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(56) References cited:
**EP-A1- 2 011 614 EP-A2- 1 044 772
DE-A1- 2 503 830 DE-A1- 2 541 259
DE-C- 366 036**

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Description

[0001] The invention relates to an apparatus for milling, according to the preamble of claim 1. Such an apparatus is disclosed by DE 2 503 830.

[0002] A laminar edge-finishing element can be applied to one or more sides of panels made of wood or composite wood-based material or the like.

[0003] The edge element is milled in such a manner as to round and/or chamfer and/or eliminate, the sharp rims of the edge element.

[0004] An apparatus is known for milling an edge element of a panel comprising a milling unit that has a miller that is arranged for removing from the edge element the excess of material, and a rotation device arranged for rotating the miller.

[0005] The miller includes cutting elements, which have a determined cutting profile and cut the edge element on the base of the cutting profile thereof, i.e. the cutting elements cut from the edge element, and thus also from the panel, parts of the rim of the edge element in such a manner that the profile of the rim corresponds to the cutting profile.

[0006] The apparatus further comprises a further milling unit that has a further miller which is also arranged for removing from the edge element the excess of material, the aforesaid rotation device also rotating the further miller.

[0007] The further miller includes further cutting elements, which have a determined further cutting profile and cut the edge element on the base of the further cutting profile thereof, i.e. the cutting elements cut from the edge element, and thus also from the panel, parts of the rim of the edge element in such a manner that the profile of the rim corresponds to the further cutting profile.

[0008] The aforesaid rotation device includes a shaft that is rotatable around a rotation axis, on which the milling unit and the further milling unit are mounted coaxially.

[0009] Further, the milling unit and the further milling unit are movable in relation to one another along a movement direction, which is parallel to and coincides with the aforesaid rotation axis, between a first operating configuration, in which the milling unit interacts with the edge element and the further milling unit does not interact with the edge element, and a second operating configuration, in which the further milling unit interacts with the edge element and the milling unit does not interact with the edge element.

[0010] Further, in the milling unit and in the further milling unit a conical surface and a further conical surface are made respectively, the conical surface being arranged for interacting in a shapingly coupled manner with the further conical surface to guide the milling unit and the further milling unit between the first operating configuration and the second operating configuration.

[0011] In other words, the conical surface and the further conical surface enable the further milling unit to be centred, i.e. the further milling unit to be correctly posi-

tioned.

[0012] A drawback of this apparatus is that, in use, it has frequent centring problems.

[0013] These centring problems are due to the deposit on the aforesaid conical surface, during the movement of the milling units between the first operating configuration and the second operating configuration, of parts removed from the edge element and/or of dust that penetrates, during this movement, an internal zone of the apparatus defined between the milling unit and the further milling unit.

[0014] This implies the need to provide frequent machine stops to perform the indispensable cleaning operations of the aforesaid conical surface, these operations being particularly slow and laborious.

[0015] Also, this entails often poor machining quality due to the incorrect positioning of the further milling unit, with the consequent rejection of many machined workpieces.

[0016] DE 2503830 and DE 2541259 disclose a milling tool especially for machining edges of workpieces, comprising two cutter halves, whose teeth or knife laterally overlap each other, and means for shifting the cutter halves axially against each other or from each other. The means for displacing the cutter halves comprises opposite threads that are carried out in the cutter halves and engage respectively a threaded portion of a receiving sleeve and a threaded projection of a part connected in rotation with said sleeve. The adjustment of the milling tool is made by a rotational movement of the sleeve that causes the cutter halves being axially displaced in mutually opposite directions.

[0017] EP 2011614 discloses an apparatus for milling an object comprises a cutting unit, a further cutting unit and driving means for moving said cutting unit and said further cutting unit with respect to one another along a movement direction. The driving means can move alternatively one of the two cutting units towards a panel rim; the two cutting units may thus interact on the rim alternatively and without an operator needing to remove manually one of the two cutting units. An object of the invention is to improve apparatuses for milling a rim of a panel.

[0018] A further object of the invention is to make an apparatus for milling that is more reliable and precise than known apparatuses.

[0019] The invention comprises an apparatus for milling as defined in independent claim 1.

[0020] Owing to the invention it is possible to obtain an apparatus for milling a rim of a panel that is more reliable and precise than known apparatuses.

[0021] In fact, said sealing means prevents parts removed from the rim and/or dust from penetrating, in said first operating configuration and in said second operating configuration, said internal zone.

[0022] More precisely, said sealing means prevents these parts removed from the rim and/or dust from being deposited on possible centring surfaces positioned in said internal zone and provided between said milling unit

and said further milling unit, these parts removed from the rim and/or dust causing, as said above, centring draw-backs in the known apparatuses.

[0023] The invention can be better understood and implemented with reference to the attached drawings, which illustrate an embodiment thereof by way of non-limiting example, in which:

Figure 1 is a schematic cross section of an apparatus in an operating configuration;

Figure 2 is an enlarged and sectioned view of a cutting unit and of a further cutting unit included in the apparatus in Figure 1 in the aforesaid operating configuration;

Figure 3 is a view like the one in Figure 2 of the cutting unit and of the further cutting unit, in a further operating configuration;

Figure 4 is an enlarged view of Figure 3;

Figure 5 is a frontal view of the cutting unit and of the further cutting unit;

Figure 6 is a partially exploded perspective view of the cutting unit and of the further cutting unit;

Figure 7 is a plan and schematic view of a panel and of the apparatus in figure 1;

Figure 8 is a partial lateral view of a panel.

[0024] With reference to Figure 7 there is shown an apparatus 1 for milling an edge element 2 that has been applied to a panel 3.

[0025] The edge element 2 has a height and a length that is greater than the thickness and respectively the length of the panel 3.

[0026] It is thus necessary to trim the edge element 2, i.e. separate therefrom and thus from the panel 3, those edge element parts that protrude from the profile of the section of the panel 3.

[0027] Further, during trimming, the rims of the edge element 2 are rounded in such a manner that the panel 3 does not have sharp rims.

[0028] Figure 7 shows the panel 3, which is moved by movement means that is not shown along a movement direction A1 that is substantially arranged according to a prevalent dimension of the edge element 2.

[0029] At the edge element 2 the apparatus 1 is positioned, which is arranged on a side opposite the panel 3 with respect to the edge element 2.

[0030] As shown in Figure 8, the movement means defines a supporting plane P on which the panel 3 is moved.

[0031] The apparatus 1 is arranged for interacting with a portion 4 of the edge element 2, arranged at a rim of the edge element 2 positioned near the supporting plane P, and extends along the movement direction A1 (Figure 8).

[0032] The apparatus 1, as shown in Figure 1, comprises a rotation device 5, including a motor, for example an electric motor. The rotation device 5 is arranged for rotating a shaft 6 around a rotation axis C that is sub-

stantially perpendicular to the movement direction A1 (Figures 1 and 7).

[0033] The apparatus 1 further comprises a cutting unit 55, comprising a supporting body 7, having a substantially disc shape (Figures 1-4 and 6).

[0034] In the centre of the supporting body 7 a hole 8 is provided, which is shaped in such a manner that the supporting body 7 can be mounted on the shaft 6.

[0035] The supporting body 7 is fixed to an end zone 20 of the shaft 6 through connecting means that is not shown in such a manner that the rotation device 5 can rotate the supporting body 7 around the rotation axis C.

[0036] The connecting means may comprise keys, a first part of which is received inside cavities 9 obtained on the supporting body 7 at the hole 8.

[0037] The keys further comprise a second part that is received inside further cavities, which are not shown, obtained on the shaft 6.

[0038] The keys are maintained in position by a washer 48 which is fixed to the shaft 6 by a screw that is received in a threaded hole 49, obtained in the end zone 20.

[0039] A projecting external wall 18 is obtained in a peripheral zone 79 of the supporting body 7.

[0040] The projecting external wall 18, which is substantially annular in shape, projects axially from and surrounds the supporting body 7.

[0041] A plurality of projecting elements 11 arranged at equivalent angular distances D projects from the projecting external wall 18 radially and partially axially.

[0042] The cutting unit 55 further comprises a plurality of cutting elements 12.

[0043] Each cutting element 12 is fixed to the respective projecting element 11, in particular part of a first face 13 of the cutting element 12 adheres to a face of the projecting element 11, through fixing means that is not shown.

[0044] The cutting elements 12 have a cutting profile 14 and, during rotation of the supporting body 7, they cut the portion 4 according to the cutting profile 14.

[0045] In particular, the supporting body 7 rotates around the rotation axis C according to a rotation direction R1 (Figures 5 and 6), in such a manner that during rotation the portion 4 interacts exclusively with the cutting elements 12.

[0046] Each projecting element 11, in fact, being retracted axially with respect to the corresponding cutting element 12, does not come into contact with the portion 4.

[0047] In particular, each projecting element 11 includes a first portion 80 for supporting a respective cutting element 12 and a second portion 81 positioned downstream of the first portion 80 with respect to the rotation direction R1.

[0048] Also, in an external surface 71 of the projecting external wall 18 a seat 72 is obtained, arranged for housing a gasket 70.

[0049] The apparatus 1 further comprises a further cutting unit 56, comprising a further supporting body 15 having a substantially disc shape (Figures 1-4 and 6).

[0050] Between the further supporting body 15 and the supporting body 7 there is defined an internal zone 99 of the apparatus 1 in which centring means 59 is positioned that is disclosed below.

[0051] In particular, the internal zone 99 is defined between mutually facing surfaces of the supporting body 7 and of the further supporting body 15, and is bound peripherally by the projecting external wall 18.

[0052] In the centre of the further supporting body 15 a further hole 17 is provided with dimensions that are greater than those of the hole 8.

[0053] In this manner also the further supporting body 15 can be inserted onto the shaft 6, in such a manner as to be positioned between the supporting body 7 and the rotation device 5 along a movement direction A2 coinciding with the rotation axis C.

[0054] In a further peripheral zone 54 of the further supporting body 15, which faces the supporting body 7, a further projecting external wall 78 is obtained.

[0055] The further projecting external wall 78, which is substantially annular in shape, projects axially from and surrounds the further supporting body 15.

[0056] In particular, the further projecting wall 78 projects axially towards the cutting unit 55, whilst the aforesaid projecting external wall 18 projects axially towards the further cutting unit 56.

[0057] Also, the further projecting wall 78 faces and is at least partially superimposed on the external surface 71 of the projecting external wall 18, the aforesaid gasket 70 being interposed, and acting between the projecting external wall 18 and the further projecting external wall 78.

[0058] From the further projecting wall 78 further projecting elements 19 protrude axially towards the cutting unit 55.

[0059] In particular, the further projecting elements 19 are arranged in a position downstream of the further supporting body 15 according to the movement direction A2.

[0060] Further, the further projecting elements 19 are arranged at a distance from the rotation axis C that is greater than the projecting external wall 18, in such a way that, as the further supporting body 15 is arranged near the supporting body 7, the further projecting elements 19 do not interfere with the supporting body 7 and are arranged in such a manner as to face the projecting external wall 18.

[0061] Also, the further projecting elements 19 have a width F that is substantially equal to and in particular slightly less than the angular distance D between two successive projecting elements 11.

[0062] In this manner, the further projecting elements 19 face, and, as will be disclosed better below, engage with the projecting elements 11 (Figure 5).

[0063] In other words, the further projecting elements 19 are shaped in such a manner as to be inserted, in use, between two successive projecting elements 11 such as to be rotated by the latter.

[0064] The further cutting unit 56 further comprises a

further plurality of further cutting elements 22. Each further cutting element 22 is fixed to the respective further projecting element 19, in particular, part of a further first face 23 of the further cutting element 22 adheres to a further face of the further projecting element 19, through further fixing means that is not shown.

[0065] The further cutting elements 22 are functionally shaped like the cutting elements 12 and have a further cutting profile 24, which may be different from the cutting profile 14. Also, each further projecting element 19 is retracted axially with respect to the corresponding further cutting element 22 in such a manner as not to come into contact with the portion 4.

[0066] Also, each further projecting element 19 further includes a further first portion 77 for supporting a respective further cutting element 22 and a further second portion 76 positioned downstream of the further first portion 77 with respect to the rotation direction R1.

[0067] The supporting body 7 and the further supporting body 15 are shaped in such a manner that the distance between one edge 42 of the cutting element 12 and the rotation axis C is substantially equivalent to the distance between a further edge 43 of the further cutting element 22 and the rotation axis C.

[0068] In one zone 75 of the further supporting body 15 facing the supporting body 7 and positioned at a shorter distance from the rotation axis C than the further peripheral zone 54, an projecting internal wall 74 is obtained, which faces the further projecting internal wall 78 and is positioned in said internal zone 99.

[0069] In this manner, the projecting internal wall 74 is positioned at a shorter distance from the rotation axis C than the further projecting external wall 78.

[0070] In other words, the projecting internal wall 74 has a radius that is less than that of the further projecting external wall 78.

[0071] The projecting internal wall 74, which is substantially annular in shape, projects axially from the further supporting body 15 towards the cutting unit 55, the projecting internal wall 74 extending axially for a portion that is greater than the further projecting external wall 78.

[0072] The projecting internal wall 74, which is concentric to the further projecting external wall 78, cooperates with the latter to form a groove 73 shaped in such a manner as to be able to receive, in use, the projecting external wall 18, the latter having a radius comprised between the radius of the projecting internal wall 74 and of the further projecting external wall 78.

[0073] In this manner, in use, the further projecting external wall 78 and the projecting internal wall 74 face, at least partially, and on opposite sides, the projecting external wall 18.

[0074] The apparatus 1 further comprises a driving device 25, arranged for reciprocally moving the cutting unit 55 and the further cutting unit 56 along the movement direction A2. More precisely, the driving device 25 moves the further supporting body 15 away from and towards the supporting body 7.

[0075] The driving device 25 comprises first driving means, arranged for moving the further cutting unit 56 towards the cutting unit 55, and second driving means arranged for moving the further cutting unit 56 away from the cutting unit 55.

[0076] The driving device 25 comprises a substantially cylindrical frame 68, inside which a cylindrical body 39 is housed and is axially slidable according to the movement direction A2. In particular, the body 39 is positioned between the further supporting body 15 and the rotation device 5 along the movement direction A2.

[0077] The body 39 is inserted onto the shaft 6 but is not fixed to the latter and does not therefore rotate together with the shaft 6.

[0078] The driving device 25 further comprises a further cylindrical body 65 mounted on the body 39 as explained below.

[0079] The further body 65 is positioned between the rotation device 5 and the further supporting body 15 along the movement direction A2.

[0080] The further body 65 comprises a head portion 64 fixed by screws, which are not shown, to the further supporting body 15, the heads of the screws being housed in openings 63 obtained in the further body 15 peripherally to the further hole 17.

[0081] The further body 65 further comprises an elongated portion 62 extending along the movement direction A2 and mounted slidably on the shaft 6, the elongated portion 62 extending substantially over the entire length of the shaft 6.

[0082] In this manner, the further body 65 is inserted onto and is slidable in relation to the shaft 6 but is not fixed to the latter and does not therefore rotate together with the shaft 6.

[0083] Between the body 39 and the further body 65 revolving means is arranged, in this case a pair of rolling-element bearings 60, 61, in such a manner that the body 39 rotatably supports the further body 65.

[0084] The bearings 60, 61 are maintained in position along the direction A2 by a first axial positioning element 46, or first ring nut, and a second axial positioning element 47, or second ring nut, acting respectively on a first bearing 60 and on a second bearing 61.

[0085] In particular, the first axial positioning element 46 fixed to the further body 65, is mounted slidably and free to rotate on the shaft 6 and is positioned between the body 39 and the further body 65.

[0086] On the other side, the second axial positioning element 47 fixed to the body 39 is mounted slidably and free to rotate on the shaft 6 and is positioned between the frame 68 and the body 39.

[0087] The first driving means comprises a chamber 33, which is defined by the frame 68 and by the body 39.

[0088] In particular, the chamber 33 is defined by an internal cylindrical wall 35, which is comprised in the frame 68 and inserted onto the shaft 6, and an external cylindrical wall 34, which is comprised in the frame 68, inserted onto the shaft 6 and has a radius that is greater

than that of the internal cylindrical wall 35.

[0089] In the body 39 there is a hollow facing the external cylindrical wall 34 in which a seal 45 is inserted, just as in the internal cylindrical wall 35 a further hollow is obtained in which a further seal 44 is inserted, the seal 45 and the further seal 44 acting between the body 39 and the frame 68 to ensure the seal of the chamber 33.

[0090] The chamber 33 is further defined by a bottom wall 37, comprised in the frame 68 and arranged near the rotation device 5, and by a further bottom wall 53 of the body 39 facing, and arranged downstream of, the bottom wall 37 according to the movement direction A2.

[0091] The first driving means further comprises a device 82 that when it is driven delivers a pressurised fluid into the chamber 33 through a conduit 38.

[0092] When the device 82 is driven, the fluid enters the chamber 33, and exerts pressure on the further bottom wall 53.

[0093] In this manner the body 39, acting as a piston, is moved according to the movement direction A2.

[0094] The second driving means comprises elastic means 40, for example a spring, arranged according to the movement direction A2.

[0095] The elastic means 40 is fixed to an abutting wall 41, fixed to the external cylindrical wall 34 and acts on a further abutting wall 84 of the body 39 in a direction opposite the movement direction A2.

[0096] The apparatus 1 further comprises a movement device, which is not shown, for example a pneumatic actuator, arranged for moving the rotation device 5 along the movement direction A2. The movement device thus moves along the direction A2 both the cutting unit 55 and the further cutting unit 56. During operation, the apparatus 1 can thus assume a first operating configuration X1, shown in Figures 3 and 4, in which the second driving means is driven.

[0097] In the first operating configuration X1, when the rotation device 5 rotates the shaft 6, the cutting elements 12 interact with the portion 4, thus rounding the rim of the edge element 2 according to the cutting profile 14.

[0098] The further cutting elements 22 are in fact more retracted than with respect to the portion 4 than the cutting elements 12 along the movement direction A2, in such a manner as not to interact with the portion 4.

[0099] The position of the further supporting body 15, with which the further cutting elements 22 are associated, is in fact determined by the body 39, which is maintained in a retracted position by the elastic means 40.

[0100] In particular, the elastic means 40 maintains the further bottom wall 53 abutting on the internal cylindrical wall 35 and on the bottom wall 37.

[0101] If a user wishes to replace the cutting profile 14 with the further cutting profile 24, the apparatus 1 is placed in a second operating configuration X2 owing to the first driving means (Figures 1 and 2).

[0102] Initially, the movement device moves the rotation device 5 in a direction opposite to the movement direction A2, in such a way as to move the supporting

body 7, and thus the cutting elements 12, away from the edge element 2.

[0103] The first driving means is thus driven and the device thus delivers into the chamber 33 the pressurised fluid, which, by acting on the further bottom wall 53, moves the body 39, the further body 65 and the further supporting body 15 to the supporting body 7 along the movement direction A2.

[0104] In this manner, the further supporting body 15, by moving together with the body 39 and the further body 65, is moved along the movement direction A2 towards the portion 4, in such a manner that the further cutting elements 22 jut out the cutting elements 12 and are in contact with the edge element 2.

[0105] During advancing, the further supporting body 15 is guided to the correct position by the aforesaid centring means 59. The centring means 59 is positioned in the internal zone 99. In this manner, the centring means 59 is nearer the rotation axis C than the projecting internal wall 74.

[0106] The centring means 59 comprises a conical centring surface 50, obtained in a zone of the supporting body 7 that faces the further supporting body 15.

[0107] The conical centring surface 50 interacts with a complementary conical surface 51 obtained on an edge of the further hole 17 when the apparatus 1 is in the second operating configuration X2.

[0108] Also, the apparatus 1 comprises an abutting surface 85 and a further abutting surface 86 positioned in the internal zone 99.

[0109] In particular, the abutting surface 85 and the further abutting surface 86 face one another and are obtained respectively in the supporting body 7 and in the further supporting body 15, the abutting surface 85 abutting on the further abutting surface 86 when the apparatus 1 is in the second operating configuration X2.

[0110] In particular, when the apparatus 1 assumes the second operating configuration X2, the complementary conical surface 51 interacts in a shapingly coupled manner with the conical centring surface 50 enabling the further supporting body 15 to be correctly positioned, whereas the abutting surface 85 abuts on the further flat surface 86.

[0111] In this manner, in the second operating configuration X2, the further cutting elements 22 interact with the portion 4. In particular, when the rotation device 5 rotates the shaft 6, the supporting body 7 is rotated, but without the cutting elements 12 interacting with the portion 4.

[0112] The supporting body 7 rotates and contacts the further supporting body 15, which is in this manner rotated in turn. In particular, a second face 92 of the second portion 81 contacts a further face 93 of the further first portion 77, the further projecting element 19 being positioned after the projecting element 11 according to the rotation direction R1.

[0113] In this manner, the further projecting elements 19, by rotating according to the rotation direction R1,

round the rim of the edge element 2 according to the further cutting profile 24, which is different from the cutting profile 14. If a user wishes to resume using the cutting profile 14, the second driving means returns the apparatus to the first operating configuration X1.

[0114] Initially, the first driving means is activated in such a manner that the fluid exits the chamber 33 in such a manner as to diminish the pressure acting on the further bottom wall 53.

[0115] The elastic means 40 moves the body 39 according to the movement direction A2, the further cutting unit 56 then moves away from the edge element 2, in such a manner that the cutting elements 12 are nearer the portion 4 than the further cutting elements 22.

[0116] Subsequently, the movement device moves the rotation device 5 according to the movement direction A2, in such a manner as to move the supporting body 7, and thus the cutting elements 12, towards the edge element 2.

[0117] The apparatus 1 has assumed the first operating configuration X1, when the cutting elements 12 again contact the portion 4.

[0118] Also in the first operating configuration X1, when the rotation device 5 rotates the shaft 6, the supporting body 7 rotates and contacts the further supporting body 15, which is in this manner rotated in turn.

[0119] Nevertheless, whilst the cutting elements 12 contact the portion 4 the further cutting elements 22 do not interact with the latter.

[0120] The apparatus 1 further comprises positioning means, which is not shown, arranged for maintaining the apparatus 1 at the correct distance from the portion 4 along a further direction A3 that is substantially perpendicular to the supporting plane P, in such a manner that the edge 42 and the further edge 43 are at a distance from the rotation axis C that is substantially equivalent to the distance between the supporting plane P and the rotation axis C.

[0121] The positioning means may comprise a roller that is suitable for engaging with a surface of the panel 3 onto which the edge element 2 is not applied.

[0122] The roller interacts with the surface of the panel 3 in transit and is induced to roll thereupon.

[0123] In this manner the roller is able to follow the transverse profile of the panel 3.

[0124] Further, it is the roller that ensures correct positioning of the apparatus 1, both when the apparatus assumes the first operating configuration X1 and when the apparatus 1 assumes the second operating configuration X2.

[0125] In use, the projecting external wall 18, the further projecting external wall 78, the projecting internal wall 74 and the gasket 70 form, and act as, sealing means to prevent, in the first operating configuration X1 and in the second operating configuration X2, parts removed from the edge element 2 and/or dust from penetrating inside the internal zone 99 and being deposited on the centring means 59, compromising the correct positioning

of the further cutting unit 56.

[0126] In particular, the further projecting external wall 78 is superimposed axially on the projecting external wall 18 for a length that is greater than a movement, measured along the movement direction A2, of the further cutting unit 56 with respect to the cutting unit 55 between the first operating configuration X1 and the second operating configuration X2, in such a way that the further projecting wall 78 remains, during this movement, in contact with the gasket 70, the latter acting between the projecting external wall 18 and the further projecting external wall 78.

[0127] This enables an apparatus 1 to be obtained for milling an edge element 2 of a panel 3 that is more reliable and precise than known apparatuses.

[0128] In one embodiment of the invention, which is not shown, the gasket 70 is not provided.

[0129] Also in this embodiment, nevertheless, the further projecting external wall 78 and the projecting internal wall 74 face, at least partially, the projecting external wall 18 such as to form a substantially U-shaped labyrinth shaped such as to prevent, in the first operating configuration X1 and in the second operating configuration X2, parts removed from the edge element 2 and/or dust from penetrating the internal zone 99.

Claims

1. Apparatus for milling an object (2), comprising a cutting unit (55) and a further cutting unit (56), said cutting unit (55) and said further cutting unit (56) being movable in relation to one another between a first operating configuration (X1), in which said cutting unit (55) interacts with said object (2) and said further cutting unit (56) does not interact with said object (2) and a second operating configuration (X2), in which said further cutting unit (56) interacts with said object (2) and said cutting unit (55) does not interact with said object (2), said apparatus (1) comprising sealing means (18, 70, 74, 78), interposed between said cutting unit (55) and said further cutting unit (56), to prevent parts removed from said object (2) and/or dust from penetrating in an internal zone (99) of said apparatus (1) defined between said cutting unit (55) and said further cutting unit (56), in said first operating configuration (X1) and in said second operating configuration (X2), wherein said sealing means (18, 70, 74, 78) comprises a projecting external wall (18) of said cutting unit (55) and a further projecting external wall (78) of said further cutting unit (56), said further projecting external wall (78) facing, and at least being partially superimposed on, said projecting external wall (18), said apparatus (1) being **characterized in that** said sealing means (18, 70, 74, 78) comprises a projecting internal wall (74) of said further cutting unit (56), said projecting internal wall (74) cooperating with said further projecting external wall (78) to form a groove (73), said groove (73) being shaped so as to receive, in said first operating configuration (X1) and in said second operating configuration (X2), said projecting external wall (18).
2. Apparatus according to claim 1, wherein said further projecting external wall (78) is axially superimposed on said projecting external wall (18) for a length that is greater than a displacement of said further cutting unit (56) with respect to said cutting unit (55) between said first operating configuration (X1) and said second operating configuration (X2).
3. Apparatus according to claim 1, wherein said projecting external wall (18), said further projecting external wall (78) and said projecting internal wall (74), are annular walls.
4. Apparatus according to any preceding claim, wherein said sealing means (18, 70, 74, 78) comprises a gasket (70) interposed, and acting, between said projecting external wall (18) and said further projecting external wall (78), in said first operating configuration (X1) and in said second operating configuration (X2).
5. Apparatus according to claim 4, wherein said projecting external wall (18) comprises a seat (72) arranged for housing said gasket (70).
6. Apparatus according to any preceding claim, wherein said projecting external wall (18) is obtained in, and projects axially towards said further cutting unit (56) from, a supporting body (7) of said cutting unit (55).
7. Apparatus according to claim 6, wherein said cutting unit (55) comprises projecting elements (11) that project radially from said supporting body (7), with said projecting elements (11) there being associated cutting elements (12), arranged for cutting said object (2) according to a cutting profile (14).
8. Apparatus according to claim 7, wherein said projecting elements (11) project radially from said projecting external wall (18).
9. Apparatus according to any preceding claim, wherein said further projecting external wall (78) is obtained in, and projects axially towards said cutting unit (55) from, a further supporting body (15) of said further cutting unit (56).
10. Apparatus according to claim 9, wherein said further cutting unit (56) comprises further projecting elements (19) that project axially from said further supporting body (15) towards said cutting unit (55), with said further projecting elements (19) there being as-

sociated further cutting elements (22), arranged for cutting said object (2) according to a further cutting profile (24).

11. Apparatus according to claim 10, wherein said further projecting elements (19) project axially from said further projecting external wall (78).
12. Apparatus according to claim 10, or 11, wherein each of said further projecting elements (19) projects towards said cutting unit (55) such as to be able to be inserted between two of said successive projecting elements (11).
13. Apparatus according to any one of claims 10 to 12, wherein said further projecting elements (19) have a width (F) that is substantially equal to an angular distance (D) between two of said successive projecting elements (11).
14. Apparatus according to any preceding claim, and comprising a rotation device (5) arranged for driving both said cutting unit (55) and said further cutting unit (56) around a rotation axis (C), in particular said rotation device (5) comprises a shaft (6) on which said cutting unit (55) and said further cutting unit (56) are mounted coaxially.
15. Apparatus according to any preceding claim, and comprising centring means (59) for guiding said cutting unit (55) and said further cutting unit (56) between said first operating configuration (X1) and said second operating configuration (X2), said centring means (59) being positioned in said internal zone (99).
16. Apparatus according to claim 15, wherein said centring means (59) comprises a conical surface (50) obtained in said cutting unit (55), and a further conical surface (51), obtained in said further cutting unit (56), said conical surface (50) being arranged for interacting in a shapingly coupled manner with said further conical surface (51) in said second operating configuration (X2).

Patentansprüche

1. Werkzeug zum Fräßen eines Gegenstandes (2), umfassend eine Schneideeinheit (55) und eine weitere Schneideeinheit (56), wobei die Schneideeinheit (55) und die weitere Schneideeinheit (56) im Bezug zueinander beweglich sind zwischen einer ersten Betriebseinstellung (X1), in welcher die Schneideeinheit (55) mit dem Gegenstand (2) wechselwirkt und die weitere Schneideeinheit (56) nicht mit dem Gegenstand (2) wechselwirkt, und einer zweiten Betriebseinstellung (X2), in welcher die wei-

tere Schneideeinheit (56) mit dem Gegenstand (2) wechselwirkt und die Schneideeinheit (55) nicht mit dem Gegenstand (2) wechselwirkt, wobei das Werkzeug (1) ein Abdichtmittel (18, 70, 74, 78) umfasst, eingefügt zwischen der Schneideeinheit (55) und der weiteren Schneideeinheit (56), um vom Gegenstand (2) entfernte Teile und/oder Staub davon abzuhalten, in einen Innenbereich (99) des Werkzeuges (1) zwischen der Schneideeinheit (55) und der weiteren Schneideeinheit (56) in der ersten Betriebseinstellung (X1) und in der zweiten Betriebseinstellung (X2) einzudringen, wobei das Abdichtmittel (18, 70, 74, 78) eine überstehende äußere Wand (18) der Schneideeinheit (55) und eine weitere überstehende äußere Wand (78) der weiteren Schneideeinheit (56) umfasst, wobei die weitere überstehende äußere Wand (78) der überstehenden äußeren Wand (18) zugewandt und zumindest teilweise von dieser überlagert ist, wobei das Werkzeug (1) **dadurch gekennzeichnet ist, dass** das Abdichtmittel (18, 70, 74, 78) eine überstehende innere Wand (74) der weiteren Schneideeinheit (56) umfasst, wobei die überstehende innere Wand (74) mit der weiteren überstehenden äußeren Wand (78) zusammenwirkt, um eine Nut (73) auszubilden, wobei die Nut (73) so geformt ist, um die überstehende äußere Wand (18) in der ersten Betriebseinstellung (X1) und in der zweiten Betriebseinstellung (X2) aufzunehmen.

2. Werkzeug nach Anspruch 1, wobei die weitere überstehende äußere Wand (78) auf einer Länge, die größer ist als ein Abstand der weiteren Schneideeinheit (56) mit Bezug auf die Schneideeinheit (55) zwischen der ersten Betriebseinstellung (X1) und der zweiten Betriebseinstellung (X2), der überstehenden äußeren Wand (18) axial überlagert ist.
3. Werkzeug nach Anspruch 1, wobei die überstehende äußere Wand (18), die weitere überstehende äußere Wand (78) und die überstehende innere Wand (74) ringförmige Wände sind.
4. Werkzeug nach einem der vorherigen Ansprüche, wobei das Abdichtmittel (18, 70, 74, 78) einen Dichtflansch (70) umfasst, der zwischen der überstehenden äußeren Wand (18) und der weiteren überstehenden äußeren Wand (78), in der ersten Betriebseinstellung (X1) und in der zweiten Betriebseinstellung (X2), eingeführt ist und fungiert.
5. Werkzeug nach Anspruch 4, wobei die überstehende äußere Wand (18) eine Aufnahme (72) umfasst, die so angeordnet ist, um den Dichtflansch (70) aufzunehmen.
6. Werkzeug nach einem der vorherigen Ansprüche, wobei die überstehende äußere Wand (18) in einem Tragkörper (7) der Schneideeinheit (55) enthalten

ist und davon axial in Richtung der weiteren Schneideeinheit (56) erstreckt.

7. Werkzeug nach Anspruch 6, wobei die Schneideeinheit (55) überstehende Elemente (11) umfasst, welche sich radial vom Tragkörper (7) aus erstrecken, wobei zu den überstehenden Elementen (11) Schneideelemente (12) gehören, die zum Schneiden des Gegenstandes (2) nach einem Schneidprofil (14) angeordnet sind. 5
8. Werkzeug nach Anspruch 7, wobei die überstehenden Elemente (11) sich radial von der überstehenden äußeren Wand (18) aus erstrecken. 10
9. Werkzeug nach einem der vorherigen Ansprüche, wobei die weitere überstehende äußere Wand (78) in einem weiteren Tragkörper (15) der weiteren Schneideeinheit (56) enthalten ist und sich davon axial in Richtung der Schneideeinheit (55) erstreckt. 15
10. Werkzeug nach Anspruch 9, wobei die weitere Schneideeinheit (56) weitere überstehende Elemente (19) umfasst, welche sich axial von dem weiteren Tragkörper (15) in Richtung der Schneideeinheit (55) erstrecken, wobei zu den weiteren überstehenden Elementen (19) weitere Schneideelemente (22) gehören, die zum Schneiden des Gegenstandes (2) nach einem weiteren Schneidprofil (24) angeordnet sind. 20
11. Werkzeug nach Anspruch 10, wobei die weiteren überstehenden Elemente (19) sich axial von der weiteren überstehenden äußeren Wand (78) aus erstrecken. 25
12. Werkzeug nach Anspruch 10 oder 11, wobei sich jedes der weiteren überstehenden Elemente (19) in Richtung der Schneideeinheit (55) so erstreckt, dass es zwischen zwei aufeinanderfolgende überstehenden Elemente (11) eingeführt werden kann. 30
13. Werkzeug nach einem der Ansprüche 10 bis 12, wobei die weiteren überstehenden Elemente (19) eine Breite (F) haben, die im Wesentlichen gleich ist zu einem Winkelabstand (D) zwischen zwei aufeinanderfolgenden überstehenden Elementen (11). 35
14. Werkzeug nach einem der vorherigen Ansprüche, das eine Drehvorrichtung (5) umfasst, die angeordnet ist, um sowohl die Schneideeinheit (55) als auch die weitere Schneideeinheit (56) um eine Rotationsachse (C) anzutreiben, wobei die Drehvorrichtung (5) insbesondere eine Welle (6) umfasst, auf welchem die Schneideeinheit (55) und die weitere Schneideeinheit (56) koaxial befestigt sind. 40
15. Werkzeug nach einem der vorherigen Ansprüche, 45

das ein Zentriermittel (59) zum Führen der Schneideeinheit (55) und der weiteren Schneideeinheit (56) zwischen der ersten Betriebseinstellung (X1) und der zweiten Betriebseinstellung (X2) umfasst, wobei das Zentriermittel (59) im Innenbereich (99) angeordnet ist.

16. Werkzeug nach Anspruch 15, wobei das Zentriermittel (59) eine konische Oberfläche (50) umfasst, die in der Schneideeinheit (55) enthalten ist, und eine weitere konische Oberfläche (51), die in der weiteren Schneideeinheit (56) enthalten ist, wobei die konische Oberfläche (50) angeordnet ist, um in einer formgekoppelten Weise mit der weiteren konischen Oberfläche (51) in der zweiten Betriebseinstellung (X2) wechselzuwirken. 50

Revendications

1. Appareil destiné au fraisage d'un objet (2), comprenant une unité de coupe (55) et une unité de coupe supplémentaire (56), ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56) étant mobiles l'une par rapport à l'autre entre une première configuration de fonctionnement (X1), dans laquelle ladite unité de coupe (55) interagit avec ledit objet (2) et ladite unité de coupe supplémentaire (56) n'interagit pas avec ledit objet (2), et une deuxième configuration de fonctionnement (X2), dans laquelle ladite unité de coupe supplémentaire (56) interagit avec ledit objet (2) et ladite unité de coupe (55) n'interagit pas avec ledit objet (2), ledit appareil (1) comprenant des moyens d'étanchéité (18, 70, 74, 78) interposés entre ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56) afin d'empêcher que des éléments retirés de l'objet (2) et/ou de la poussière ne pénètrent dans une zone interne (99) dudit appareil (1) définie entre ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56), dans ladite première configuration de fonctionnement (X1) et dans ladite deuxième configuration de fonctionnement (X2), lesdits moyens d'étanchéité (18, 70, 74, 78) comprenant une paroi externe en saillie (18) de ladite unité de coupe (55) et une paroi externe en saillie supplémentaire (78) de ladite unité de coupe supplémentaire (56), ladite paroi externe en saillie supplémentaire (78) faisant face à ladite paroi externe en saillie (18) tout en lui étant au moins partiellement superposée, ledit appareil (1) étant **caractérisé en ce que** lesdits moyens d'étanchéité (18, 70, 74, 78) comprennent une paroi interne en saillie (74) de ladite unité de coupe supplémentaire (56), ladite paroi interne en saillie (74) coopérant avec ladite paroi externe en saillie supplémentaire (78) pour former une rainure (73), ladite rainure (73) étant d'une forme telle qu'elle est apte à recevoir, dans ladite première configuration de fonctionne- 55

ment (X1) et dans ladite deuxième configuration de fonctionnement (X2), ladite paroi externe en saillie (18).

2. Appareil selon la revendication 1, dans lequel ladite paroi externe en saillie supplémentaire (78) est superposée axialement à ladite paroi externe en saillie (18) sur une longueur qui est supérieure à un déplacement de ladite unité de coupe supplémentaire (56) par rapport à ladite unité de coupe (55) entre ladite première configuration de fonctionnement (X1) et ladite deuxième configuration de fonctionnement (X2). 5
3. Appareil selon la revendication 1, dans lequel ladite paroi externe en saillie (18), ladite paroi externe en saillie supplémentaire (78) et ladite paroi interne en saillie (74) sont des parois annulaires. 10
4. Appareil selon une quelconque revendication précédente, dans lequel lesdits moyens d'étanchéité (18, 70, 74, 78) comprennent un joint d'étanchéité (70) interposé et agissant entre ladite paroi externe en saillie (18) et ladite paroi externe en saillie supplémentaire (78), dans ladite première configuration de fonctionnement (X1) et dans ladite deuxième configuration de fonctionnement (X2). 20
5. Appareil selon la revendication 4, dans lequel ladite paroi externe en saillie (18) comprend un siège (72) disposé de manière à loger ledit joint d'étanchéité (70). 25
6. Appareil selon une quelconque revendication précédente, dans lequel ladite paroi externe en saillie (18) est obtenue dans un corps de support (7) de ladite unité de coupe (55) tout en se projetant axialement, par rapport à celui-ci, vers ladite unité de coupe supplémentaire (56). 30
7. Appareil selon la revendication 6, dans lequel ladite unité de coupe (55) comprend des éléments en saillie (11) qui se projettent radialement à partir dudit corps de support (7), des éléments de coupe (12) étant associés auxdits éléments en saillie (11) et prévus pour assurer la coupe dudit objet (2) conformément à un profil de coupe (14). 35
8. Appareil selon la revendication 7, dans lequel lesdits éléments en saillie (11) se projettent radialement à partir de ladite paroi externe en saillie (18). 40
9. Appareil selon une quelconque revendication précédente, dans lequel ladite paroi externe en saillie supplémentaire (78) est obtenue dans un corps de support supplémentaire (15) de ladite unité de coupe supplémentaire (56) tout en se projetant axialement, par rapport à celui-ci, vers ladite unité de coupe (55). 45

10. Appareil selon la revendication 9, dans lequel ladite unité de coupe supplémentaire (56) comprend des éléments en saillie supplémentaires (19) qui se projettent axialement à partir dudit corps de support supplémentaire (15) vers ladite unité de coupe (55), des éléments de coupe supplémentaires (22) étant associés auxdits éléments en saillie supplémentaires (19) et prévus pour assurer la coupe dudit objet (2) conformément à un profil de coupe supplémentaire (24). 50
11. Appareil selon la revendication 10, dans lequel lesdits éléments en saillie supplémentaires (19) se projettent axialement à partir de ladite paroi externe en saillie supplémentaire (78). 55
12. Appareil selon la revendication 10 ou 11, dans lequel chacun desdits éléments en saillie supplémentaires (19) se projette vers ladite unité de coupe (55) de telle manière qu'il soit apte à être inséré entre deux desdits éléments en saillie (11) successifs.
13. Appareil selon l'une quelconque des revendications 10 à 12, dans lequel lesdits éléments en saillie supplémentaires (19) ont une largeur (F) qui est sensiblement égale à une distance angulaire (D) entre deux desdits éléments en saillie (11) successifs.
14. Appareil selon une quelconque revendication précédente, et comprenant un dispositif de rotation (5) prévu pour entraîner à la fois ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56) autour d'un axe de rotation (C), ledit dispositif de rotation (5) comprenant en particulier un arbre (6) sur lequel ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56) sont montées de manière coaxiale.
15. Appareil selon une quelconque revendication précédente, et comprenant des moyens de centrage (59) destinés à guider ladite unité de coupe (55) et ladite unité de coupe supplémentaire (56) entre ladite première configuration de fonctionnement (X1) et ladite deuxième configuration de fonctionnement (X2), lesdits moyens de centrage (59) étant placés dans ladite zone interne (99).
16. Appareil selon la revendication 15, dans lequel lesdits moyens de centrage (59) comprennent une surface conique (50), obtenue dans ladite unité de coupe (55), et une surface conique supplémentaire (51), obtenue dans ladite unité de coupe supplémentaire (56), ladite surface conique (50) étant prévue pour interagir selon un mode de couplage par la forme avec ladite surface conique supplémentaire (51) dans ladite deuxième configuration de fonctionnement (X2).

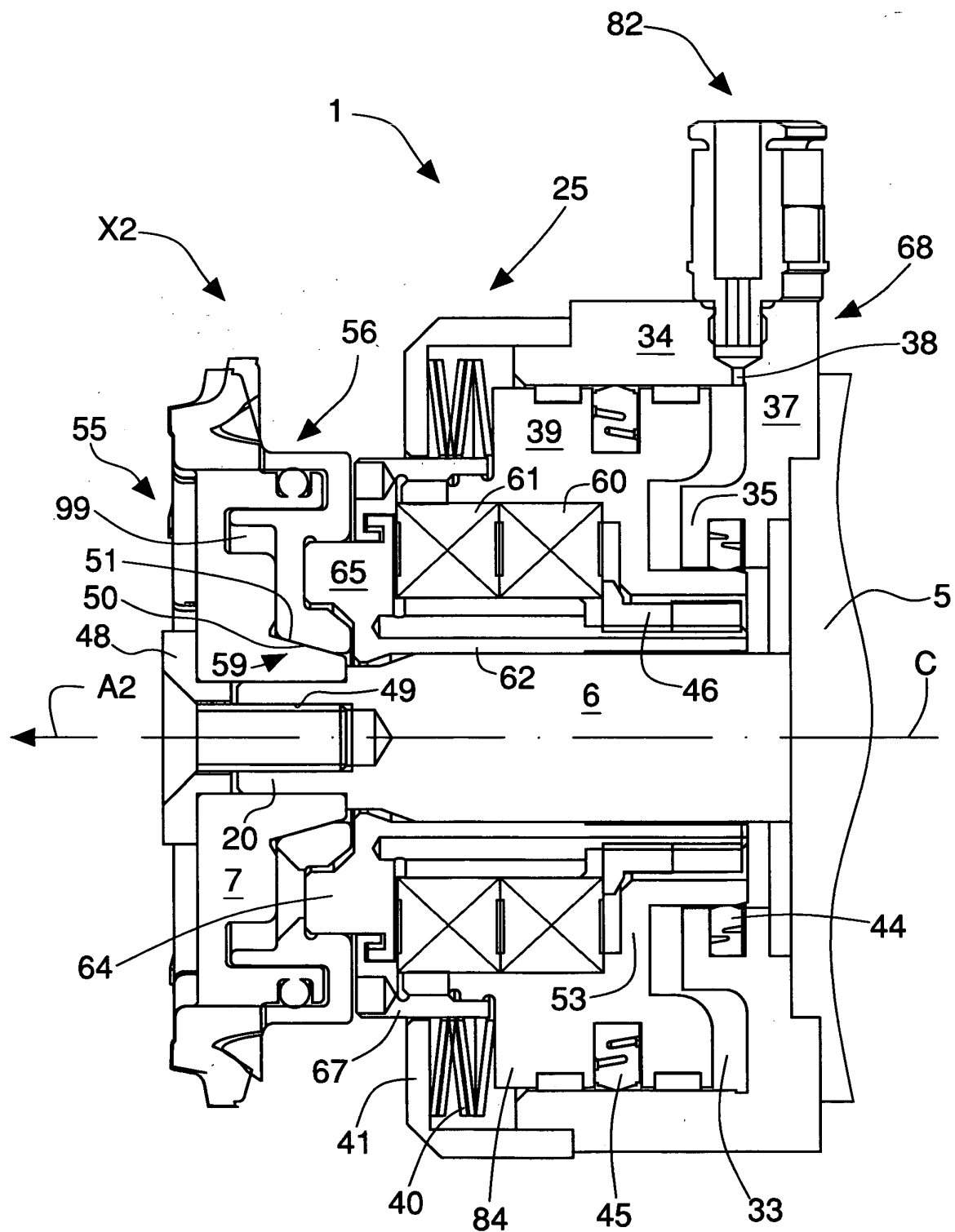


Fig. 1

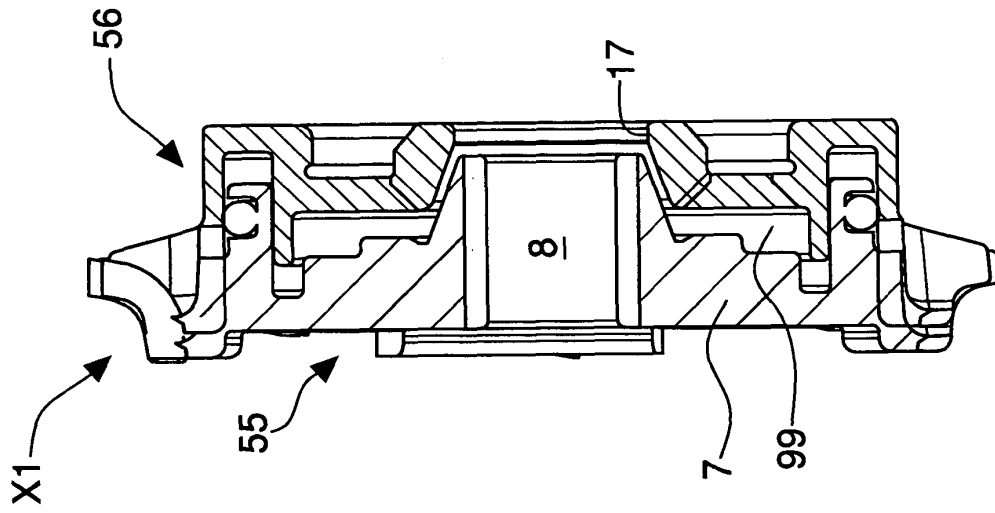


Fig. 3

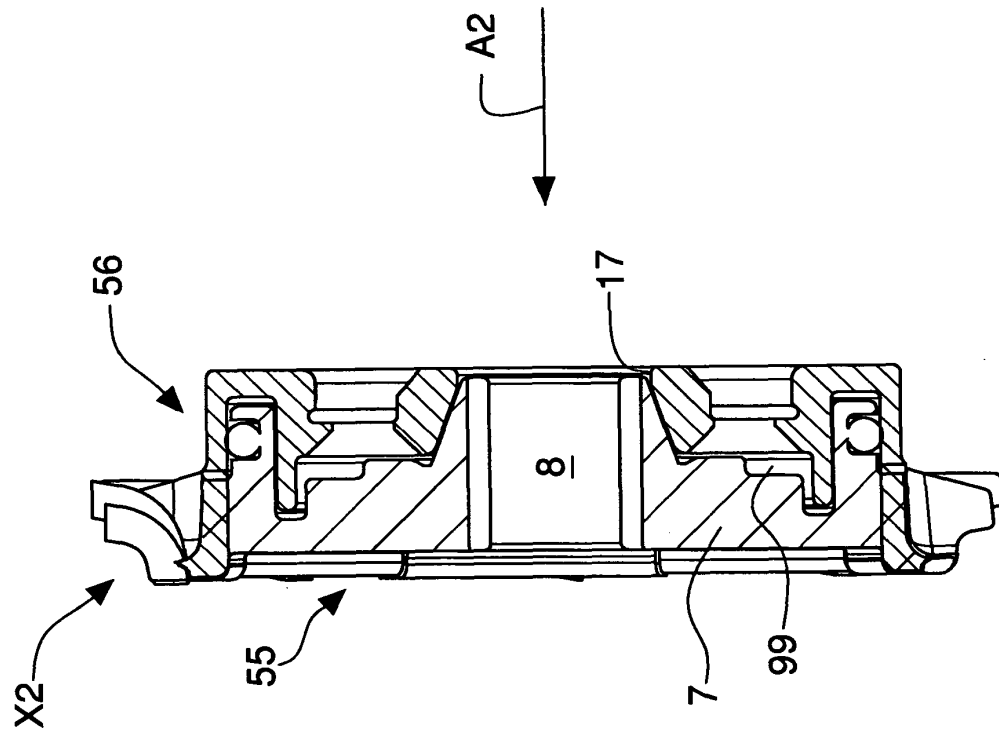


Fig. 2

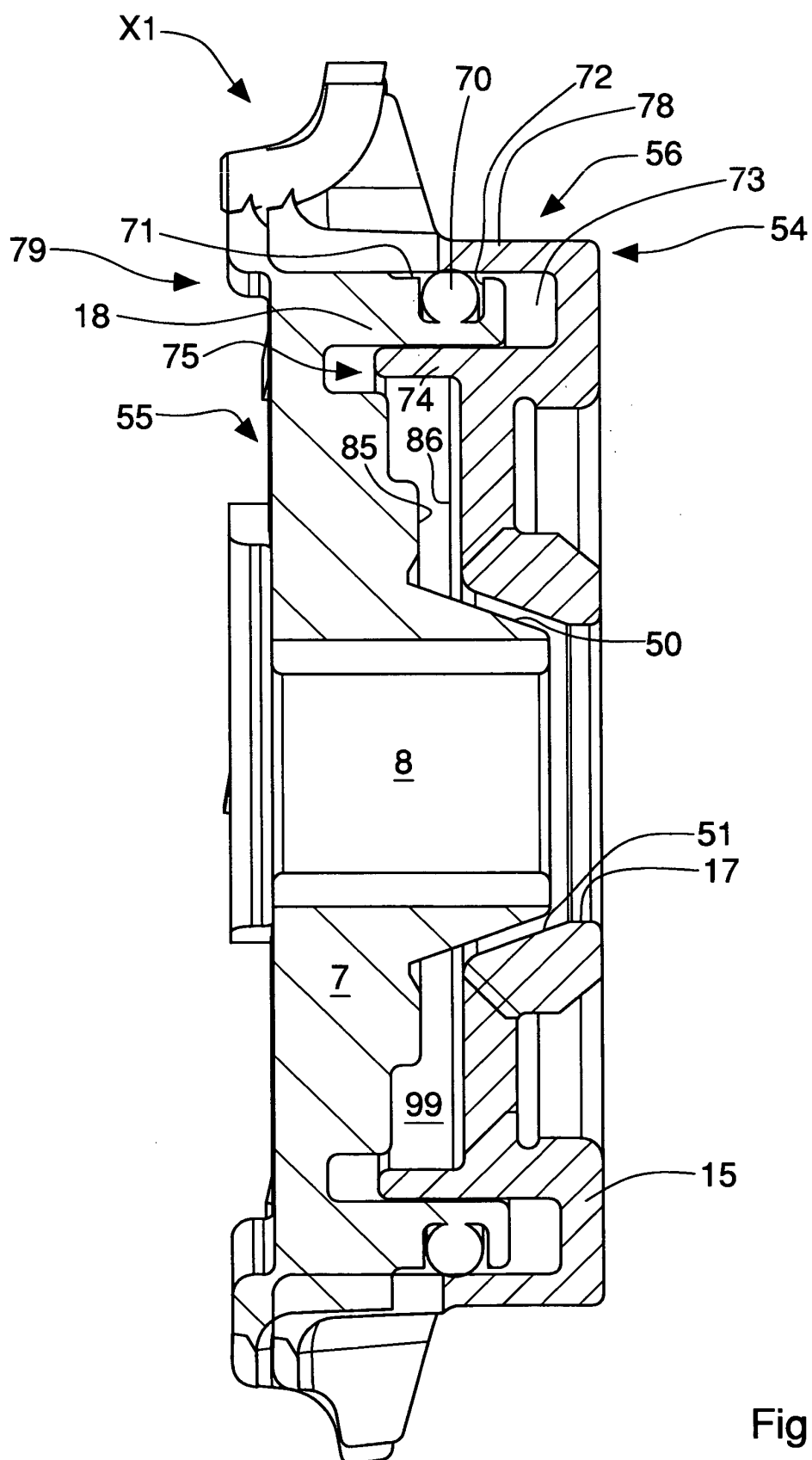


Fig. 4

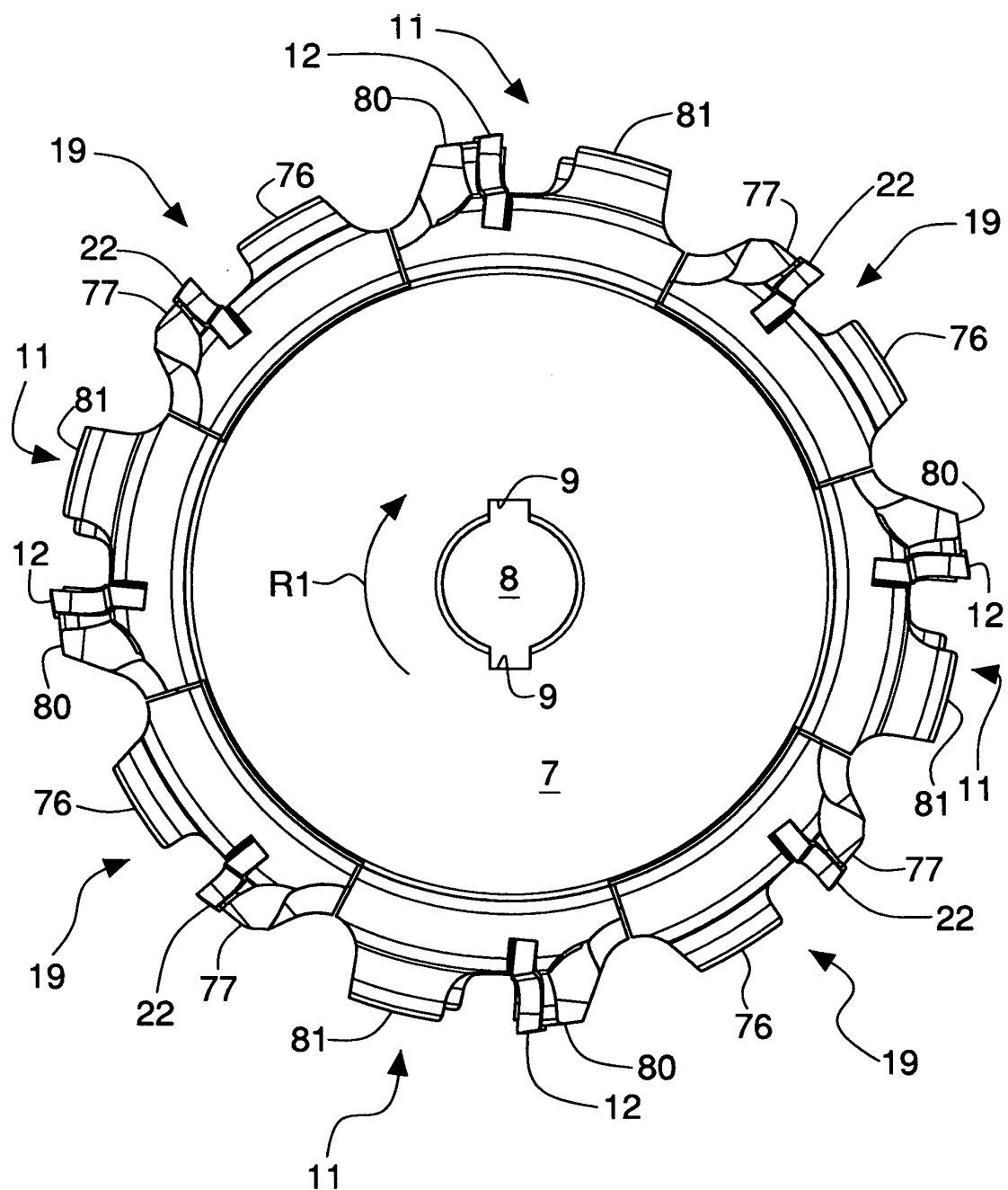


Fig. 5

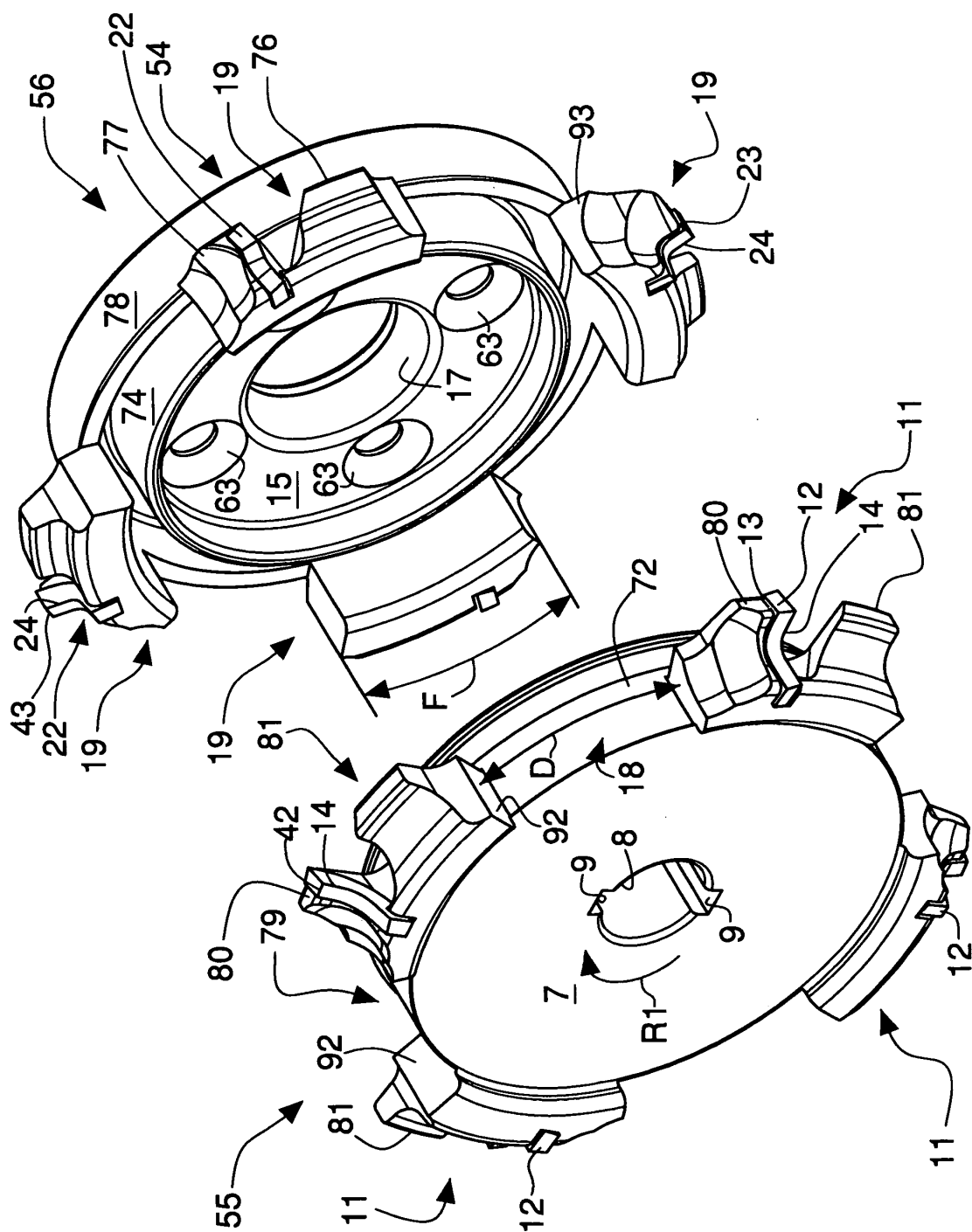
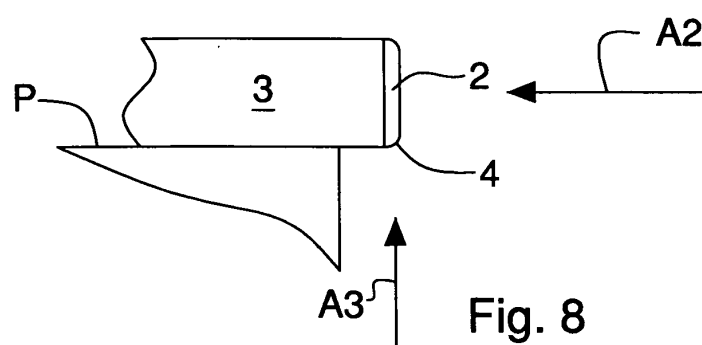
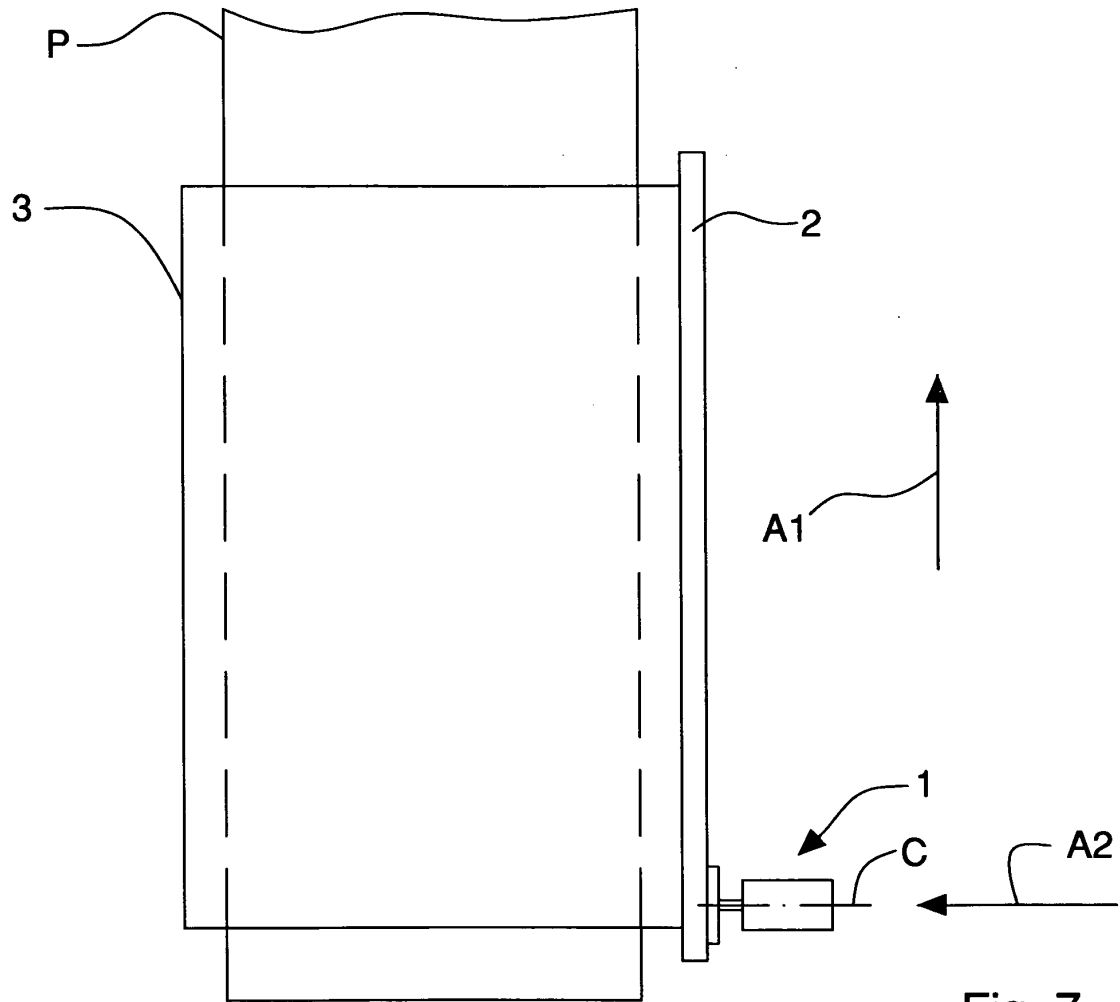


Fig. 6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 2503830 [0001] [0016]
- DE 2541259 [0016]
- EP 2011614 A [0017]