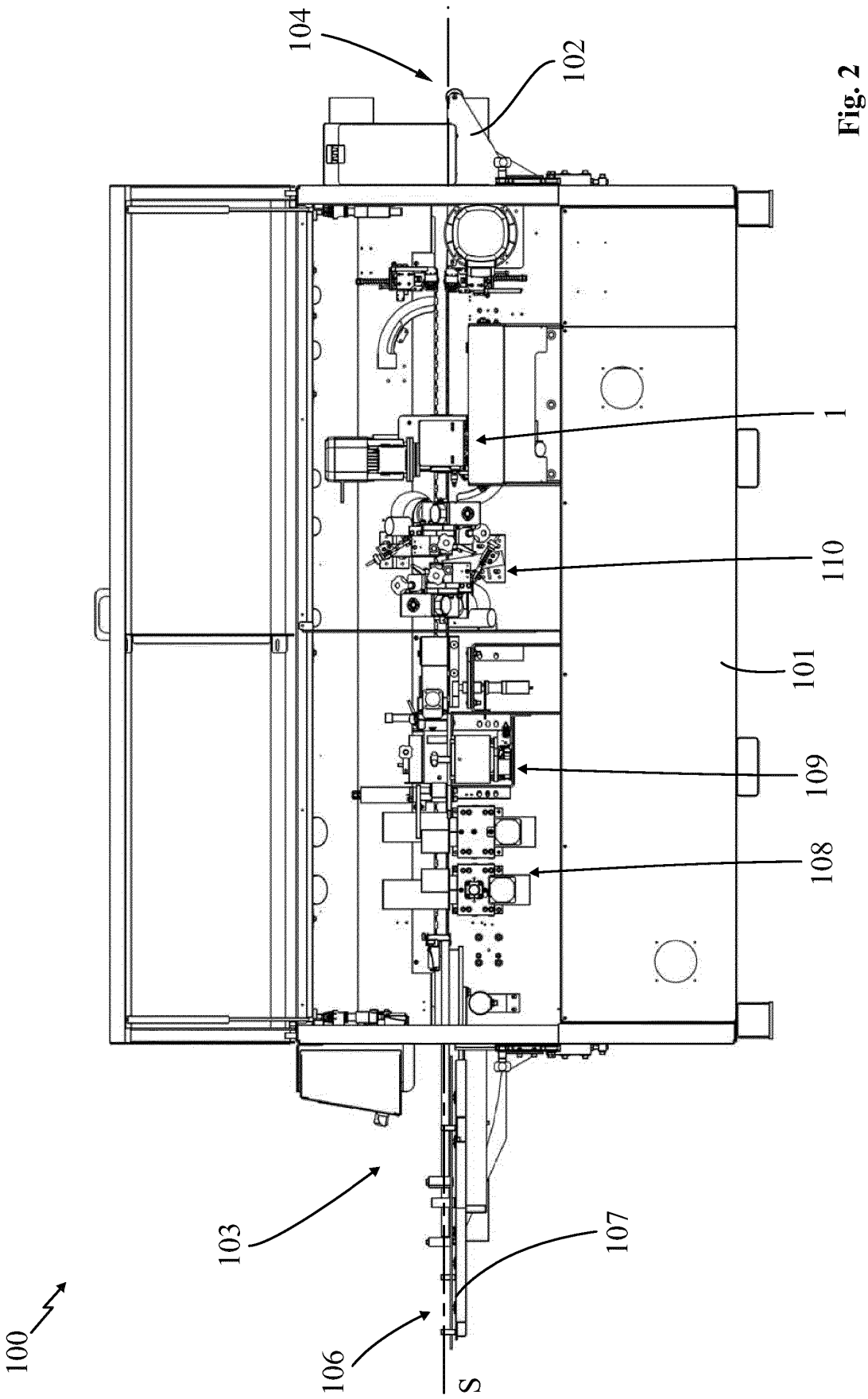

Fig. 2

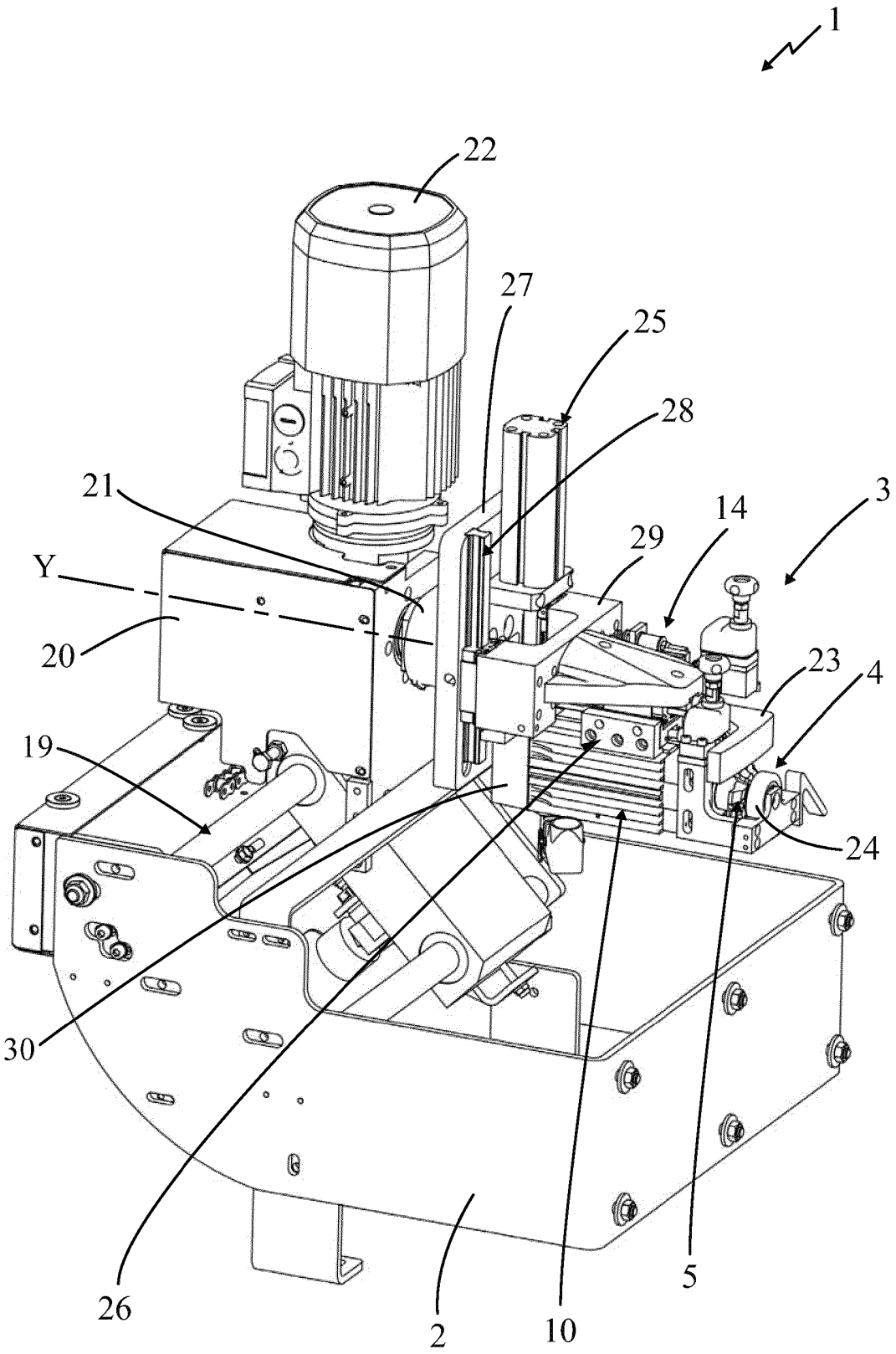

Fig. 3

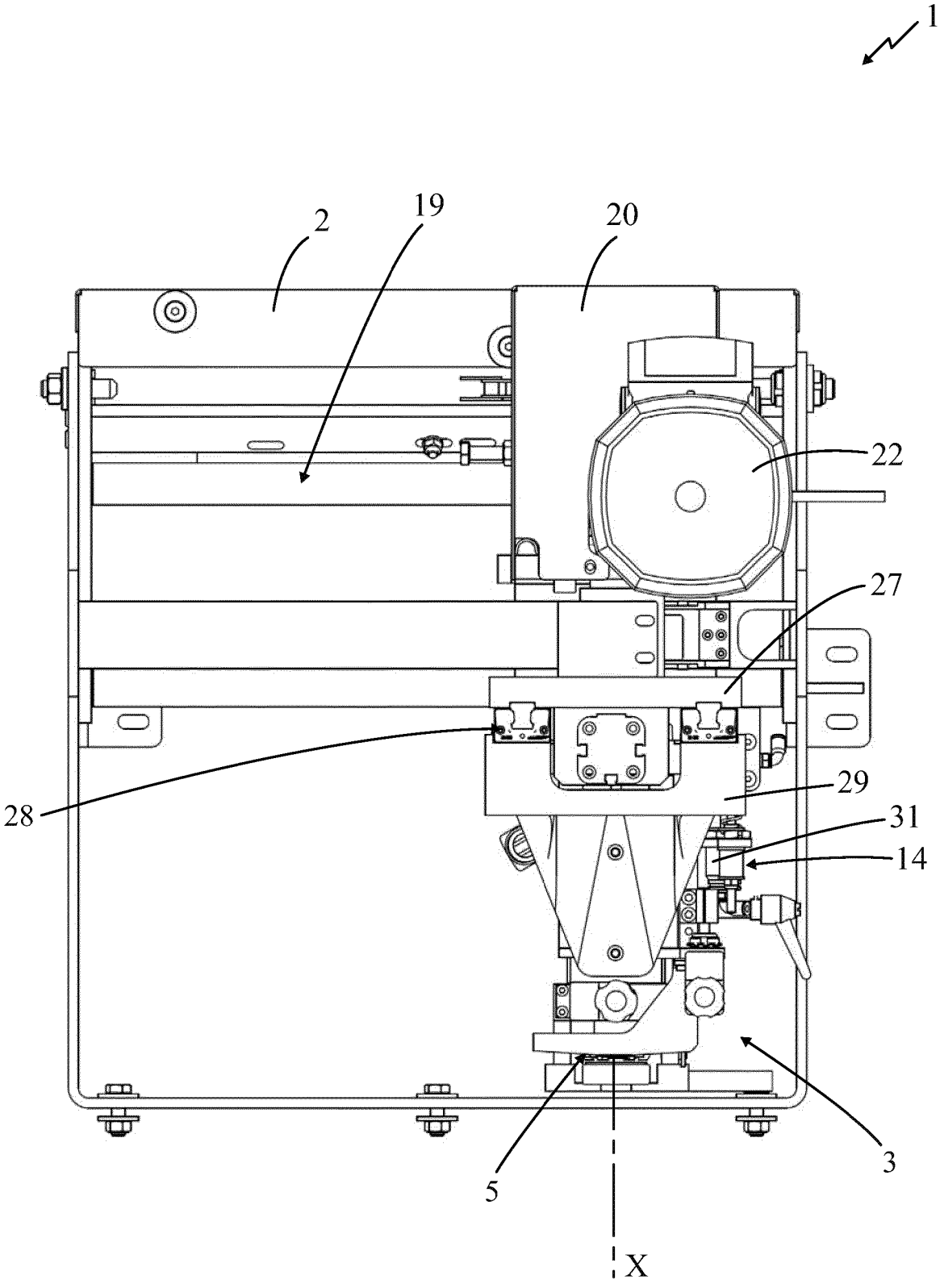

Fig. 4

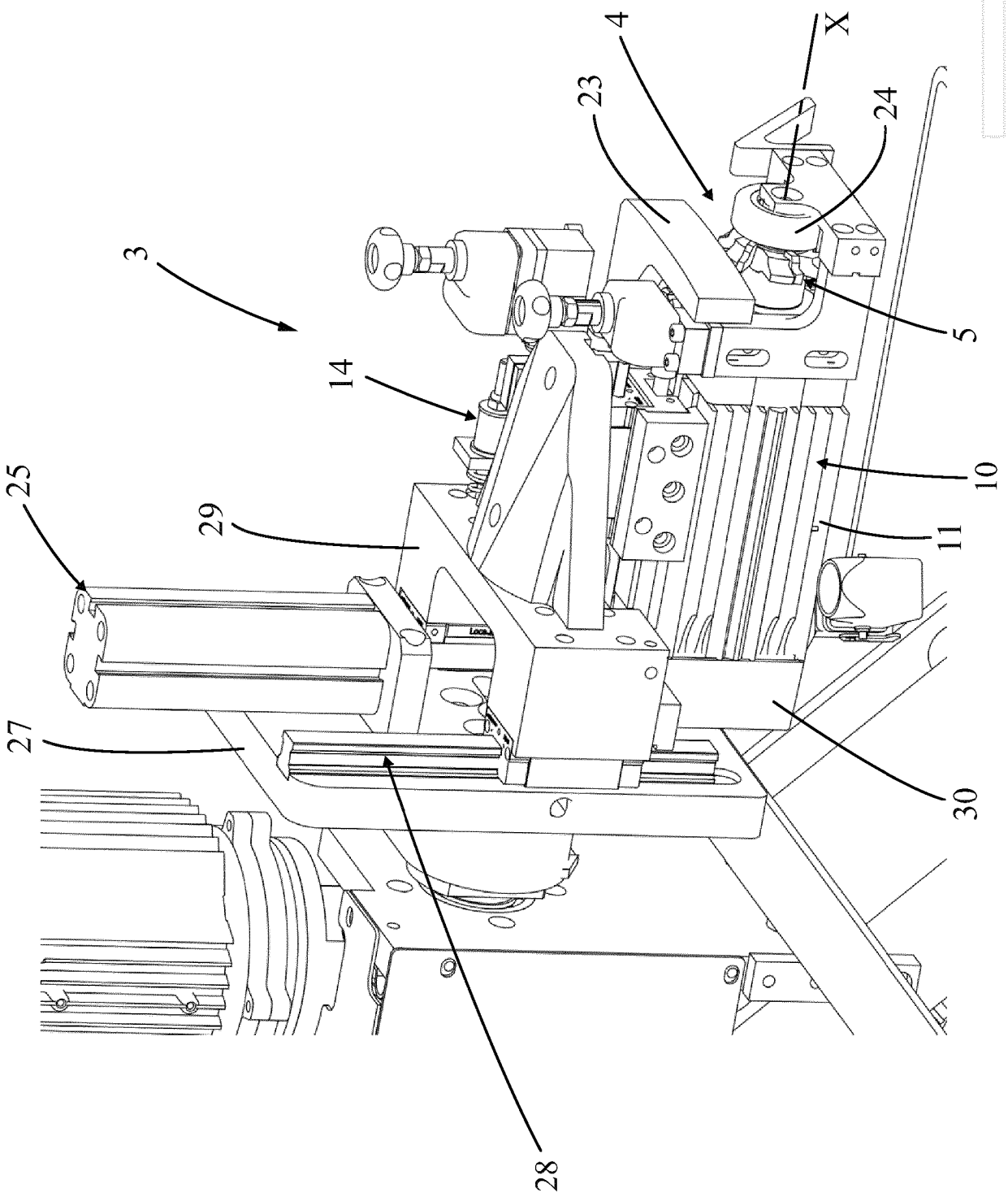

Fig. 5

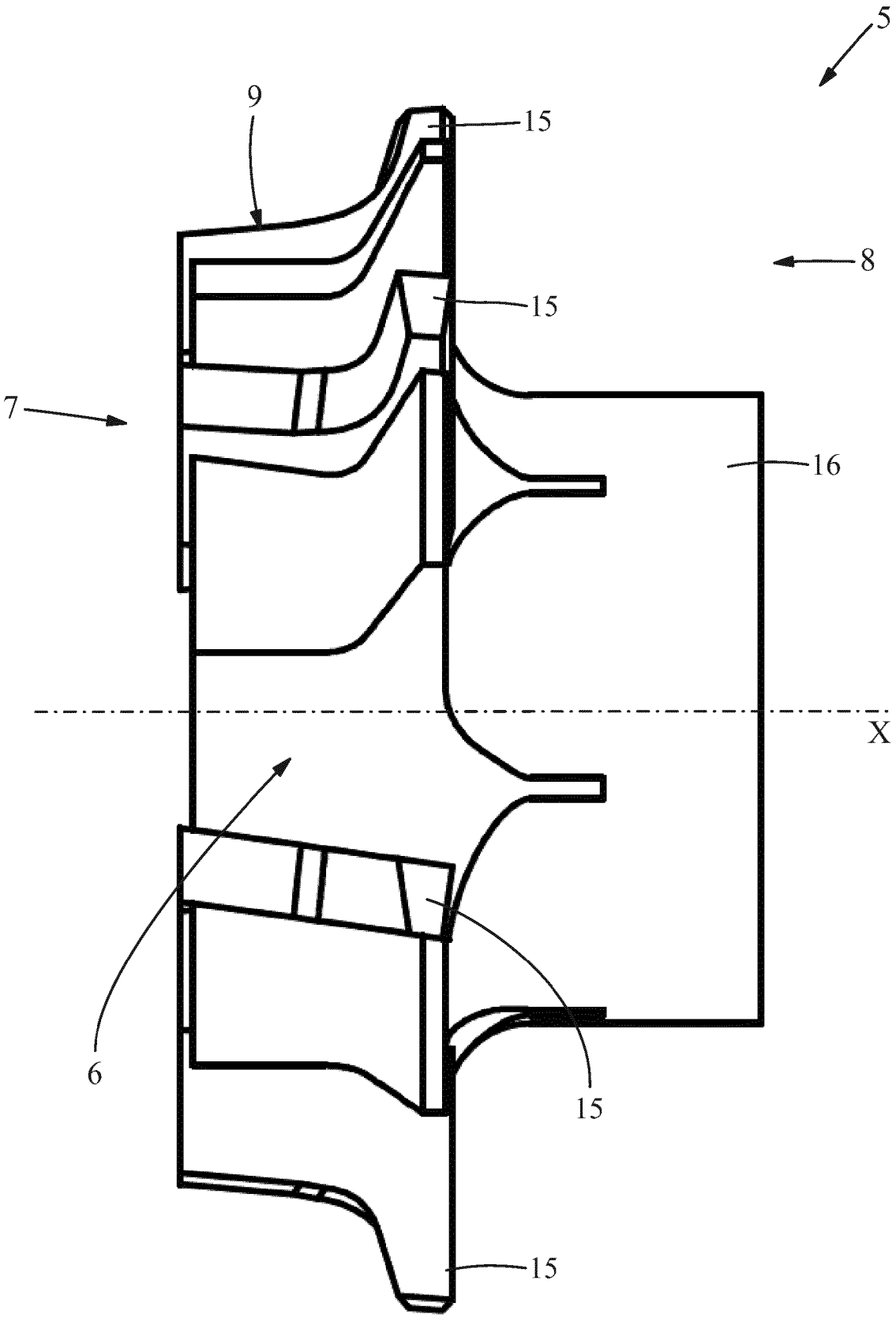

Fig. 6

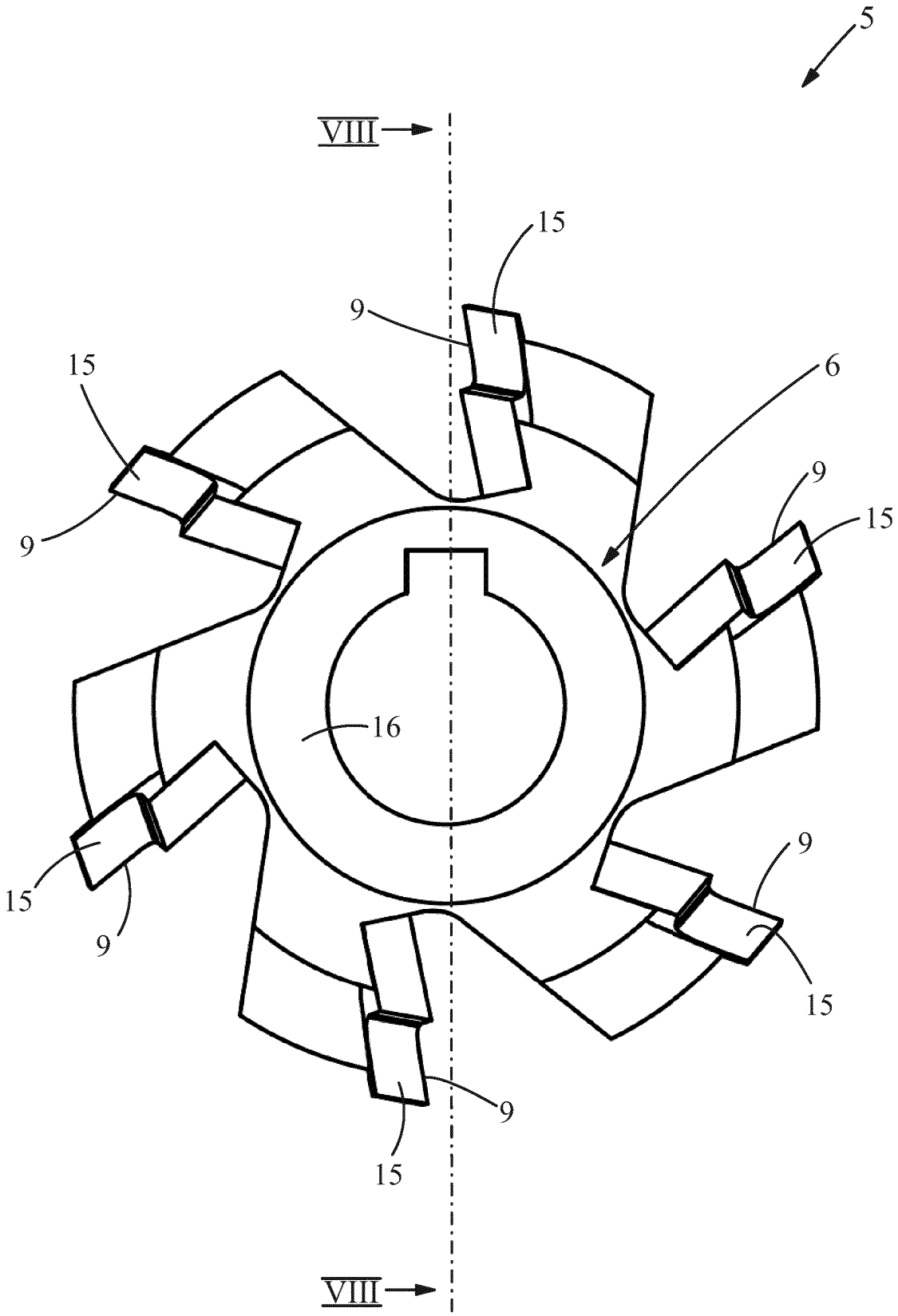

Fig. 7

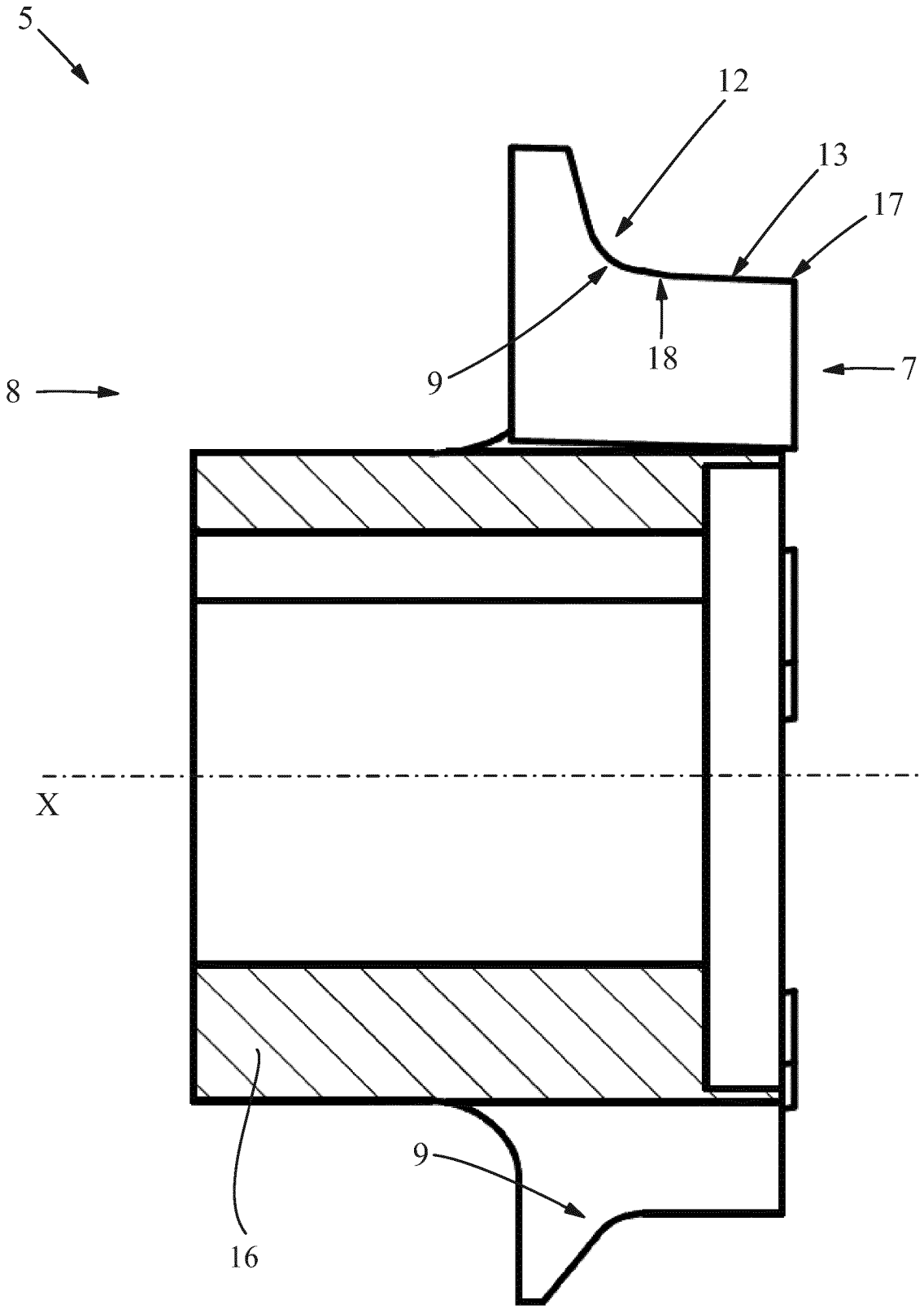

Fig. 8

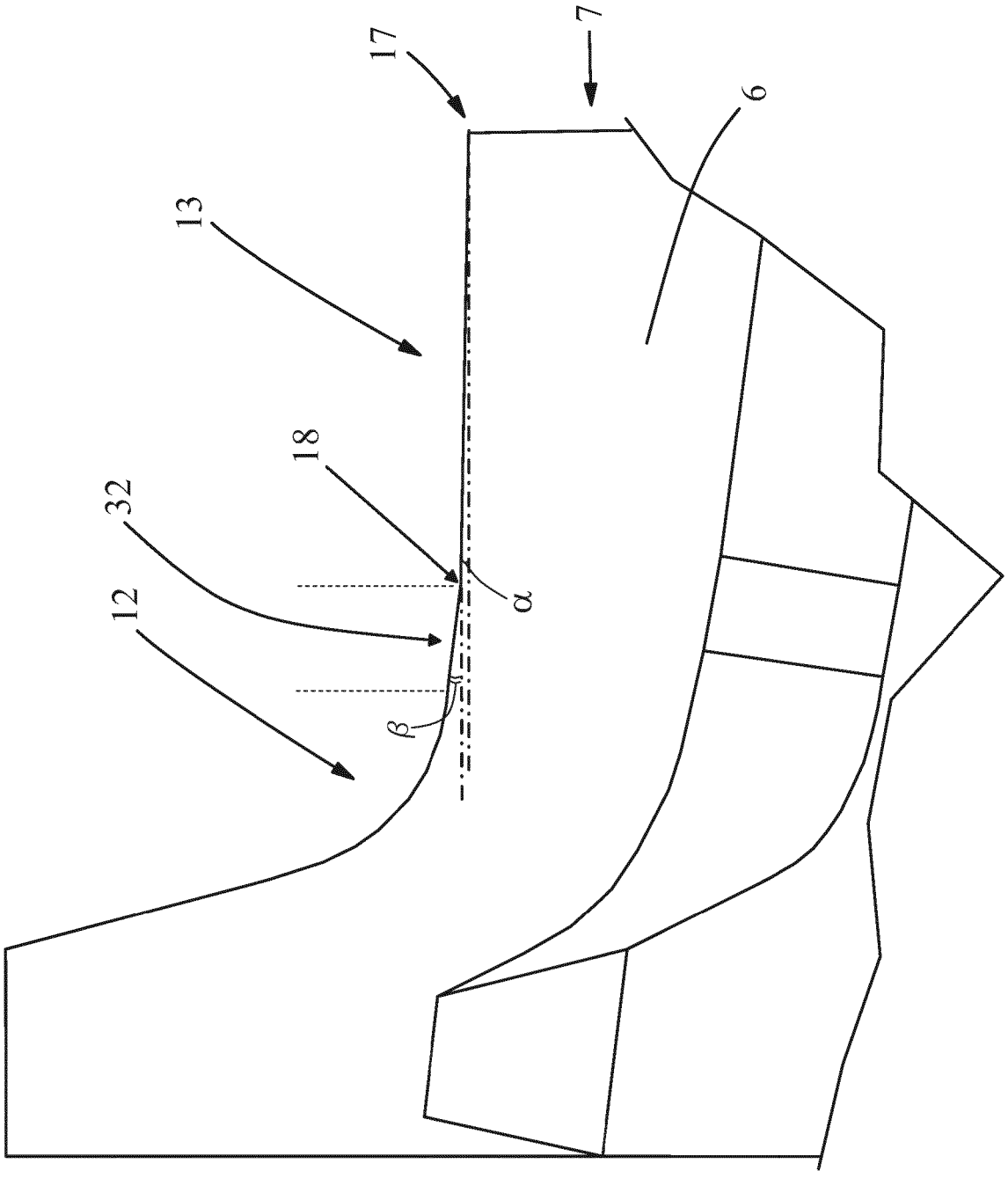

Fig. 9

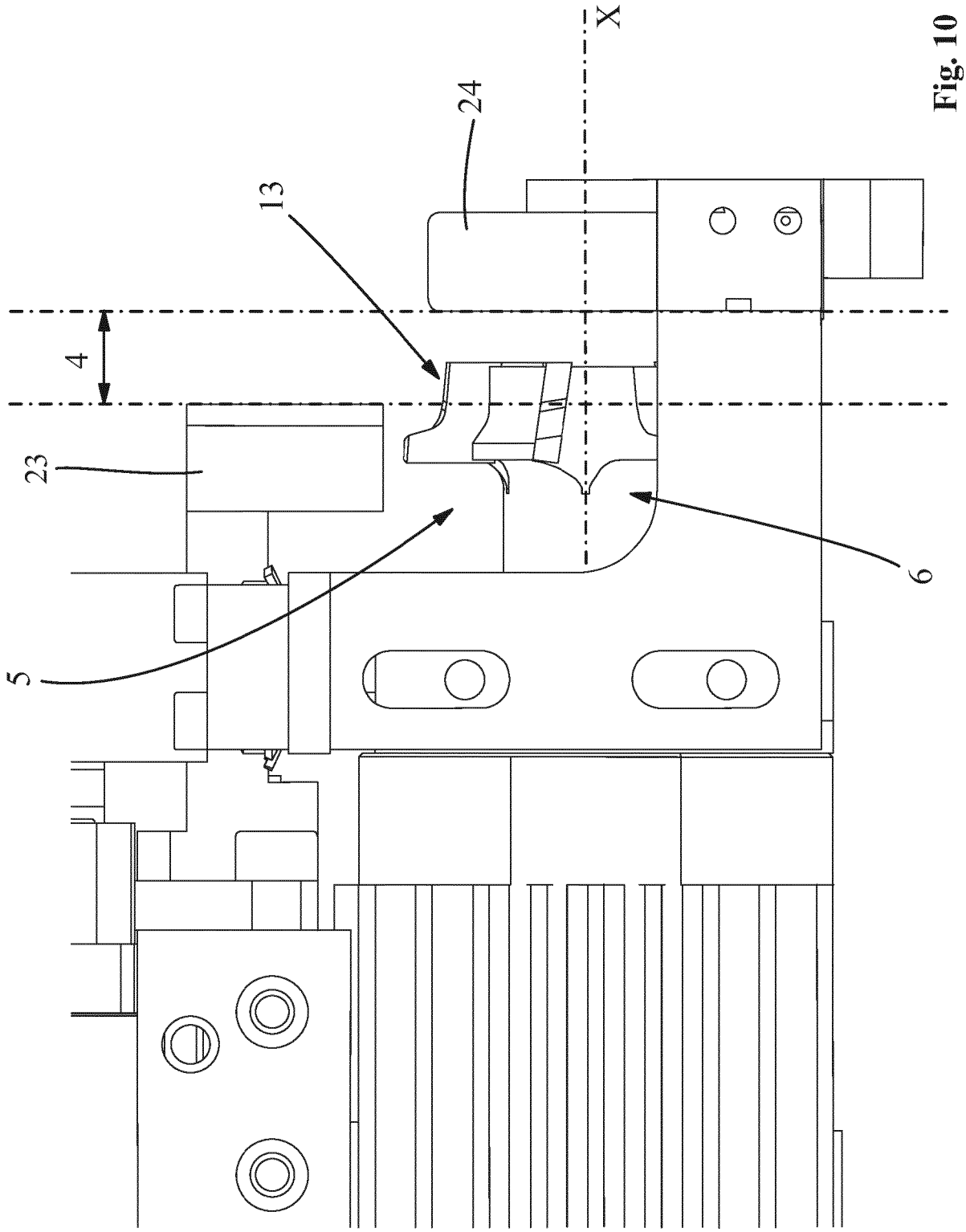

Fig. 10

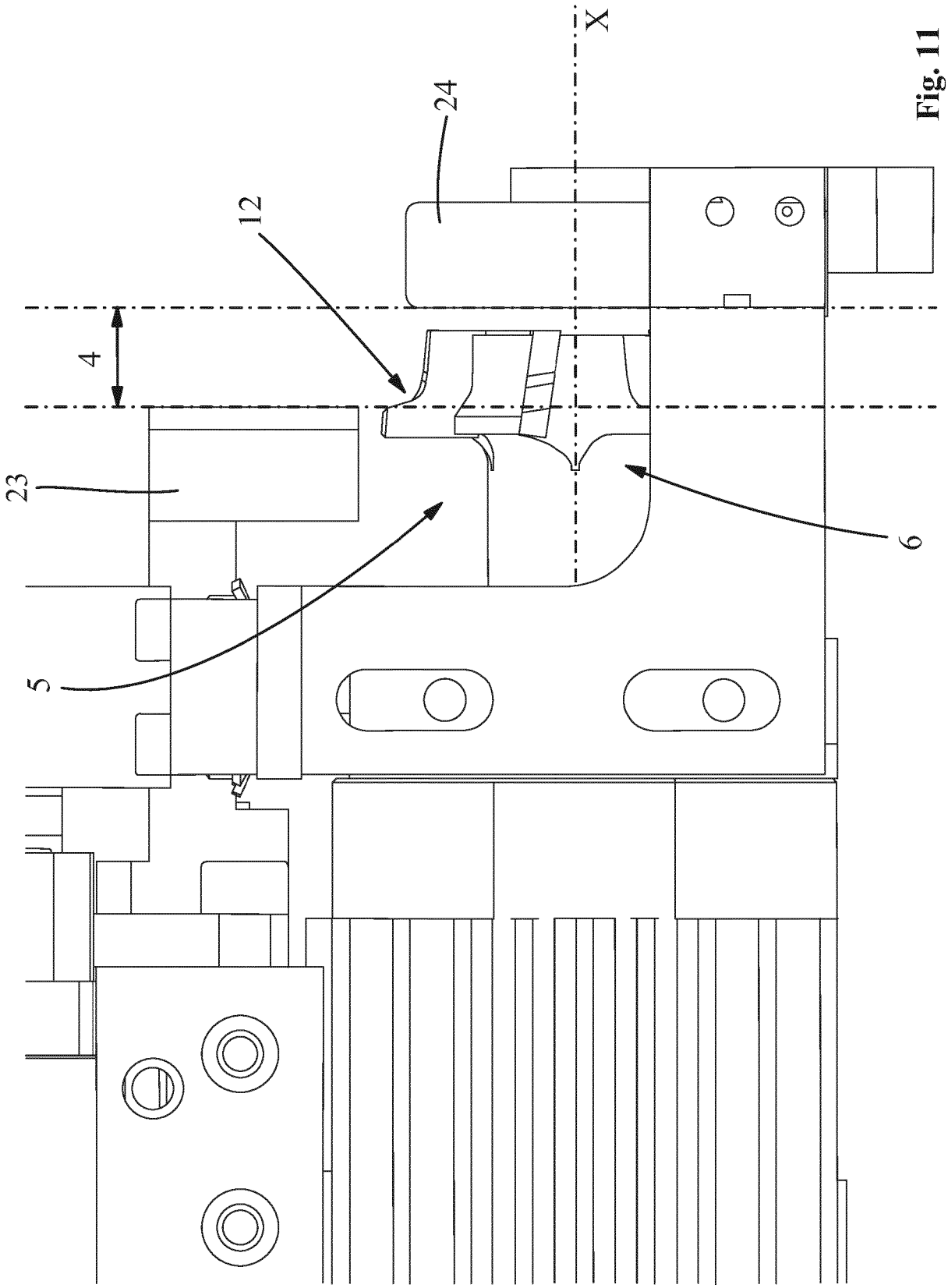

Fig. 11

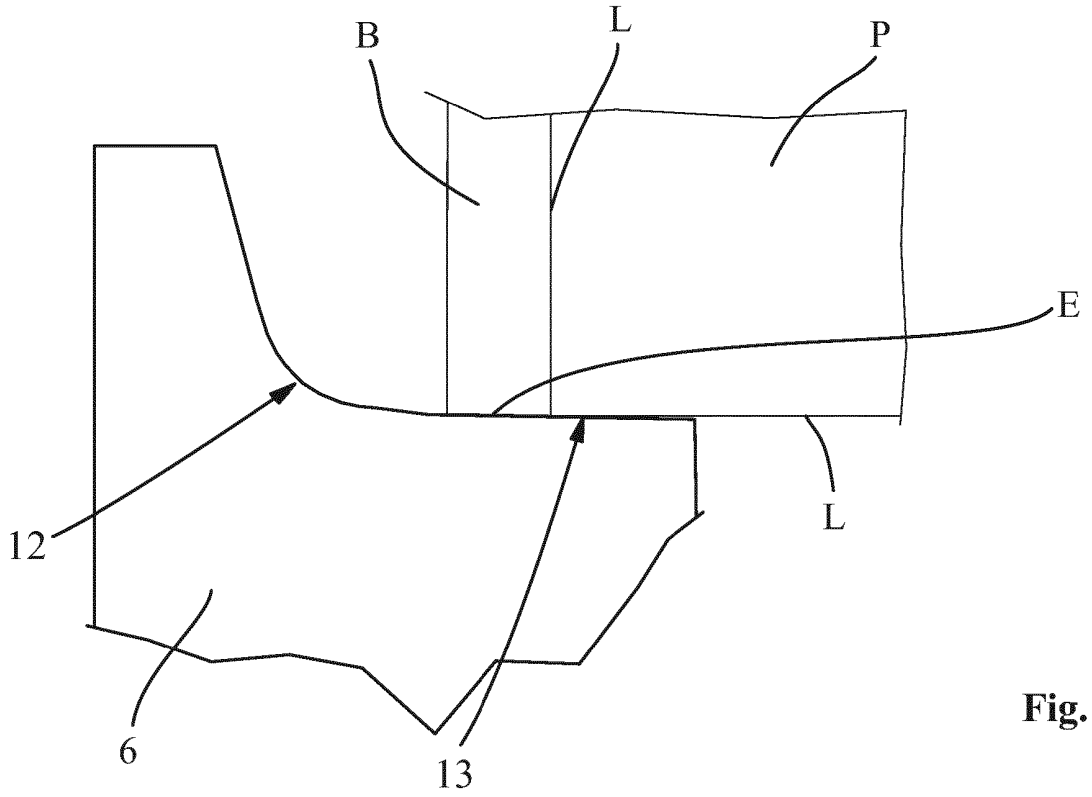

Fig. 12

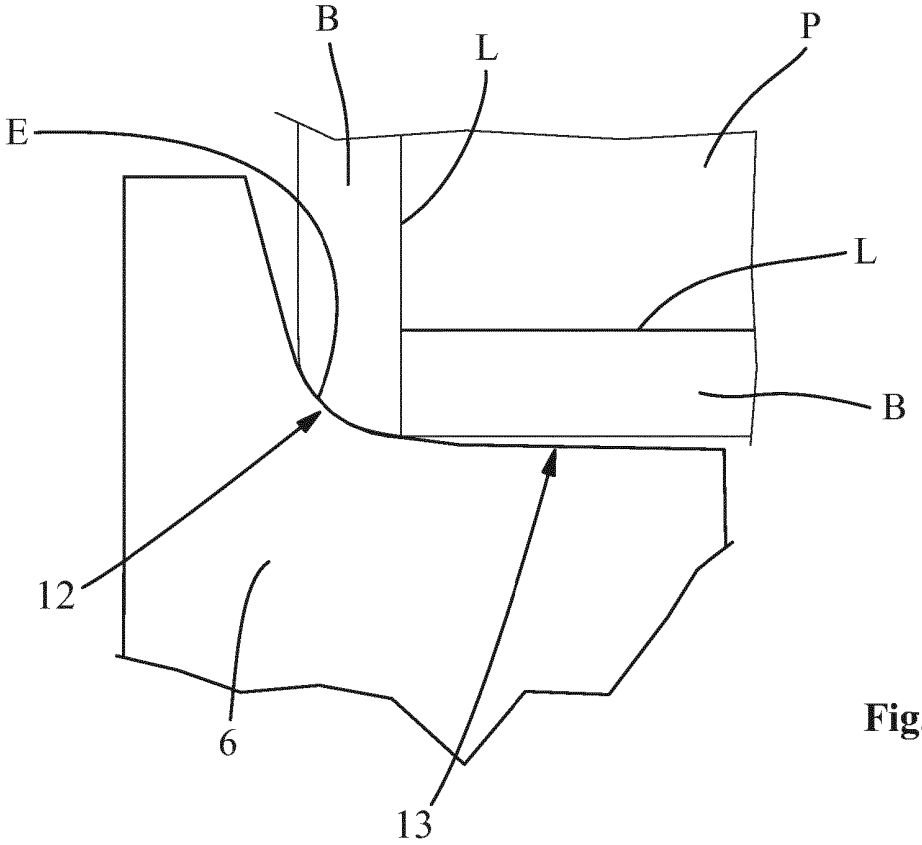

Fig. 13

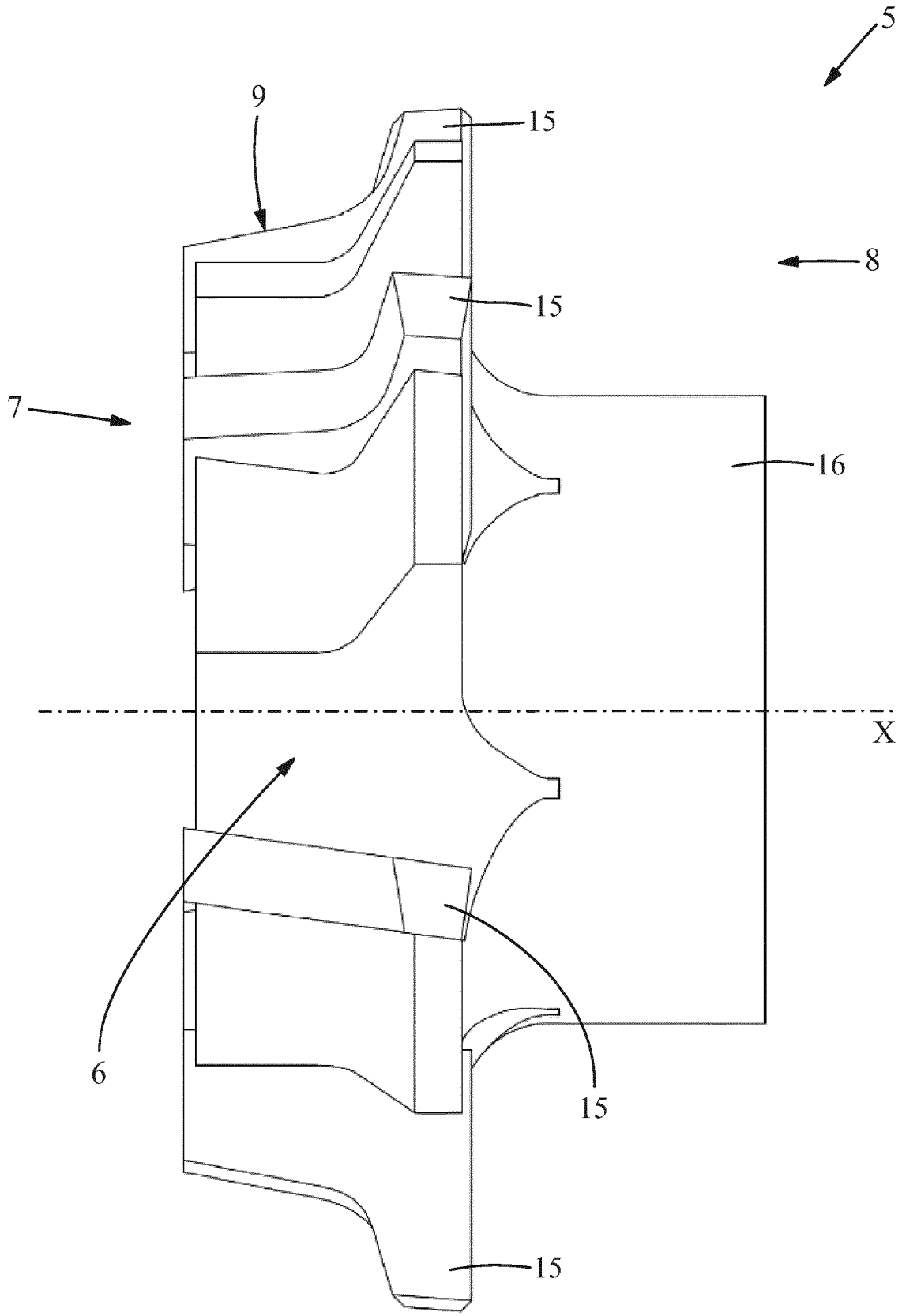

Fig. 14

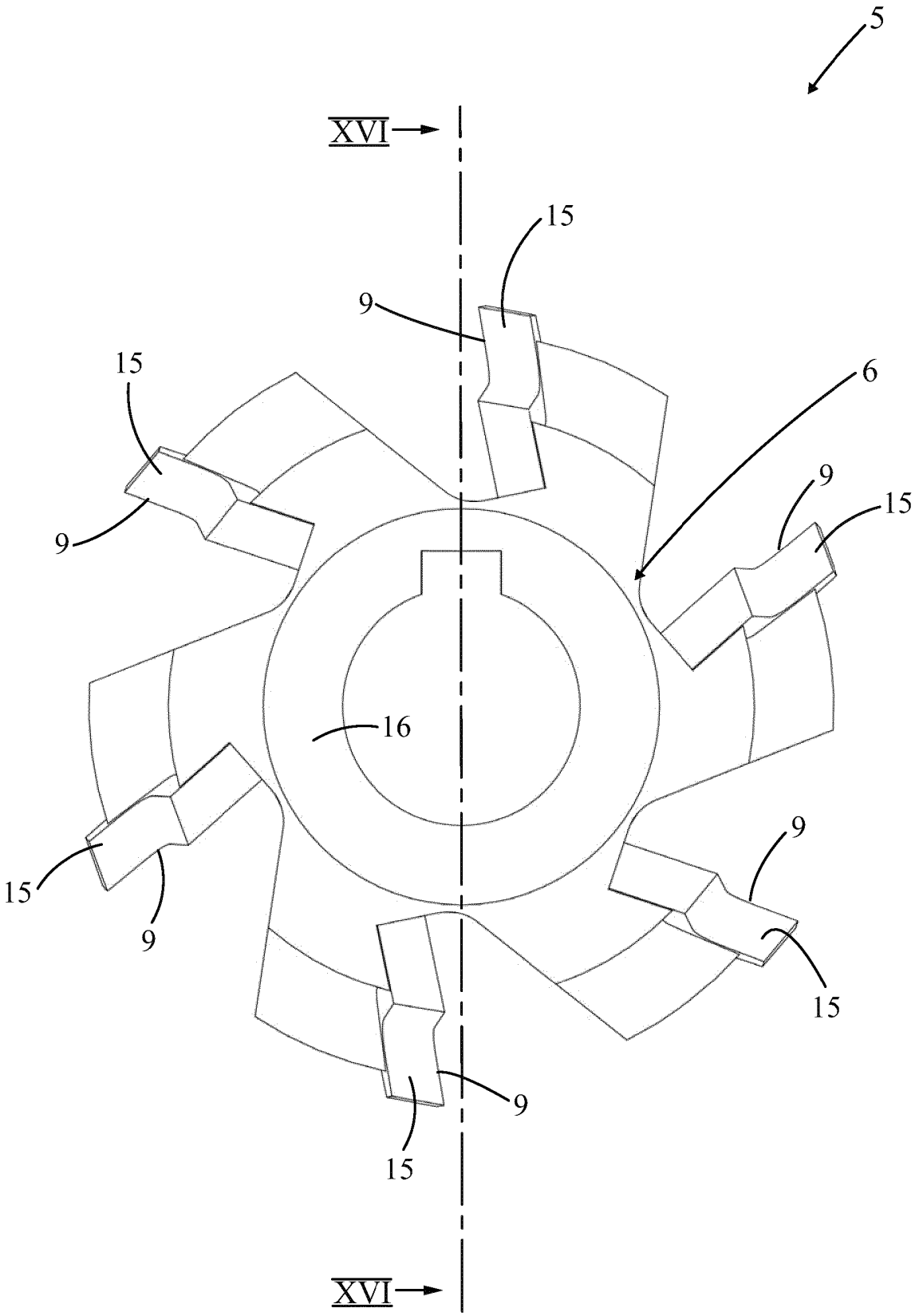

Fig. 15

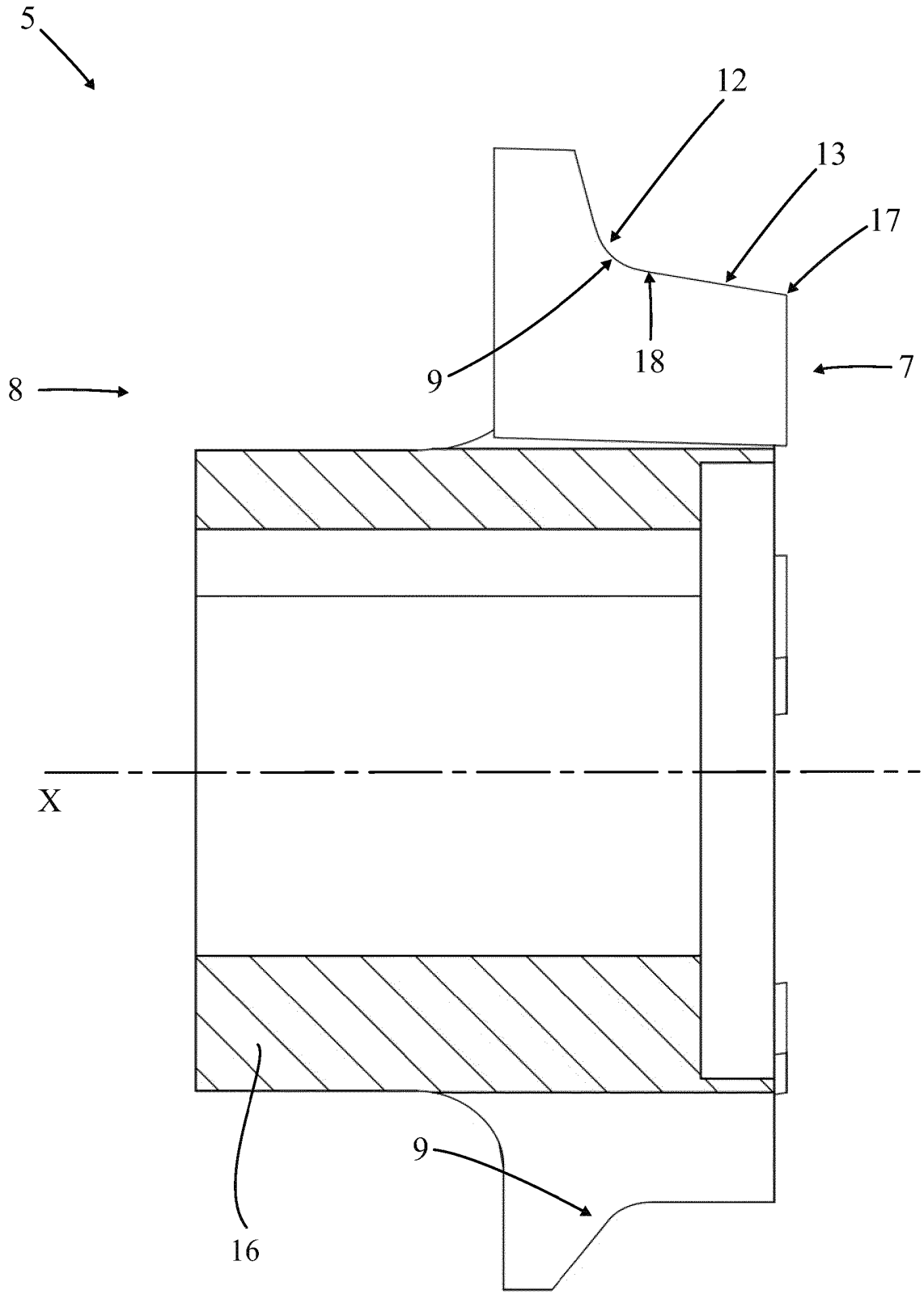

Fig. 16

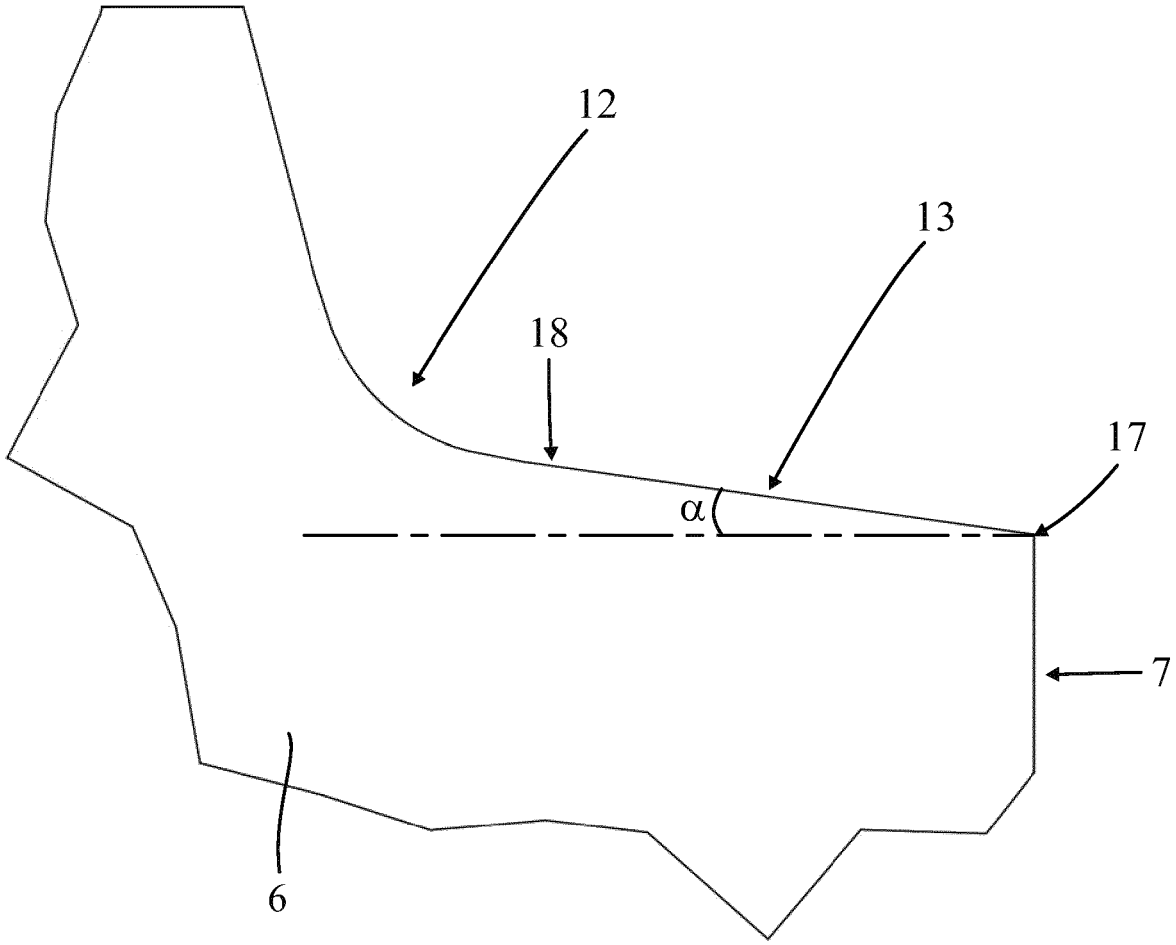

Fig. 17

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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