



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.11.2020 Bulletin 2020/47

(51) Int Cl.:
B26D 1/38 (2006.01) B26D 7/26 (2006.01)

(21) Application number: **20171040.7**

(22) Date of filing: **23.04.2020**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **KILKKU, Antero**
28100 Pori (FI)
• **KIURU, Markku**
29600 Noormarkku (FI)
• **RAMSTEDT, Karl**
28130 Pori (FI)
• **RIIHIMÄKI, Tommi**
28600 Pori (FI)

(30) Priority: **15.05.2019 FI 20194070 U**

(71) Applicant: **Valmet Technologies Oy**
02150 Espoo (FI)

(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(54) **BLADE ARRANGEMENT AND CROSS-CUTTING MACHINE**

(57) The invention relates to a blade arrangement 10 in a cutting roll 12 of a sheet cutter of a pulp drying machine 100. The cutting roll has a recess 16 comprising a counter surface 18 and fastening elements 21 for fastening the blade arrangement to the counter surface. The blade arrangement includes an elongated cutting blade 22 fastened in the recess for cutting a pulp sheet, an elongated guide strip 24 adapted to support the cutting blade against the counter surface and having openings 26 for fasteners 28 comprising a head 30 for fastening the guide strip to the counter surface. The guide strip includes a longitudinal blade recess 34 of the cutting blade, formed on the side opposite to the guide strip relative to the head of each fastener, adapted to lock the cutting blade between the guide strip and the counter surface by means of friction locking.

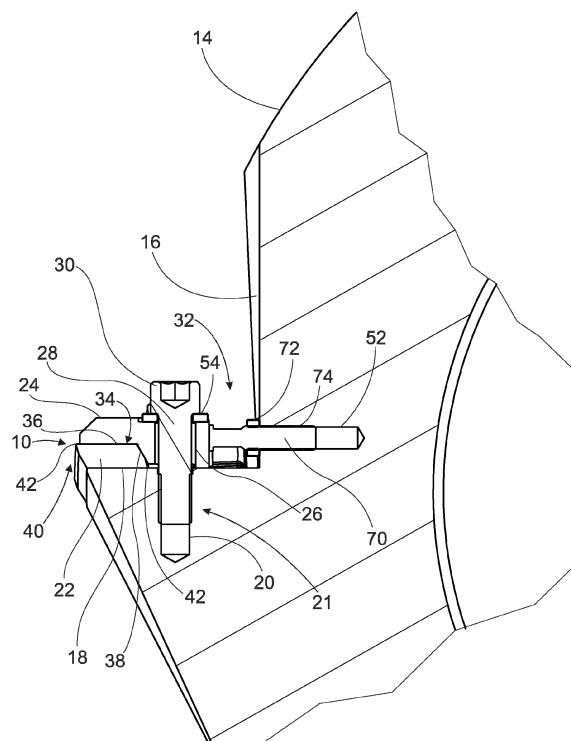


Fig. 6

Description

[0001] The invention relates to a blade arrangement in the cutting roll of the sheet cutter of a pulp drying machine, which cutting roll includes a roll shell recess comprising a counter surface for the blade arrangement and first fasteners for fastening the blade arrangement to the counter surface of the cutting roll, which blade arrangement includes:

- an elongated cutting blade for cutting a pulp sheet, adapted to be fastened in the recess of the cutting roll,
- an elongated guide strip adapted to support the cutting blade against the counter surface, with the guide strip comprising openings for fasteners,
- fasteners comprising a head for fastening the guide strip to the counter surface by means of the fasteners through openings in the guide strip, and
- adjustment elements for positioning the guide strip in the radial direction of the cutting roll.

The invention also relates to a cross-cutting device of the sheet cutter of a pulp drying machine.

[0002] In a pulp drying machine, the fibre web is cut using a sheet cutter both in the longitudinal direction and in the cross direction of the fibre web to form pulp sheets. A cross-cutting device can be used for the cross-directional cutting of the fibre web, where the cutting roll of the cross-cutting device, while the cutting roll is rotating, cuts the fibre web when the cutting blade included in the cutting roll coincides with the fibre web that is against the counter piece of the cross-cutting device. The cutting blade penetrates in the radial direction of the cutting roll directly into the recess so that it can be adjusted irrespective of the guide strip. Depending on the properties of the fibre web to be cut, the cutting blade either remains at a distance from the counter piece or touches it to cut a pulp sheet from the fibre web. The cutting blade wears gradually and must be replaced to maintain a sufficient operating reliability of the cross-cutting device.

[0003] Prior art includes a blade arrangement of a cutting roll, known by the name Valmet Cross Cutter™, which includes a guide strip, a cutting blade, adjustment elements for the guide strip and the cutting blade, and fasteners for fastening the guide strip and the cutting blade in the recess of the roll shell of the cutting roll. In such roll arrangement, the replacement of the cutting blade requires the removal of the fasteners, because each fastener penetrates both the guide strip and the cutting blade, with the cutting blade being between the guide strip and the recess. After the replacement of the cutting blade, the guide strip and the cutting blade have to be adjusted precisely into position to restore the cutting effectiveness of the cutting roll. This is a laborious process that requires professional skills and generally takes approximately 12 h. Because of the long duration, the replacement of the cutting blade may be the work stage

that takes the longest time in a service shutdown, extending the duration of the service shutdown and hence the downtime of the pulp drying machine.

[0004] Another problem of the blade arrangement according to the above-mentioned prior art is that it is difficult to make the cutting blade, which has been made from a hard material to improve wear resistance, to stay in place for a length of time despite a great tightening torque of the fasteners. So that the cutting blade can be adjusted relative to the guide strip, the cutting blade must have openings that are larger than the diameter of the fasteners. Such openings enable the movement of the cutting blade relative to the fasteners, at least in the radial direction of the cutting roll. Even though the fasteners are tightened to a great torque, the tightening of the fasteners becomes gradually loose as a result of the vibration of the cutting roll. In this case, the cutting blade is able to move relative to the guide strip, and the functioning of the cutting roll is deteriorated.

[0005] The object of the present invention is to accomplish a blade arrangement that is more reliable and easier, in terms of the replacement of the cutting blade, than prior art blade arrangements. The characteristic features of the present invention will be more fully understood from claim 1. Another object of the present invention is to accomplish a cross-cutting device that is more reliable and easier, in terms of the replacement of the cutting blade, than prior art cross-cutting devices of the sheet cutter of a pulp drying machine. The characteristic features of the present invention will be more fully understood from claim 5.

[0006] The object of the invention can be attained by means of a blade arrangement in the cutting roll of the sheet cutter of a pulp drying machine, which cutting roll includes a roll shell recess comprising a counter surface for the blade arrangement and first fasteners for fastening the blade arrangement to the counter surface of the cutting roll. The blade arrangement includes an elongated cutting blade for cutting a pulp sheet, adapted to be fastened in the recess of the cutting roll, an elongated guide strip adapted to support the cutting blade against the counter surface, with the guide strip comprising openings for fasteners, fasteners comprising a head for fastening the guide strip to the counter surface by means of the fasteners through the openings in the guide strip, and adjustment elements for positioning the guide strip in the radial direction of the cutting roll. The invention is characterised by the fact that the guide strip includes a longitudinal blade recess of the cutting blade, formed on the side opposite to the guide strip relative to the head of each fastener, adapted to lock the cutting blade between the guide strip and the counter surface by means of friction locking.

[0007] Due to the blade recess, the cutting blade can be locked with friction locking by pressing with the guide strip against the counter surface, without the use of fasteners that penetrate the cutting blade. At the same time, the guide strip can be supported directly to the counter

surface. In this case, when the cutting blade is being replaced, the fasteners are only opened so much that the compression between the guide strip and the cutting blade can be removed, in which case the cutting blade can be pulled off from between the guide strip and the counter surface. When installing the cutting blade, only the positioning of the guide strip is re-adjusted, and the cutting blade resting on it adjusts on the basis of the guide strip. This both avoids separate adjustments of the guide strip and the cutting blade and saves significant time when installing the cutting blade. Since the cutting blade does not have separate adjustment, the adjustment of the cutting blade cannot change when using the cutting roll, just as long as the position of the guide strip remains unchanged. The blade arrangement according to the invention also has a simpler structure than the prior art blade arrangement, which reduces the manufacturing costs. In prior art, it has been necessary to make openings in the hard cutting blade for fasteners, and this has been a laborious work stage. Now this work stage is omitted.

[0008] The cutting blade is advantageously an unperforated piece. Such piece is easier to manufacture from a hard material than a prior art cutting blade comprising holes.

[0009] Advantageously, the blade recess includes a friction surface in the direction of the plane of the guide strip, adapted to support the cutting blade against the counter surface, and a bottom surface that is at an angle relative to the friction surface, adapted to support the cutting blade in the direction of the plane of the guide strip. This enables the precise positioning of the cutting blade both in the radial direction and in the tangential direction of the cutting roll by means of the positioning of the guide strip alone.

[0010] The biggest diameter of each opening is advantageously 120 - 300% of the diameter of the fastener to position the guide strip in the radial direction of the cutting roll. This enables a movement of the guide strip in the radial direction of the cutting roll while the fasteners remain in place, locked to the first fasteners of the counter surface, advantageously to counter threads.

[0011] According to an embodiment, each opening in the guide strip is a slot, the longitudinal direction of which is in the radial direction of the cutting roll to position the guide strip in the radial direction of the roll. Slots also enable a movement of the guide strip in the radial direction of the cutting roll while the fasteners remain in place, locked to the first fasteners of the counter surface.

[0012] According to an embodiment, the cutting blade includes two support surfaces in the longitudinal direction of the cutting blade, adapted to be set against the guide strip and the counter surface, and two edge surfaces in the longitudinal direction of the cutting blade, each edge surface of which has one blade edge, with the edge surfaces being parallel, enabling the turning of the cutting blade 180° around its longitudinal axis to replace the cutting blade edge. By means of a cutting blade equipped

with two blade edges, the same cutting blade can be used twice as long a time before a cutting blade needs to be replaced. In the blade arrangement according to the invention, a cutting blade is advantageously not sharpened, but is it replaced after both blade edges have become blunt.

[0013] The cutting blade advantageously includes two support surfaces in the longitudinal direction of the cutting blade, adapted to be set against the guide strip and the counter surface, and two edge surfaces of the cutting blade, which support surfaces and edge surfaces are uniform and continuous planar surfaces. In other words, the cutting blade does not include openings or recesses for fastening. In this case, the cutting blade can be manufactured easily, and particularly hard materials can be used in manufacture.

[0014] Advantageously, the cutting blade extends radially 1 - 5 mm farther from the centre point of the cutting roll than what the guide strip does. In this case, the cutting blade detaches the cut pulp sheet from the blade arrangement of the cutting roll, and the pulp sheet cannot adhere to the guide strip. In other words, a so-called "kick plate" is formed in the blade arrangement.

[0015] The adjustment elements are advantageously adjustment bolts and adjustment nuts movable over them, which nuts are adapted to be tightened against the recess to accomplish a support of the guide strip in the radial direction of the cutting roll.

[0016] The roughness of the friction surface of the guide strip can be 1.6 - 10 Ra, advantageously 3.2 - 7 Ra. By means of a sufficient roughness of the friction surface, the friction required by the reliable friction locking of the cutting blade in the radial direction of the cutting roll is accomplished by a reasonable tightening torque of the fasteners.

[0017] Advantageously, the surface roughness of the cutting blade in a surface that sets against the friction surface of the guide strip is 5 - 7 Ra. In friction locking, the surface roughness of both the guide strip and the cutting blade matters so that the friction locking can be made reliable by a reasonable tightening torque of the fasteners.

[0018] The tightening torque of the fasteners can be 250 Nm - 330 Nm, advantageously 270 - 300 Nm. The maximum tightening torque is determined by the yield limit of the fasteners.

[0019] According to an embodiment, each edge surface in the cutting blade includes a bevel that forms a blade edge, and the guide strip includes a second counter surface that corresponds to the bevel to support the cutting blade in the radial direction of the roll. Due to the second bevel surface, a sufficiently large support surface is obtained between the guide strip and the cutting blade so that the cutting blade can be supported firmly against the guide strip in the radial direction of the cutting roll.

[0020] The depth of the blade recess of the guide strip in the longitudinal direction of the adjustment elements can be 2 - 4 mm smaller, advantageously 3 mm smaller

than the depth of the cutting blade in the longitudinal direction of the adjustment elements. In this case, the cutting blade protrudes 2 - 4 mm farther in the radial direction of the cutting roll than what the guide strip does, preventing the adhering of the fibre web to the guide strip when the fibre web is being cut.

[0021] The object of the cross-cutting device according to the invention can be achieved by the cross-cutting device of the sheet cutter of a pulp drying machine, which cross-cutting device includes a stationary counter piece and a rotating cutting roll. The cutting roll includes a body comprising two ends, adjustable bearing housings adapted at each end for adjusting the distance between the cutting roll and the counter piece, a roll shell adapted around the body, with the roll shell comprising at least one recess for the blade arrangement and first fasteners for fastening the blade arrangement to the counter surface included in the recess of the roll shell, and a blade arrangement for cutting the fibre web into pulp sheets. The blade arrangement includes an elongated cutting blade for cutting a pulp sheet, adapted to be fastened in the recess of the cutting roll, an elongated guide strip adapted to support the cutting blade against the counter surface, with the guide strip comprising openings for fasteners, fasteners comprising a head for fastening the guide strip to the counter surface through an opening in each guide strip, and adjustment elements for positioning the guide strip in the radial direction of the cutting roll. It is characteristic of the cutting device according to the invention that the guide strip includes a blade recess in the longitudinal direction of the cutting blade, formed on the side opposite to the guide strip relative to the head of the fastener, adapted to lock the cutting blade between the guide strip and the counter surface by means of friction locking.

[0022] In addition to the advantages of the invention stated above in connection with the blade arrangement, the cutting device according to the invention also achieves the advantage that the position of the cutting blade relative to the guide strip does not need to be adjusted so as to compensate for the wear of the cutting blade. In the blade arrangement according to the invention, the wear of the cutting blade is compensated for by transferring the entire cutting roll relative to the counter piece by means of transferrable bearing housings.

[0023] Each cutting blade advantageously includes two blade arrangements adapted on opposite sides of the cutting roll. This keeps the speed of rotation of the cutting roll moderate.

[0024] The cutting roll advantageously includes second counter threads in the radial direction of the cutting roll for fastening the adjustment elements to the recess of the cutting roll.

[0025] The adjustment elements can be fastened to the body of the roll by means of threaded holes. The guide strip can be pushed out by means of the smooth head of the bolt of the adjustment element. If it is necessary to make the guide strip move inwards, the fastening

bolts are loosened and the guide strip is pushed inwards.

[0026] The blade arrangement according to the invention is suitable for use either in new pulp drying machines as a cross-cutting device according to the invention or as retrofitted in existing pulp drying machines as a blade arrangement according to the invention. In retrofitting, the blade arrangement according to the invention replaces a prior art blade arrangement without a need to modify the other surrounding structures, or at the most with minimum changes. It has been noted in connection with the blade arrangement and the cross-cutting device according to the invention that, surprisingly, the cutting blade does not require separate adjustment of its own; instead, the adjustment of the guide strip alone is sufficient, when the location between the guide strip and the cutting blade remains constant. In this case, the optimum location of the cutting blade can be adjusted mainly by adjusting the guide strip, while the remainder of the adjustment comes from the adjustable bearing housings of the cutting roll.

[0027] The invention is described below in detail by making reference to the enclosed drawings that illustrate some embodiments of the invention, in which:

- Figure 1 shows a cross-cutting device, according to the invention, of a sheet cutter of a pulp drying machine as a layout image,
- Figure 2 shows a separate cutting roll with bearing housings viewed from an end, with the blade arrangement according to the invention being part of the cutting roll,
- Figure 3 shows an axonometric view of a separate cutting roll without bearing housings viewed from an end, with the blade arrangement according to the invention being part of the cutting roll,
- Figure 4 shows a separate cutting roll without bearing housings viewed from an end, with the blade arrangement according to the invention being part of the cutting roll,
- Figure 5 shows a separate cutting roll viewed from an end as a cross-sectional view, with the blade arrangement according to the invention being part of the cutting roll,
- Figure 6 shows the blade arrangement of Figure 5 in cross section and in magnification,
- Figure 7 shows the cutting blade of the blade arrangement according to the invention separately, viewed from an end.

[0028] In accordance with Figure 1, a cross-cutting device 11 and a blade arrangement 10 according to the invention are part of a pulp drying machine 100. Figure 1 only shows part of a pulp drying machine 100, more specifically the press section 110, cutting section 112 and sheet layer section 114 of the dryer.

[0029] In the pulp drying machine 100, a fibre web formed from cellulose pulp arrives on the slitting machine 122 as a uniform and fully wide web, and it is cut in the

direction of travel of the fibre web, in other words in the longitudinal direction, into multiple separate webs. After this, these parallel webs are cut in the cross direction into pulp sheets using a cross-cutting device 11 according to the invention. The pulp sheets are piled into pulp sheet stacks on the sheet layer section 114. In accordance with Figure 1, the cross-cutting device 11 according to the invention includes the main parts rotating cutting roll 12 and stationary counter piece 104. The counter piece can be, for example, a counter blade beam equipped with a stationary blade, or equivalent. The roll nip 118 preceding the cross-cutting device 11 pushes the fibre web to the cross-cutting device 11, and the subsequent drive pulley 120 tightens the fibre web, which is cut by the cross-cutting device 11. The rotating cutting roll 12, in turn, includes a blade arrangement 10 according to the invention, most advantageously two blade arrangements 10 on opposite sides of the cutting roll 12 as shown in Figures 3 - 6. When the cutting roll 12 is rotating, the blade arrangements 10 coincide with the counter piece 104 on every rotation, in which case, when the blade arrangement 10 and the counter piece 104 coincide with each other, the fibre web that remains between them is cut in the cross direction of the web. The cutting can take place when the blade arrangement 10 is in contact with the counter piece 104, or more advantageously when the blade arrangement 10 is sufficiently close to the counter piece 104 without a contact between these. The correct distance depends on the properties, such as grammage, raw material and running speed, of the fibre web to be cut.

[0030] The cutting roll 12 shown in Figure 1 is fastened to the frame 60 of the pulp drying machine 100 by using the bearing housings of the cutting roll. Figure 2 shows one bearing housing 48. Each bearing housing 48 of the cutting roll 12 can be, for example, bolted to the frame to lock the cutting roll 12 into place. Advantageously, each bearing housing 48 includes adjustment means 62, by means of which the distance of the blade arrangement 10 from the counter piece can be fine-adjusted. The adjustment means 62 can be, for example, a trapezoidal screw, with which an adjustment of 1/60 mm is achieved. The adjustment means can be fully similar to those used in prior art cutting rolls. The adjustment typically needed is only 5 - 10 hundredths of a millimetre, which is caused by the wear of the cutting blade. Each bearing housing can further include a measuring plate to indicate the adjustment, with an eccentric indicating the transfer of the bearing.

[0031] Figure 3 shows the cutting roll 12 of the cross-cutting device according to the invention in more detail, separately without the bearing housings. The cutting roll 12 includes a body 44 and two ends 46, from which the cutting roll 12 is supported to the frame of the pulp drying machine by means of bearing housings. The cutting roll 12 includes a roll shell 14 formed around the body, in which roll shell 14 a recess 16 has been formed for the blade arrangement 10. The recess can be a structure cast in the roll shell, or it can be formed by fastening a

separate fastened piece to the roll shell. The cutting roll 12 advantageously includes two recesses 16 on opposite sides of the roll shell 14 of the cutting roll 12 relative to each other for the blade arrangements 10. Even though the Figures 1 - 6 show that the cross-cutting device 11 includes a cutting roll 12 that has two blade arrangements 10, the cutting roll 12 of the cross-cutting device 11 according to the invention can also have 1 - 4 recesses and corresponding blade arrangements. Each recess advantageously includes a counter surface 18 comprising fastening elements 21, in other words advantageously counter threads 20, for locking each blade arrangement 10 in each recess 16.

[0032] In accordance with Figures 3 and 4, each blade arrangement 10 includes an elongated cutting blade 22, an elongated guide strip 24 adapted to support the cutting blade 22 against the counter surface 18, fasteners 28 adapted to be tightened into the counter threads 20 shown in Figures 5 and 6 for fastening the guide strip 24, and adjustment elements 32 connected to the guide strip 24 in the direction of the plane of the guide strip 24 for positioning the guide strip 24 in the radial direction of the cutting roll 12 against the recess 16.

[0033] In accordance with Figure 6, the guide strip 24 includes openings 26 for the fasteners 28. The openings 26 are advantageously larger than the fasteners 28 at least in the radial direction of the cutting roll 12 so that the guide strip 24 can be moved relative to the fasteners 28 screwed in the counter threads 20 of the counter surface 18 for positioning the guide strip 24 in the radial direction of the cutting roll 12. The openings can be round or slot-like. Advantageously, the largest diameter of an opening is 150 - 300% of the diameter of the part of the fastener 28 that penetrates the opening 26. For this purpose, each fastener 28 includes a head 30 that has a larger diameter than the rest of the fastener 28, with the head 30 forming a support surface for the guide strip 24. Spacers 54 can be used between the fastener 28 and the opening 26. Openings can be located in the guide strip at a distance of 50 - 200, advantageously 80 - 130 mm from each other, in which case a firm locking for the guide strip is achieved. In this context, it is to be understood that only some of the openings 26 and fasteners 28 of the guide strip have been shown in Figure 3, but in practice there are openings and fasteners at even spacing over the entire distance of the guide strip, like there are fastening elements formed in the recess for the fasteners.

[0034] In accordance with Figure 6, the guide strip 24 includes a blade recess 34 in the longitudinal direction of the cutting blade 22 for locking the cutting blade 22 between the guide strip 24 and the counter surface 18 by means of friction locking. The blade recess 34 has been formed in the guide strip 24 on the side opposite to the guide strip 24 relative to the head 30 of each fastener 28, in other words installed on the side of the counter surface 18 of the guide strip 24. In this way, an empty space remains between the guide strip 24 and the coun-

ter surface 18, in which empty space the cutting blade 22 is installed. Advantageously, the blade recess 34 includes, in accordance with Figure 6, a friction surface 36 in the direction of the plane of the guide strip 24, and a bottom surface 38 for supporting the cutting blade 22. The friction surface 36 supports the cutting blade 22 in a perpendicular direction relative to the plane of the counter surface 18, in other words in the direction of the tangent of the cutting blade, while the bottom surface 38 supports it in the radial direction of the cutting roll 12. When the guide strip 24 is tightened with a sufficient torque of the fasteners into the counter threads 20 of the counter surface 18, the guide strip presses the cutting blade 22 against the counter surface 18 at such force, which, together with the friction between the counter surface 18, the guide strip 24 and the cutting blade 22, also accomplishes a locking friction force of the cutting blade 22 in the radial direction of the cutting roll 12.

[0035] The guide strip 24 is advantageously a piece manufactured from two or more parts. In this case, the guide strip 24 is easily transportable and installable. Advantageously, the guide strip consists of two or more parts, with the length of each part being 500 - 1,000 mm.

[0036] The cutting blade can be a part made up of one or more pieces. Advantageously, the cutting blade is manufactured from a part or parts at the most 5 m long if the width of the cutting roll is greater than 5 m. On the other hand, no openings or recesses are formed in the cutting blade in the blade arrangement according to the invention for fastening, which is why the difficult machinability of powder steel is not a problem. The cutting blade 22 advantageously includes, as shown in Figure 7, two support surfaces 41 adapted to be installed against the guide strip 24 and the counter surface 18, and two edge surfaces 40. Each edge surface 40 includes a bevel that forms a blade edge 42, and the guide strip 24 includes a second counter surface that corresponds to the bevel for supporting the cutting blade in the radial direction of the roll. Due to its symmetrical shape accomplished by the two blade edges 42 and parallel edge surfaces 40, the cutting blade 22 is turnable 180° relative to its longitudinal axis for the utilisation of both blade edges 42 before the replacement of the cutting blade.

[0037] In the blade arrangement according to the invention, the depth of the cutting blade in the radial direction of the cutting roll can be 20 - 30 mm, if the blade arrangement is used in existing cutting rolls to replace a prior art blade arrangement. On the other hand, if the blade arrangement according to the invention is used in new rolls, in that case the depth of the cutting blade can be 30 - 40 mm. When using a deeper cutting blade, the cutting blade has more friction surface for fastening.

[0038] The guide strip 24 is supported in the radial direction of the cutting roll 12 in the recess 16 of the roll shell 14 of the cutting roll 12 by means of adjustment elements 32 as shown in Figures 5 and 6. The adjustment elements 32 are advantageously adjustment nuts 72 adapted on threads 74 over adjustment bolts 70. The

adjustment bolts 70 are turnable into second counter threads 52 that are in the radial direction of the cutting roll 12. The adjustment nuts 72 settle against the recess 16, forming a second support surface, by means of which the guide strip 24 is supported in the recess of the cutting roll 12 in the radial direction of the cutting roll 12. Even though the second support surface does not have a large surface area, it is sufficient, because the forces directed at the guide strip are directed so that the forces in the direction of the tangent of the cutting roll are approximately 10 times greater than the forces in the radial direction of the cutting roll.

[0039] By means of the adjustment elements 32, the protrusion of the guide strip 24 in the radial direction of the cutting roll 12 can be adjusted, and at the same time also the location of the cutting blade 22 in the radial direction of the cutting roll 12 can be adjusted. In other words, the positioning of the cutting blade 22 in the radial direction of the cutting roll 12 is only done by moving the guide strip while the positioning between the guide strip and the cutting blade is stationary. The positioning of the guide strip 24 by means of the adjustment bolts 70 that serve as adjustment elements 32 and by means of the adjustment nuts 72 that are adapted on threads over them takes place by turning the adjustment nuts 72, in which case the guide strip, which is supported against them in the radial direction of the cutting roll 12, moves radially either outwards or inwards. Advantageously, there are adjustment elements at regular intervals for accomplishing firm supporting. The adjustment elements 32 can be fastened to the body of the cutting roll 12 by threaded holes.

[0040] Advantageously, the recess that is formed in the cutting roll, and the counter surface, cutting blade and guide strip have a slightly spiral shape in the longitudinal direction between the ends of the cutting roll. In other words, they have a twist, and there is a pitch between the ends. This means that the plane of the guide strip points to a slightly different direction perpendicularly from the surface of the roll shell of the cutting roll at one end of the cutting roll as compared to the other end. Due to the spirality, when the blade arrangement of the cutting roll coincides with the counter piece while the cutting roll is rotating, the cutting of the fibre web takes place at a slightly different time at the different ends of the cutting roll, like scissors cutting. The spirality is also disclosed by the cross sections of Figures 5 and 6.

[0041] In order to ensure sufficient friction to lock the cutting blade between the guide strip and the counter surface, the friction surface of the guide strip and the counter surface are advantageously machined to a suitable smoothness for accomplishing a sufficient friction force in the radial direction of the cutting roll by tightening the fasteners. The roughness of the friction surface of the guide strip and of the counter surface can be 1.6 - 10 Ra, advantageously 3.2 - 7 Ra. Advantageously, the surface roughness of the cutting blade in a surface that settles against the friction surface of the guide strip is 5 - 7

Ra. Due to the machined surfaces, no separate shoulders or grooves are needed in the friction surface and in the cutting blade to achieve sufficient friction. In other words, the sides of the cutting blade, which sides are in the direction of the plane of the friction surface of the guide strip and of the counter surface, are straight.

[0042] The material used in the cutting blade is advantageously of powder steel, but can also be of high-chromium steel. Powder steel is more expensive than high-chromium steel, but also more durable. The manufacturing cost of the cutting blade is considerably smaller than the costs arising in the replacement of the cutting blade while the pulp drying machine is at a standstill, which is why a more durable material is preferred in the cutting blade so as to extend the interval between service shut-downs. The guide strip and the counter surface can be of, for example, unhardened tool steel or similar.

[0043] The installation and replacement of the blade arrangement and the cross-cutting device according to the invention take place in the following stages. When installing the cutting blade, the guide strip is fastened first against the counter surface by installing the fasteners through the openings in the guide strip and by tightening the fasteners to the fastening elements only so as to keep the guide strip in the recess. After this, the bearing housings of the cutting roll are adjusted to the zero position. The cutting blade is installed between the guide strip and the counter surface, and the fasteners are tightened to a torque of 50 Nm. The cutting roll is rotated so that the blade arrangement settles against the counter piece, in which case the need for blade adjustment can be seen. The adjustment elements are used for adjusting the position of the guide strip and the cutting blade relative to the counter piece to be suitable, by turning the adjustment nuts that serve as adjustment elements. Finally, the fasteners are tightened to their final tightening torque to lock the cutting blade. The tightening torque can be 250 - 330 Nm. When replacing the cutting blade, in turn, the fasteners are loosened without removing them entirely from the counter threads, in which case the cutting blade can be either turned so as to take a new blade edge into use or replaced entirely, after which the above-mentioned installation process is repeated.

The invention relates to a blade arrangement 10 in a cutting roll 12 of a sheet cutter of a pulp drying machine 100. The cutting roll has a recess 16 comprising a counter surface 18 and fastening elements 21 for fastening the blade arrangement to the counter surface. The blade arrangement includes an elongated cutting blade 22 fastened in the recess for cutting a pulp sheet, an elongated guide strip 24 adapted to support the cutting blade against the counter surface and having openings 26 for fasteners 28 comprising a head 30 for fastening the guide strip to the counter surface. The guide strip includes a longitudinal blade recess 34 of the cutting blade, formed on the side opposite to the guide strip relative to the head of each fastener, adapted to lock the cutting blade between the guide strip and the counter surface by means

of friction locking.

Claims

1. A blade arrangement (10) in the cutting roll (12) of the sheet cutter of a pulp drying machine (100), which cutting roll (12) includes a roll shell (14) recess (16) comprising a counter surface (18) for the blade arrangement (10) and fastening elements (21) for fastening the blade arrangement (10) to the counter surface (18) of the cutting roll (12), which blade arrangement (10) includes:
 - an elongated cutting blade (22) for cutting a pulp sheet, adapted to be fastened in the recess (16) of the cutting roll (12),
 - an elongated guide strip (24) adapted to support the cutting blade (22) against the counter surface (18), with the guide strip (24) comprising openings (26) for fasteners (28),
 - fasteners (28) comprising a head (30) for fastening the guide strip (24) to the counter surface (18) by means of the fasteners (28) through openings in the guide strip (24), and
 - adjustment elements (32) for positioning the guide strip (24) in the radial direction of the cutting roll (12), **characterised in that** the guide strip (24) includes a longitudinal blade recess (34) of the cutting blade (22), formed on the side opposite to the guide strip (24) relative to the head (30) of each fastener (28), adapted to lock the cutting blade (22) between the guide strip (24) and the counter surface (18) by means of friction locking.
2. A blade arrangement according to claim 1, **characterised in that** the blade recess (34) includes a friction surface (36) in the direction of the plane of the guide strip (24), adapted to support the cutting blade (22) against the counter surface (18), and a bottom surface (38) that is at an angle relative to the friction surface (36), adapted to support the cutting blade (22) in the direction of the plane of the guide strip (24).
3. A blade arrangement according to claim 1 or 2, **characterised in that** the cutting blade (22) includes two support surfaces (41) in the longitudinal direction of the cutting blade (22), adapted to be set against the guide strip (24) and the counter surface (18), and two edge surfaces (40) of the cutting blade (22), which said support surfaces (41) and edge surfaces (40) are each uniform and continuous planar surfaces.
4. A blade arrangement according to any one of the claims 1 - 3, **characterised in that** the cutting blade (22) includes two support surfaces (41) in the longi-

tudinal direction of the cutting blade (22), adapted to be set against the guide strip (24) and the counter surface (18), and two edge surfaces (40) of the cutting blade (22), each edge surface (40) of which has one blade edge (42), with the edge surfaces (40) being parallel, enabling the turning of the cutting blade (22) 180° around its longitudinal axis to replace the cutting blade edge (42). 5

5. A cross-cutting device (11) of the sheet cutter of a pulp drying machine (100), which cross-cutting device (11) includes a stationary counter piece (104) and a rotating cutting roll (12), which cutting roll (12) includes: 10

- a body (44) comprising two ends (46),
 - adjustable bearing housings (48) adapted at each end (46) for adjusting the distance between the cutting roll (12) and the counter piece (104),
 - a roll shell (14) adapted around the body (44), with the roll shell (14) comprising at least one recess (16) for the blade arrangement (10) and fastening elements (21) for fastening the blade arrangement (10) to the counter surface (18) included in the recess (16) of the roll shell (14),
 - a blade arrangement (10) for cutting the fibre web into pulp sheets, where the blade arrangement (10) includes: 15 20 25

- an elongated cutting blade (22) for cutting a pulp sheet, adapted to be fastened in the recess (16) of the cutting roll (12),
 - an elongated guide strip (24) adapted to support the cutting blade (22) against the counter surface (18), with the guide strip (24) comprising openings (26) for fasteners (28),
 - fasteners (28) comprising a head (30) for fastening the guide strip (24) to the counter surface (18) through each opening (26) in the guide strip (24), and
 - adjustment elements (32) for positioning the guide strip (24) in the radial direction of the cutting roll (12), 30 35 40 45

characterised in that the guide strip (24) includes a longitudinal blade recess (34) of the cutting blade (22), formed on the side opposite to the guide strip (24) relative to the head (30) of a fastener (28), adapted to lock the cutting blade (22) between the guide strip (24) and the counter surface (18) by means of friction locking. 50

55

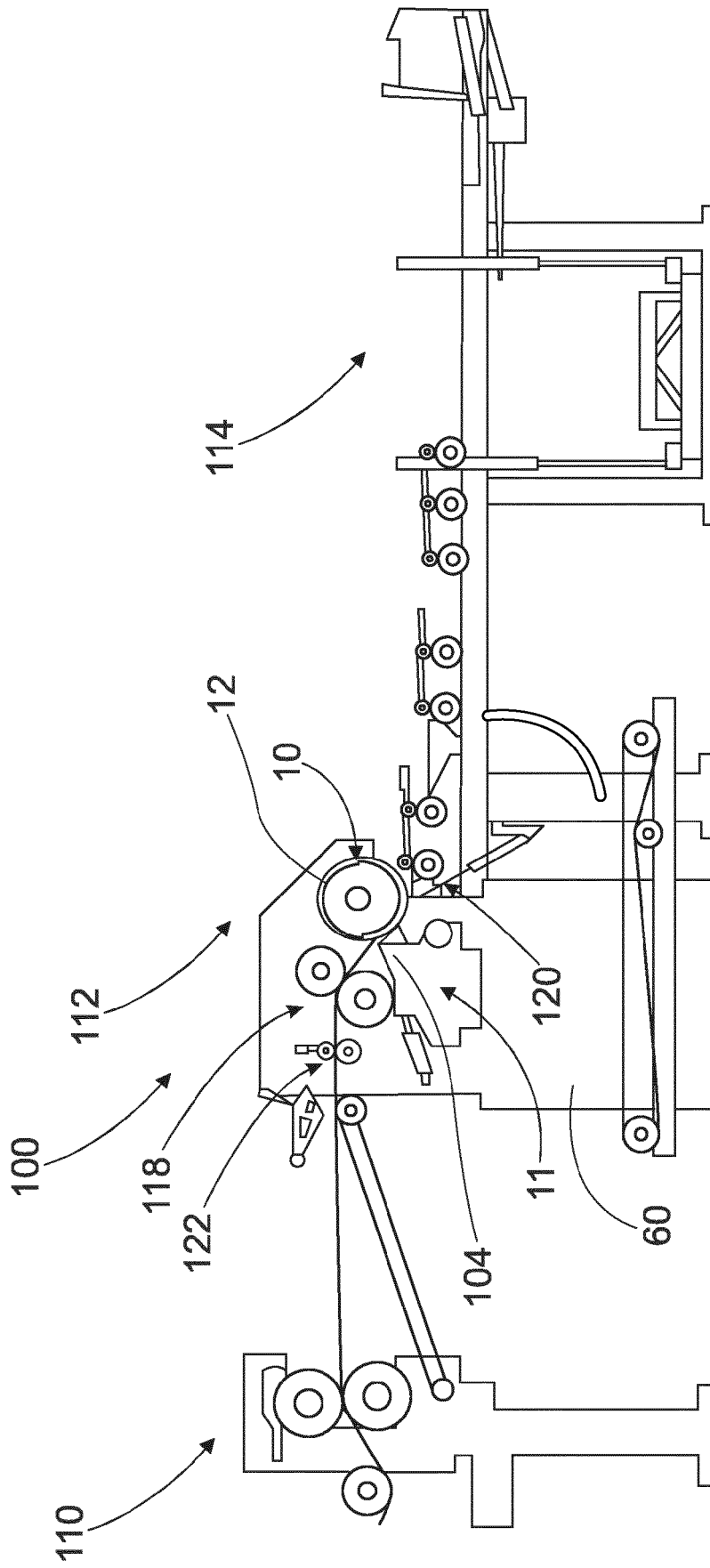


Fig. 1

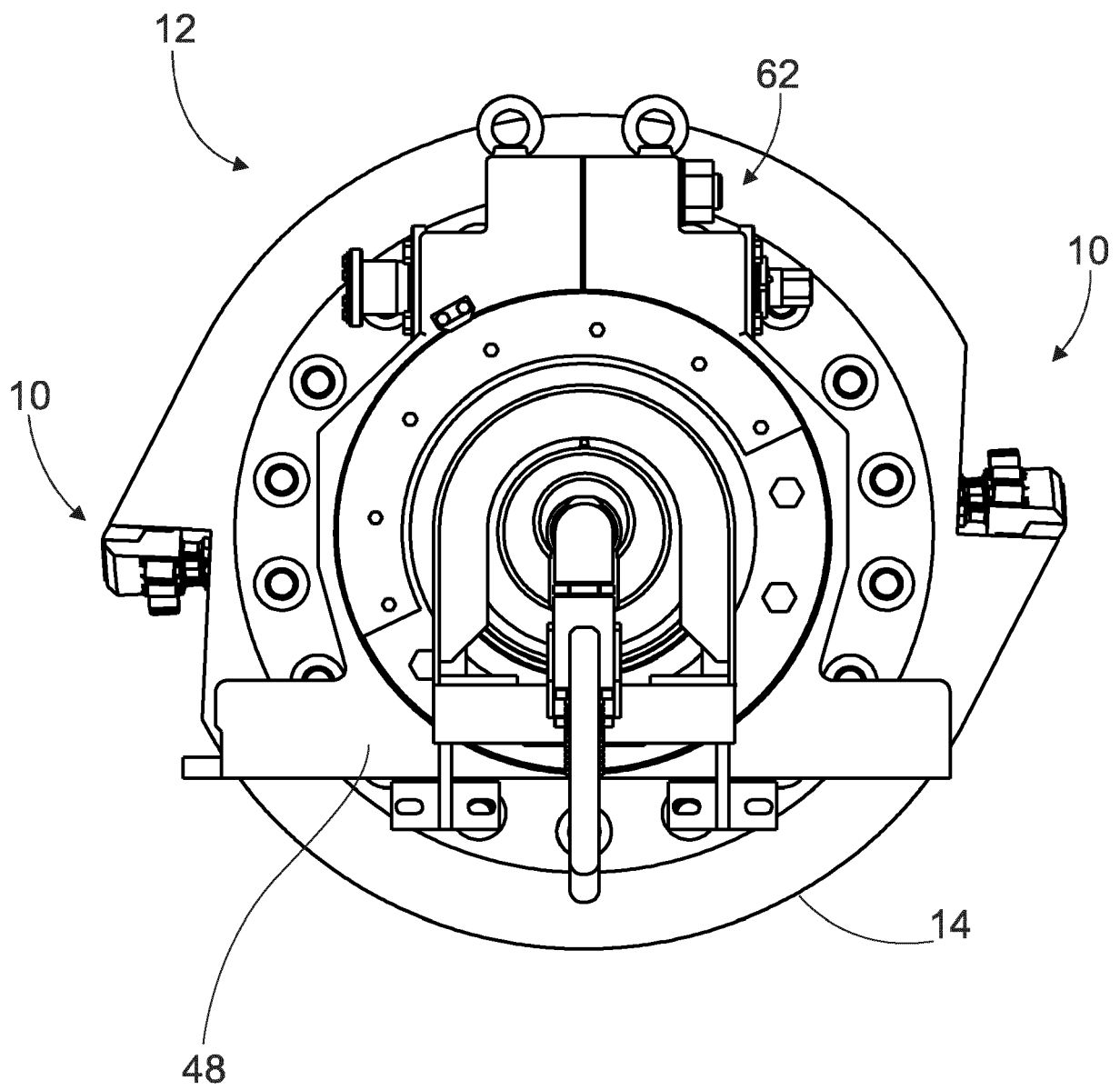


Fig. 2

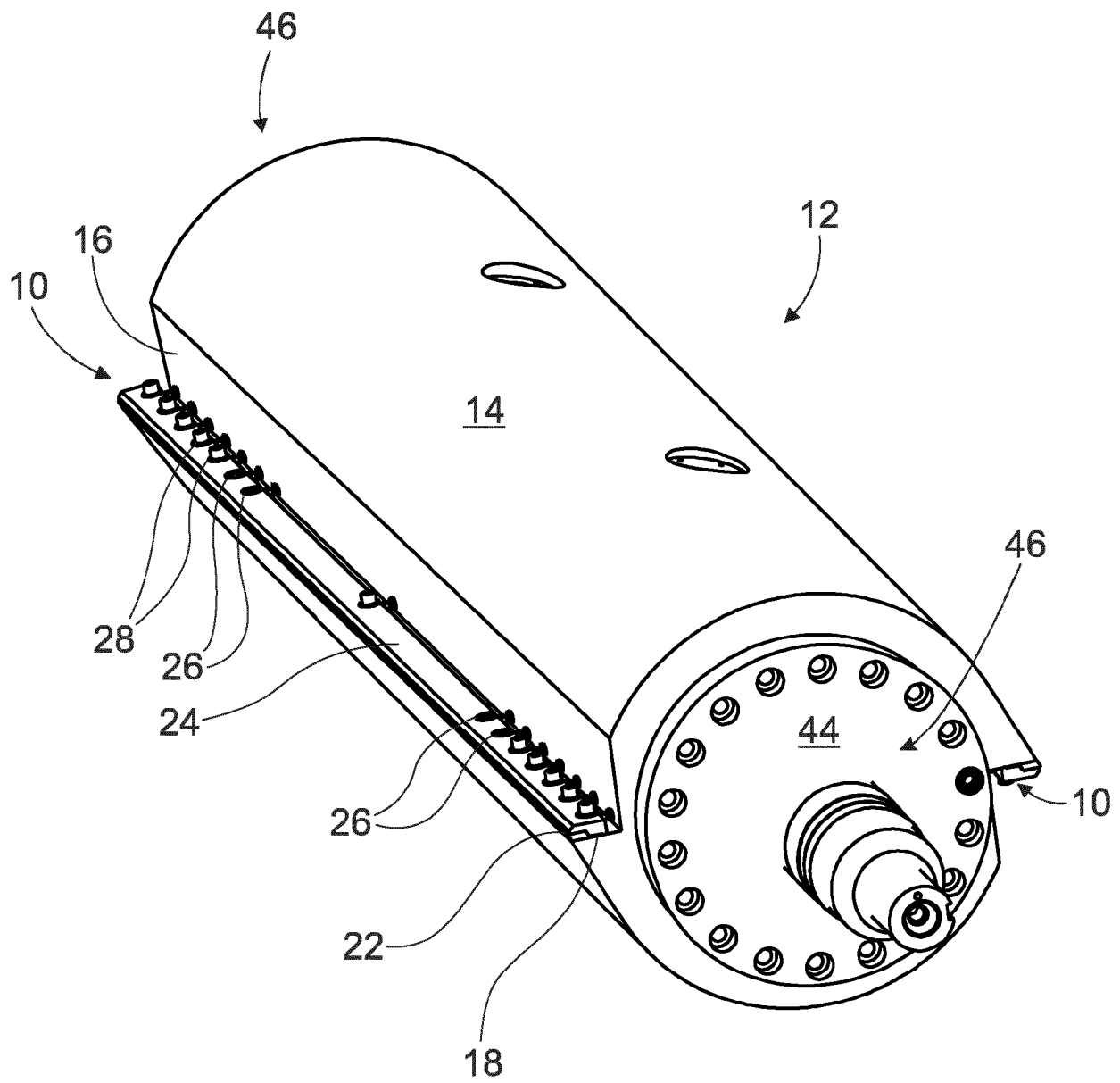


Fig. 3

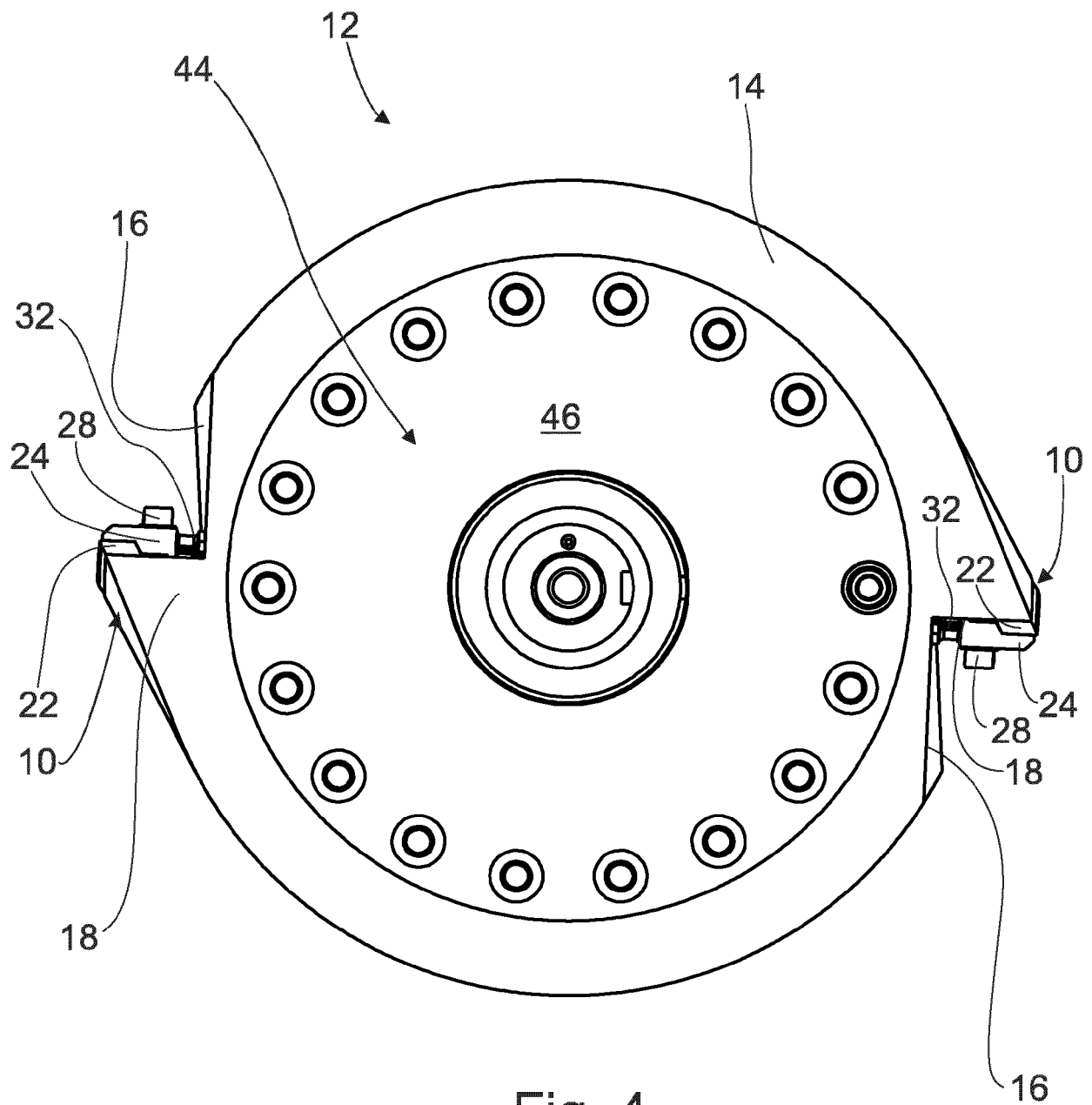


Fig. 4

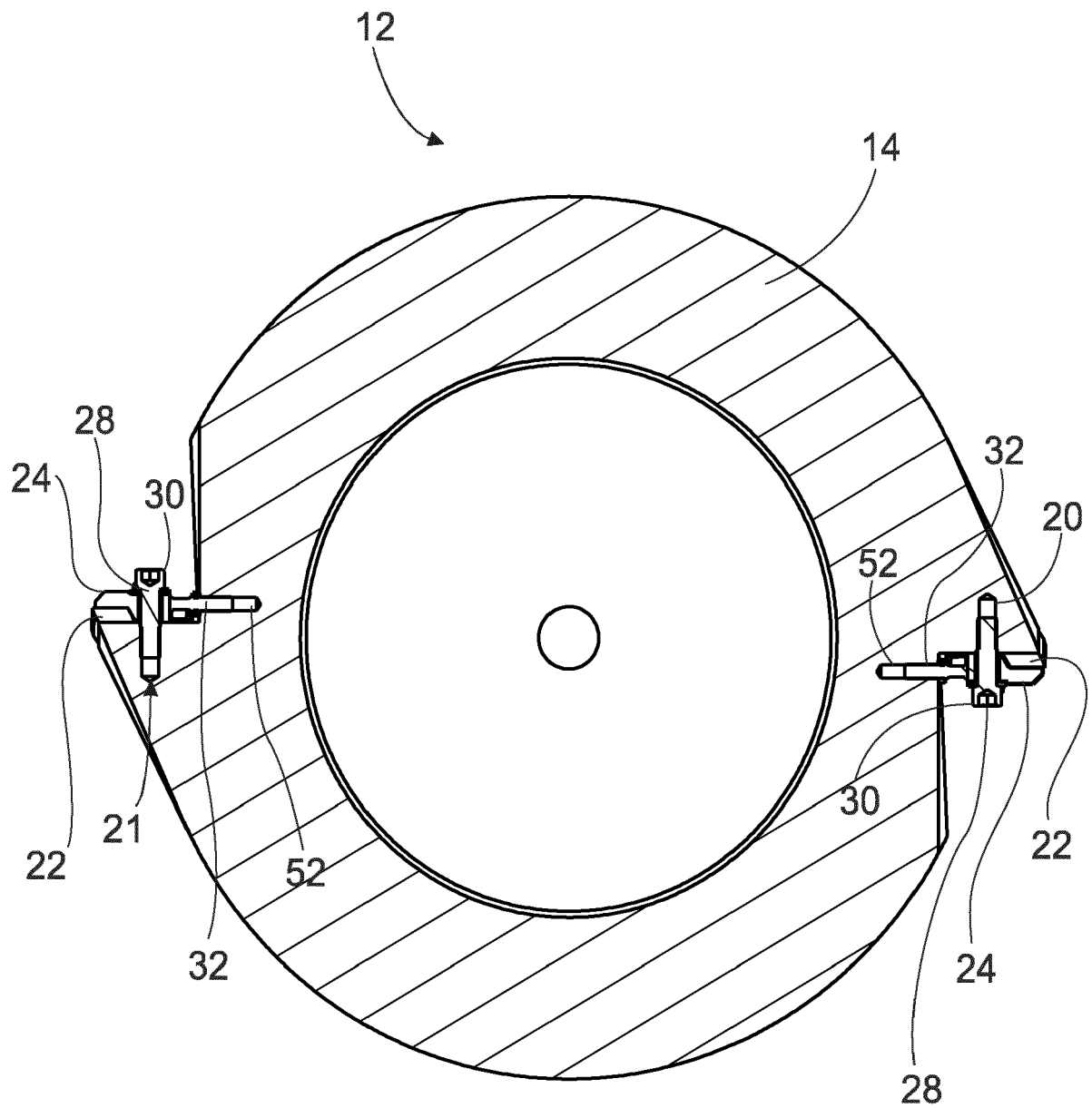


Fig. 5

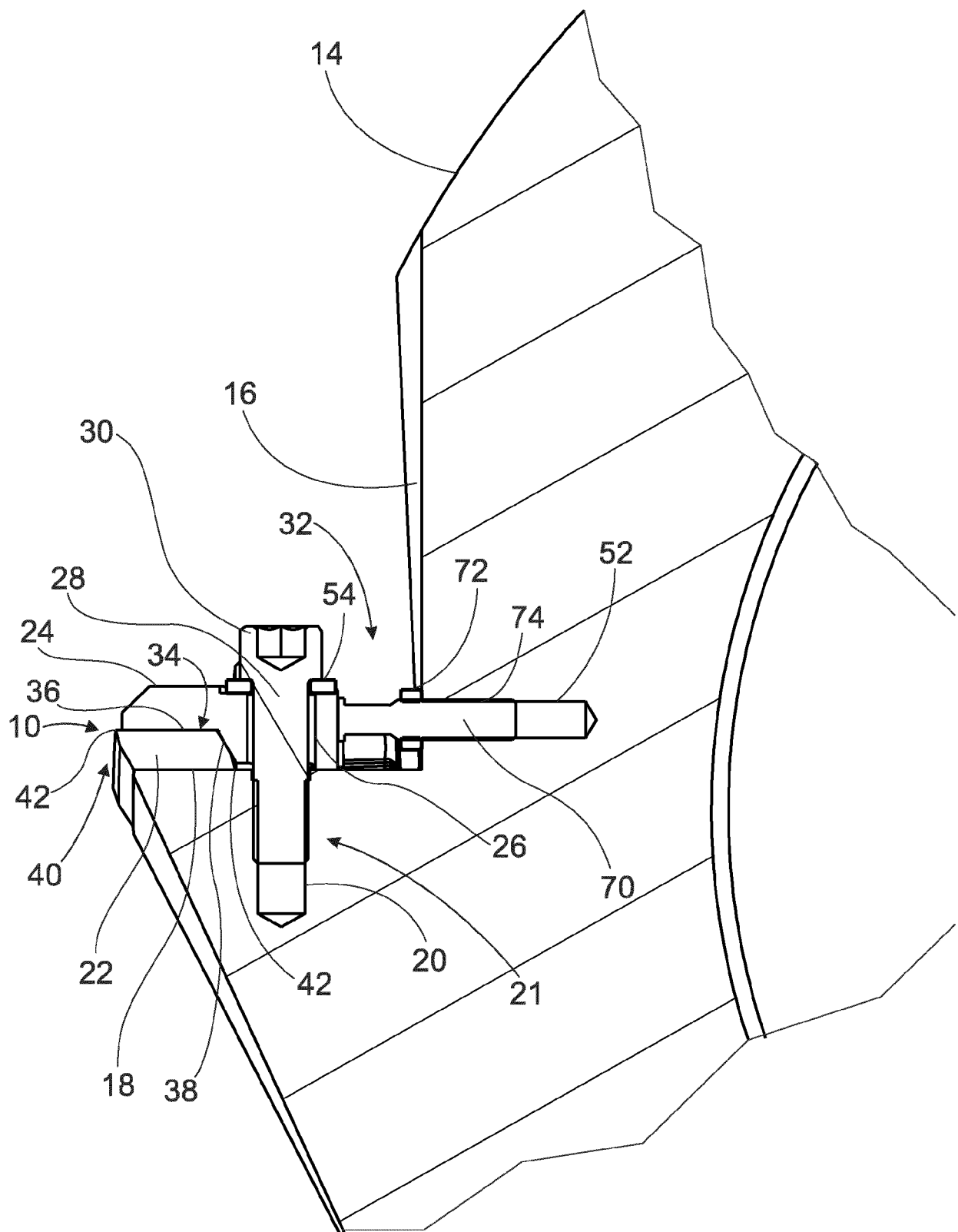


Fig. 6

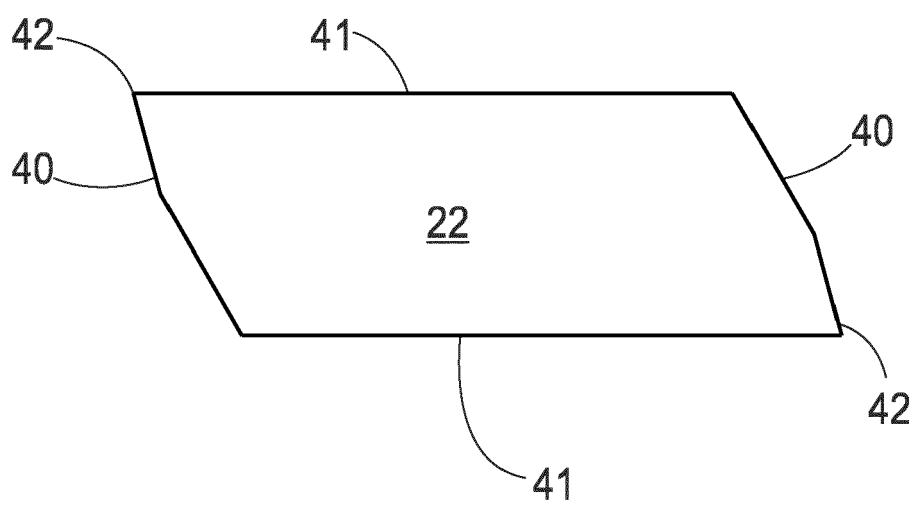


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 20 17 1040

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 93/23215 A1 (GRONBJERG IB [DK]) 25 November 1993 (1993-11-25) * figure 2 *	1-5	INV. B26D1/38 B26D7/26
A	US 3 899 947 A (FALTIN HANS G) 19 August 1975 (1975-08-19) * figure 4 *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			B26D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 September 2020	Examiner Wimmer, Martin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 17 1040

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-09-2020

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9323215	A1	25-11-1993	AT 160309 T 15-12-1997
			AU 4308793 A 13-12-1993
			DE 69315337 T2 18-06-1998
			DK 64992 A 19-11-1993
			EP 0641274 A1 08-03-1995
			JP 3370992 B2 27-01-2003
			JP H07506775 A 27-07-1995
			US 5609084 A 11-03-1997
			WO 9323215 A1 25-11-1993

US 3899947	A	19-08-1975	NONE
