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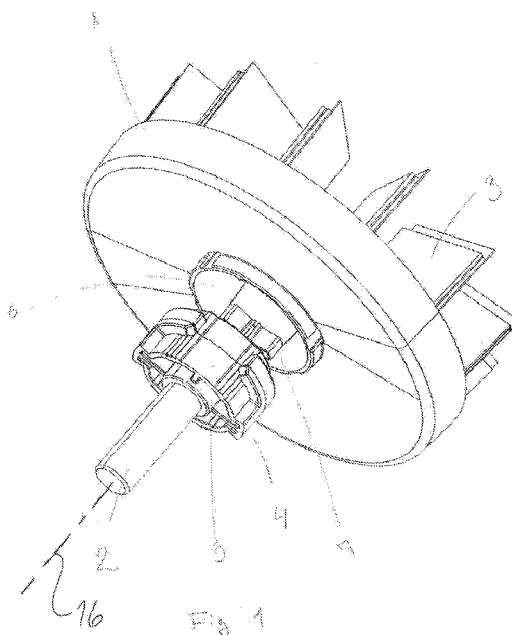
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(54) Title: BAYONET COUPLING AND MACHINING UNIT WITH SUCH BAYONET COUPLING



(57) Abstract: Bayonet coupling for mounting of a tool (1) on a drive shaft (2) of a machining unit. The drive shaft (2) is connected to the tool (1) via a bayonet coupling, which comprises two coupling parts. The one coupling part is provided with a receiving groove (5) for an engaging tab (7) placed on the other coupling part. The receiving groove (5) has a first section (10) with an extension parallel to the axis of rotation and the second section (8, 9) of the receiving groove has an extension transverse, preferably perpendicular, to the axis of rotation, so that the tool (1) is driven via the engagement of the bayonet coupling. The bayonet coupling is distinguished in that the second section (8, 9) of the receiving groove has an extension on either side of the first section, so as to form a T-shaped receiving groove, and the bayonet coupling is devised with at least one locking tab (12) with barbs (13) for engaging with a corresponding toothing (11) so that a locking engagement is established upon rotation of the tool by engaging of the locking tabs (12) with the toothing (11).

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This produces a bayonet coupling which enters into locking engagement regardless of the direction of rotation of the tool, thereby achieving greater safety, since the risk of the tool (1) dropping off during use is minimized.

Bayonet coupling and machining unit with such bayonet coupling

Field of the invention

5 The present invention concerns a bayonet coupling for mounting of a tool with tool elements on a drive shaft of a machining unit, which has a motor, which comprises a drive shaft for driving the tool about an axis of rotation, and where the drive shaft is connected in driving manner either directly or indirectly to the tool via a bayonet coupling, which comprises two coupling parts, the one coupling part being provided with a receiving groove for an engaging tab on the other coupling part, which receiving
10 groove has a first section with an extension parallel to the axis of rotation and a second section with an extension transverse, preferably perpendicular, to the axis of rotation, so that the tool is driven via the engagement of the bayonet coupling.

Background of the invention

15 A machining unit is known where various types of tool elements are mounted on various tools, and where the mentioned tools are easy to replace, both to change between different tools and to replace the tool when worn down. One example of such a machining unit is described in WO2014/086367. For easy replacing, it employs bayonet couplings between a drive plate and a base plate for the tool.

20 Furthermore, there is known from US 4,661,009 A a bayonet coupling of the kind mentioned above, and which possesses all the features that are described in the preamble of claim 1. This document shows an L-shaped receiving groove, and there is no mention that the receiving groove can have a T-shape.

25 It is desirable to be able to handle tools whose rotation can be oriented clockwise or counterclockwise.

30 However, this will present a disadvantage for elements which are connected via a bayonet coupling, since the engaging tab can only engage with the second section of the receiving groove upon rotation in one direction. When using a machining unit with rotation in the opposite direction, the engaging tab will find itself in the first section of the receiving groove. Thus, there is a risk of the tool becoming loosened from the drive shaft.

Insofar as the machining unit is used with rotation in the one direction such that the engaging tab engages with the second section of the receiving groove, there is likewise a disadvantage. When the motor is switched off, the tool of the machining unit may rotate by inertia into a position where the engaging tab finds itself in the first section of the receiving groove. Thus, there is a risk of the tool becoming loosened from the drive shaft.

Purpose of the invention

The purpose of the present invention is to indicate a tool where these drawbacks have been remedied.

A further purpose is to indicate a tool which is able to rotate in both directions without the risk of a bayonet connection between motor and tool being inadvertently released. Yet another purpose is for a machining unit to be easily used together with various types of tool elements which are mounted on different tools, and where the mentioned tools are easy to replace in order to switch between different tools and to replace the tool when worn down.

Description of the invention

These purposes are achieved according to the present invention with a bayonet coupling for mounting of a tool with tool elements on a drive shaft of a machining unit, which has a motor, which comprises a drive shaft for driving the tool about an axis of rotation, and where the drive shaft is connected in driving manner either directly or indirectly to the tool via a bayonet coupling, which comprises two coupling parts, the one coupling part being provided with a receiving groove for an engaging tab on the other coupling part, which receiving groove has a first section with an extension parallel to the axis of rotation and a second section with an extension transverse, preferably perpendicular, to the axis of rotation, so that the tool is driven via the engagement of the bayonet coupling, and which is characterized in that the second section of the receiving groove has an extension on either side of the first section, so as to form a T-shaped receiving groove. The bayonet coupling is devised with at least one locking tab with barbs for engaging with a corresponding toothing or a number of projections to establish a locking engagement of the locking tabs with the toothing or the projections upon rotation of the tool.

This ensures that the bayonet coupling can lock in both directions. The T-shaped groove ensures that the tool is secured to the drive shaft. The bayonet coupling can become engaged regardless of the direction of rotation of the drive shaft. Locking tab and corresponding toothing or projection ensures that the tool is in locking engagement in the second section of the receiving groove. The locking engagement ensures that the tool and the drive shaft, once entering into locking engagement, cannot rotate in relation to one another. This prevents the engaging tab from returning to the first part of the receiving groove, for example, during a sudden braking of the tool. This lowers the risk of the tool dropping off during use.

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This increases the safety in use of a machining unit with rotating tools. This is because the tool, regardless of the direction of rotation, cannot become loosened from the drive shaft during use.

15

It is preferred to place one or more toothings or the projections on a drive shaft's hub portion and one or more corresponding locking tabs are placed in a bore in the tool for locking of the parts of the bayonet socket against mutual rotation.

20

This achieves greater safety during use of the machining unit with rotating tool. This is accomplished in that the locking engagement between at least one toothing or the projections and one or more locking tab holds the two parts of the bayonet coupling together. Thus, the tool cannot become loosened from the drive shaft, for example when the machining unit is halted, and the rotation of the tool ceases. Thus, the engaging tab cannot rotate back to the first section of the receiving groove, which prevents the tool from falling off the drive shaft.

25

The machining unit's drive shaft is connected in driving manner either directly or indirectly to the tool via the bayonet coupling.

30

In order to secure the tool on the drive shaft, the locking direction of the bayonet socket is such that at least one of the locking tabs of the bayonet socket engages with a corresponding toothing or projection in the direction of rotation of the drive shaft. The attempt of the parts of the bayonet socket to rotate in the opposite direction will be prevented by the locking engagement between at least one locking tab and the

corresponding toothing.

5 The toothings or the projections are preferably placed so that at least one locking tab engages with a toothing or one of the projections regardless of the direction of rotation of the locking direction of the bayonet coupling.

This accomplishes the same secure mounting of the tool on the machining unit's drive shaft regardless of the direction of rotation of the tool.

10 The toothing or the projections are preferably shaped so that one surface of the toothing or the projections faces away from the locking tab or tabs which will engage when the engaging tab is in the first section of the receiving groove. All or some of the toothing or the projection will engage with the locking tabs after rotation of the first and/or second coupling part in relation to each other, when the engaging tab is in the second section of
15 the receiving groove. The engagement between toothing or projection and locking tabs thus secure the coupling parts of the bayonet socket in a ratchet lock.

Each locking tab preferably comprises a weakening line. This means that the locking tab is damaged when the tool and the hub portion on the machining unit's drive shaft is
20 changed.

Since the locking tab comprises a weakening line, the tool becomes easy to remove from the machining unit after use. This is accomplished in that at least one of the locking tabs breaks off in or at the weakening line when the tool is removed, that is,
25 when the tool is rotated in the opposite direction on the drive shaft in relation to the direction of rotation during the mounting of the tool. In this way, the at least one locking tab no longer engages with the corresponding toothing or projection. Hence, the tool can be rotated again opposite the locking direction and be removed from the machining unit.

30

The weakening line furthermore has the result that the tool cannot be mounted on the drive shaft once more. Hence, the tool is for onetime use, since it is destroyed upon being removed. Thus, the tool cannot be reused, or attempted to be removed to change the grinding bodies. This increases the safety for the user of the tool and prevents

reusing of defective or worn tools or those at the end of their service life.

5 The bayonet coupling's at least one toothing or projection is preferably placed on a hub portion on the drive shaft. The locking tabs are preferably placed in a bore in the tool, where the bore is designed to accommodate the hub portion. The bayonet coupling's at least one locking tab thus locks against the corresponding toothing or projection on the hub portion when the bayonet socket is assembled.

10 This means that the hub portion on the drive shaft is not damaged when tool and machining unit are separated. Upon separation of tool and machining unit, it will preferably be the locking tabs which are destroyed. Thus, it is the tool which is damaged, and not the hub portion.

15 The coupling part with the receiving groove is preferably placed on the hub portion with the receiving groove arranged on the outer perimeter of the hub portion. The coupling part with the engaging tab is preferably arranged in a bore on the tool part, the bore being designed to receive the hub portion.

20 Alternatively, the coupling part with the engaging tab is preferably a hub portion with the engaging tab arranged on the outer perimeter of the hub portion. The coupling part with the receiving groove is preferably arranged in a bore on the tool part, the bore being designed to receive the hub portion.

25 This means that the bayonet coupling can be constructed in two different ways. The hub portion may either have the coupling part with the receiving groove, or the hub portion may have the coupling part with the engaging tab, while the bore will have the opposite coupling part with either the engaging tab or the receiving groove.

30 This achieves flexibility in the construction of the bayonet coupling, such that the two different configurations can be used in order to adapt the machining unit with the tool to a specific customer or a specific task.

The construction of the bayonet coupling with T-shaped receiving groove means in practice that both coupling parts have a T-shaped receiving groove, and both coupling

parts have at least one engaging tab. It is possible to design the two receiving grooves to have the same shape and size. Accordingly, the coupling parts may be produced so that both coupling parts have an engaging tab, having the same shape and size. There is thus a choice as to which part is called the receiving groove and which part is called the engaging tab.

When the coupling part's receiving groove is placed on the hub portion, a toothing or projection is preferably arranged in the second section of the receiving groove on either side of the first section. Thus, the two coupling parts of the bayonet coupling lock together regardless of the direction of rotation in which they are clamped together. This ensures the same secure mounting regardless of whether the machining unit is rotating clockwise or counterclockwise.

The bayonet coupling is preferably designed so that the engaging tab comprises two locking tabs directed against each other. At least one of the locking tabs is designed to engage with one of the receiving groove's toothings or projections depending on the direction of rotation.

A symmetry is achieved in having the bayonet coupling's engaging tab with two locking tabs directed against one another, since there is one locking tab which engages with the toothing or the projections when the bayonet coupling is rotated in the clockwise direction and the other locking tab engages with the toothing or the projections when the bayonet coupling is rotated counterclockwise. This achieves the same locking effect regardless of the direction in which the tool is rotating.

Alternatively, the receiving groove is placed in the bore on the tool and the engaging tab on the hub portion. Thus, the receiving groove is preferably bounded by locking tabs on either side of the receiving groove's first section, and the toothing or the projections are arranged on the hub portion at the dorsal engaging surface of the engaging tab, that is, the surface on the engaging tab which is opposite the end surface of the drive shaft.

The engaging tab's dorsal engaging surface is the portion of the engaging tab which faces away from the termination on the hub portion and the drive shaft. The engaging surface is preferably flat, but it may also be shaped otherwise, such as slanting or

rounded.

5 This ensures that, when the bayonet coupling is assembled, at least one locking tab will engage with a corresponding toothing or projection on the hub portion, regardless of whether the bayonet coupling is being rotated clockwise or counterclockwise during the assembly of the bayonet socket, for example, while mounting a tool on a drive shaft. This achieves the same locking of the tool on the drive shaft's hub portion regardless of the direction in which the tool is secured to the hub portion. To achieve a onetime-use tool, the coupling part with the locking tabs is placed on the tool.

10

The bayonet coupling's one coupling part is preferably provided with at least two receiving grooves. Similarly, the second coupling part is also preferably provided with at least two engaging tabs, such that the number of engaging tabs is the same as the number of receiving grooves.

15

This achieves a bayonet coupling having two locks between the bayonet coupling's one part and the bayonet coupling's other part. Among other things, this helps ensure a stable transfer of rotational force from the drive shaft to the tool. This also means that no unwanted vibrations are created on account of only one fastening point. Furthermore, this helps ensure that the tool is secured to the drive shaft at least at two locking points. This also helps prevent a tool from being inadvertently loosened from the drive shaft during a machining chore and possibly being thrown out from the machining unit.

20

25 It is possible to have more than two receiving grooves, such as three, four, five or six. There can be the same number of engaging tabs as the number of receiving grooves, or there can be fewer. For example, it is possible to have four receiving grooves, which are preferably arranged in rotational symmetry on the one part of the bayonet coupling, while the other part of the bayonet coupling may have two engaging tabs, which will cooperate with two of the four receiving grooves on the other part.

30

The bayonet coupling is preferably designed so that there is a collar or a flange in the bottom of the bore, where the collar or the flange is oriented transversely, preferably perpendicularly, to the bore. This ensures that the coupling part on the hub portion is

mounted at the proper height in the bore in the coupling part, so that the assembly process is easy. Furthermore, the collar or the flange ensures that the two coupling parts cannot shift in relation to each other axially along the axis of rotation. The hub portion will be clamped between the collar or flange of the bore and an upper boundary of the bore and thus lock the two coupling parts together. This upper boundary in one of the
5 aforementioned variants is the aforementioned engaging tab. In the other variant, the upper boundary is a wall around the receiving groove's second section.

10 The receiving groove's second section preferably has a size such that the engaging tab can slide into it without risk of movement in the axial direction of the drive shaft.

This ensures that the tool cannot move undesirably in the axial direction along the drive shaft and thereby alter the pressure exerted between the grinding, polishing or machining unit and the workpiece with possible consequent changes in the quality of
15 the grinding, sanding or polishing work.

The receiving groove's second section is preferably formed so that the top side and/or bottom side of the receiving groove are slightly inclined toward each other. In this way, the receiving groove's second part is slightly broader where it meets the receiving
20 groove's first part as compared to the receiving groove's inner end. This ensures that, when the two parts of the bayonet coupling rotate to engage with each other, it is easier to ensure that the starting positions of the two parts are opposite each other and to then ensure that increased friction is achieved in the bayonet socket upon continued rotation in order to secure the two parts of the bayonet socket in relation to each other.

25 As an alternative to this, the engaging tab is formed with slightly wedge-shaped ends, such that the end or ends of the engaging tab are narrower than the central part of the engaging tab.

30 The bayonet coupling is preferably formed on the drive shaft in that the hub portion comprises a central shaft and a hub bushing, which are connected to each other, preferably by being molded or screwed together.

The central shaft may also alternatively comprise a collar, which is provided with at

least one guide hole, which interacts with at least one guide tab on the hub bushing to establish a rotationally fixed connection.

5 The invention also concerns a machining unit with a bayonet socket, as described above, for mounting of a tool on a drive shaft of a motor unit.

The machining unit's tools preferably have means of grinding, sanding, polishing, or similar chores, which are designated here as tool elements.

10 The machining unit may for example comprise a disk portion, which is secured to the drive shaft with the above-described bayonet socket, so that the tool is secured to the disk portion instead of being secured directly to the drive shaft, thereby achieving an indirect securing of the tool to the machining unit, in a manner already known.

15 This means that the bayonet coupling can be used with various existing equipment items, having direct and indirect coupling to the machining unit.

20 The machining unit is for example outfitted such that the tool and the separate disk portion are connected in that the disk portion is provided with first connection means, interacting in releasable manner with corresponding second connection means on the tool.

25 The first and second connection means are chosen preferably among hook and fastener connections and bayonet couplings.

The tool elements of the tool preferably comprise means of grinding, polishing, or similar chores.

Description of drawings

30 The invention will be described in the following with reference to the drawings, where Fig. 1 shows a bayonet coupling for securing of a onetime-use tool to a drive shaft in a machining unit,

Fig. 2 shows a coupling part of the bayonet coupling on a hub portion of a drive shaft,

Fig. 3 a - 3d show the hub portion's coupling part from different angles,

Fig. 4 shows the tothing or projection on the hub portion,
Fig. 5 shows a tool with bore with resilient tabs, and
Fig. 6 shows details of the bore with resilient tabs and a lower collar.

5 Detailed description of the invention

The invention is described in relation to a bayonet coupling with two couplings, where the coupling part with the receiving groove is placed on the outside of a hub portion, seated on a drive shaft, while the coupling part with the engaging tab is placed in a bore. The bore is part of a tool. The bayonet coupling may have a different configuration, as described above.

Fig. 1 shows a tool 1 which is to be secured to a drive shaft 2. The drive shaft 2 is driven by a motor (not shown in the figures) for rotation about an axis of rotation 16. The tool has mounted tool elements 3, such as grinding elements or polishing elements. On the drive shaft is seated a hub portion. The hub portion is designed with two receiving grooves 5, while only one receiving groove can be seen in fig. 1. The tool 1 has a bore 6 placed centrally on the outside of the tool 1. Further down in the bore are two engaging tabs 7 (only one engaging tab can be seen in fig. 1). As mentioned above, it is possible to have more or fewer receiving grooves and engaging tabs.

The hub portion 4 has a T-shaped receiving groove 5, and when the hub portions 4 is placed in the bore 6 the tool 1 can be rotated both clockwise and counterclockwise, and thus establish a locking engagement both in clockwise and counterclockwise rotation. This ensures that the machining unit is firmly seated on the drive shaft, regardless of the direction in which the tool rotates.

Fig. 2 shows a hub portion, respectively right and left part of the second section of two different receiving grooves 5.

Fig. 3a-3d shows the receiving groove from different angles. On the hub portion 4 shown there are two receiving grooves, each having a first section and a second section, which second section is divided into a right part 9 and a left part 8.

Fig. 4 shows the hub portion 4 with the right part of the second section of the receiving

groove 9 and the left part of the second section of the receiving groove 8. In both right and left parts of the second section of the receiving groove there is placed a toothing 11. The toothing faces away from the first section of the receiving groove and interacts as a ratchet with the bore's locking tabs. The toothing ensures that the tool cannot rotate opposite the locking direction, for example, if the rotation stops suddenly, thereby ensuring that the tool does not drop off during use.

Fig. 5 shows the outside of the tool 1. The bore 6 is placed centrally on the outside of the tool 1. In the bore 6 are placed two engaging tabs 7 opposite each other.

10

Fig. 6 shows the inner portion of the bore. There are two engaging tabs 7, each one comprising two locking tabs 12, where the locking tabs are facing each other. On the outside of the locking tabs there is formed a barb 13. The barbs of the locking tabs form the second part of the ratchet together with the toothing 11 in the receiving groove 5 (fig. 4).

15

The locking tabs 12 furthermore have a weakening line 14. When the bayonet coupling is removed, the locking tabs 12 will be bent or broken off, so that it is possible to turn the two parts of the bayonet coupling against the ratchet. The use of weakening lines is preferable for onetime use of machining units.

20

In the lowermost portion of the bore 6 there is placed a collar 15, which is perpendicular to the bore 6. The collar 15 means that the hub portion 4 cannot go through the tool 1, but instead the hub portion 4 is maintained at the height where the receiving groove 5 and engaging tab 7 have the proper height so that they easily engage with each other. Furthermore, the hub portion will be clamped between engaging tabs and the collar and thus ensure that the tool has no movement axially along the axis of rotation during use.

25

1. Tool
2. Drive shaft
- 30 3. Tool elements
4. Hub portion
5. Receiving groove.
6. Bore
7. Engaging tab

8. Left part of second section of the receiving groove
9. Right part of second section of the receiving groove
10. First section of the receiving groove
11. Toothings
- 5 12. Locking tab
13. Barb
14. Weakening line
15. Collar
16. Axis of rotation

PATENT CLAIMS

1. A bayonet coupling for mounting of a tool (1) with tool elements (3) on a drive shaft (2) of a machining unit, which has a motor, which comprises a drive shaft (2) for driving the tool about an axis of rotation (16), and where the drive shaft is connected in driving manner either directly or indirectly to the tool via a bayonet coupling, which comprises two coupling parts, the one coupling part being provided with a receiving groove (5) for an engaging tab (7) on the other coupling part, which receiving groove (8, 9, 10) has a first section (10) with an extension parallel to the axis of rotation and a second section (8, 9) with an extension transverse, preferably perpendicular, to the axis of rotation (16), so that the tool is driven via the engagement of the bayonet coupling, **characterized in that** the second section (8, 9) of the receiving groove has an extension on either side of the first section, so as to form a T-shaped receiving groove, and the bayonet coupling is devised with at least one locking tab (12) with barbs (13) for engaging with a corresponding toothing (11) or a number of projections to establish a locking engagement of the locking tabs with the toothing (11) or the projections upon rotation of the tool.
2. The bayonet coupling according to claim 1, **characterized in that** each locking tab comprises a weakening line (14) so that the locking tab (12) is damaged when the tool is removed from the drive shaft's hub portion (4).
3. The bayonet coupling according to any one of the preceding claims, **characterized in that** one or more toothings (11) or projections are placed on a hub portion (4) on the drive shaft, and at least one locking tab (12) is placed in a bore of the tool, and the bore is designed to receive the hub portion.
4. The bayonet coupling according to any one of the preceding claims, **characterized in that** the coupling part with the receiving groove (5) is the hub portion (4), the receiving groove being arranged at an outer perimeter of the hub portion, and the coupling part with the engaging tab (7) is arranged in the bore of the tool.
5. The bayonet coupling according to claim 4, **characterized in that** the engaging tab (7) comprises two locking tabs (12) directed against one another, and the toothing (11)

or the projections are arranged in the receiving groove's second section (8,9).

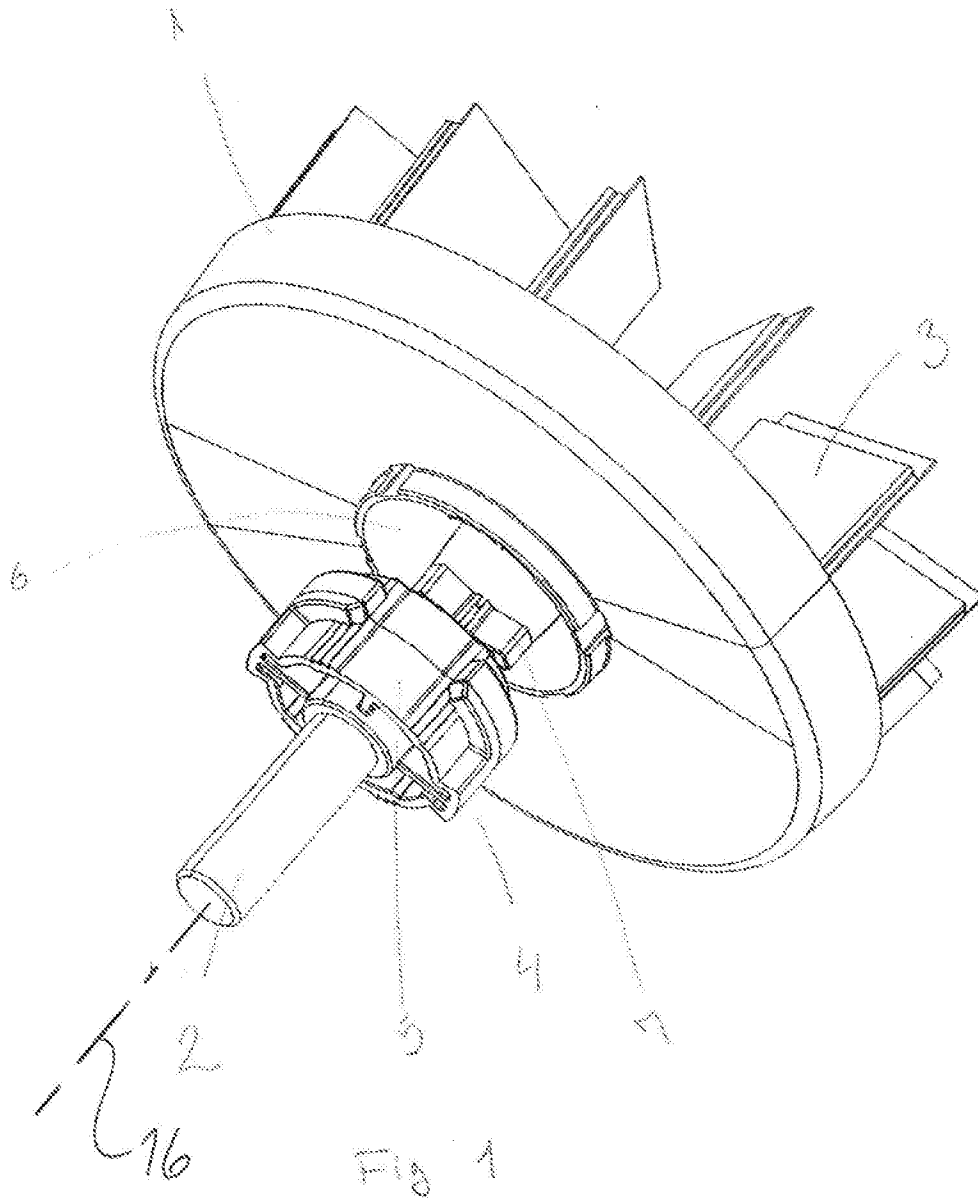
5 6. The bayonet coupling according to any one of claims 1-3, **characterized in that** the coupling part with the engaging tab (7) is a hub portion (4), the engaging tab (7) being arranged on an outer perimeter of the hub portion, and the coupling part with the receiving groove (8, 9, 10) is arranged in the bore of the tool.

10 7. The bayonet coupling according to claim 6, **characterized in that** the receiving groove's (8, 9, 10) boundary contains locking tabs (12) on either side of the receiving groove's first section (10), and the toothing (11) or the projections are arranged on the hub portion on the dorsal engaging surface of the engaging tab.

15 8. The bayonet coupling according to any one of the preceding claims, **characterized in that** the one coupling part is provided with at least two receiving grooves (8, 9, 10), and the second coupling part is provided with at least two engaging tabs (7), so that the number of receiving grooves is at least the same as the number of engaging tabs.

20 9. The bayonet coupling according to any one of the preceding claims, **characterized in that** the receiving groove's second section (8,9) has a size such that the engaging tab (7) can slide into it without risk of movement in the direction of the axis of rotation.

10. A machining unit, preferably for grinding, sanding, polishing or similar work tasks, where the machining unit comprises a bayonet coupling according to any one of claims 1-9 for mounting of a tool (1) on a drive shaft (2) of a motor unit.



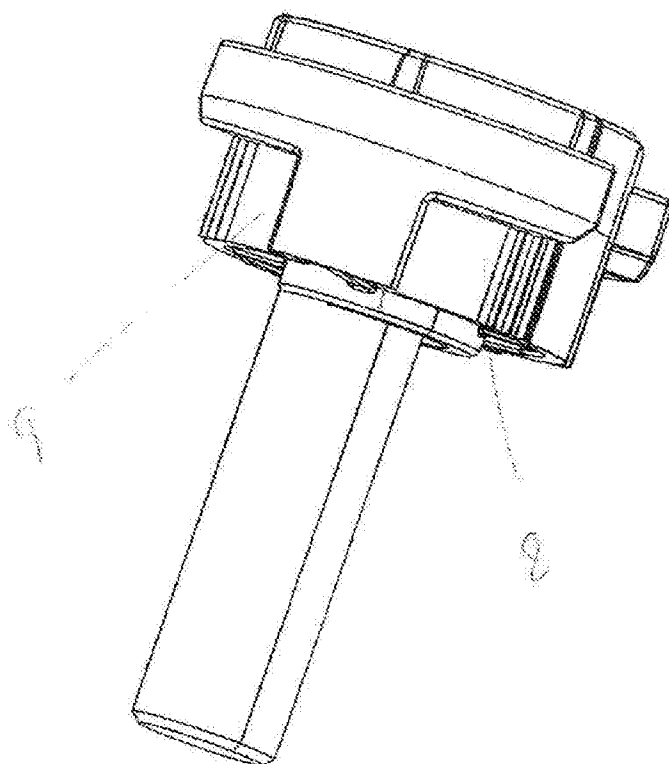


Fig. 2

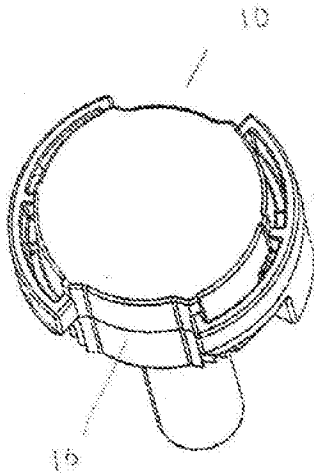


Fig 3a

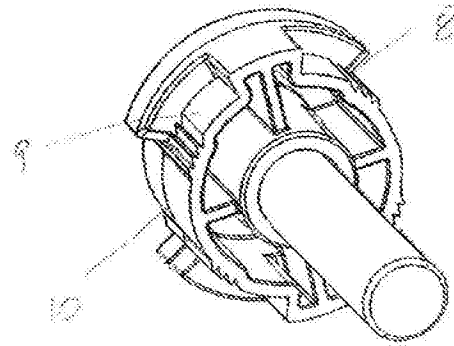


Fig 3b

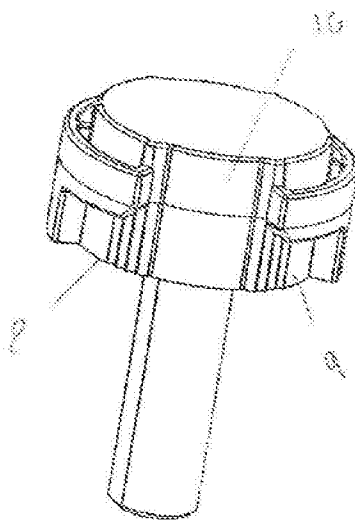


Fig 3c

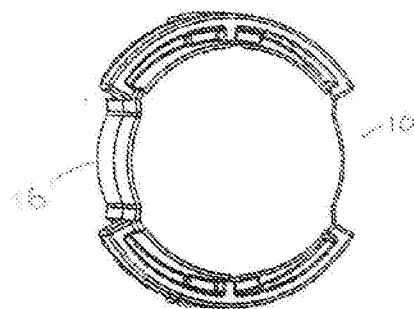


Fig 3d

4 / 6

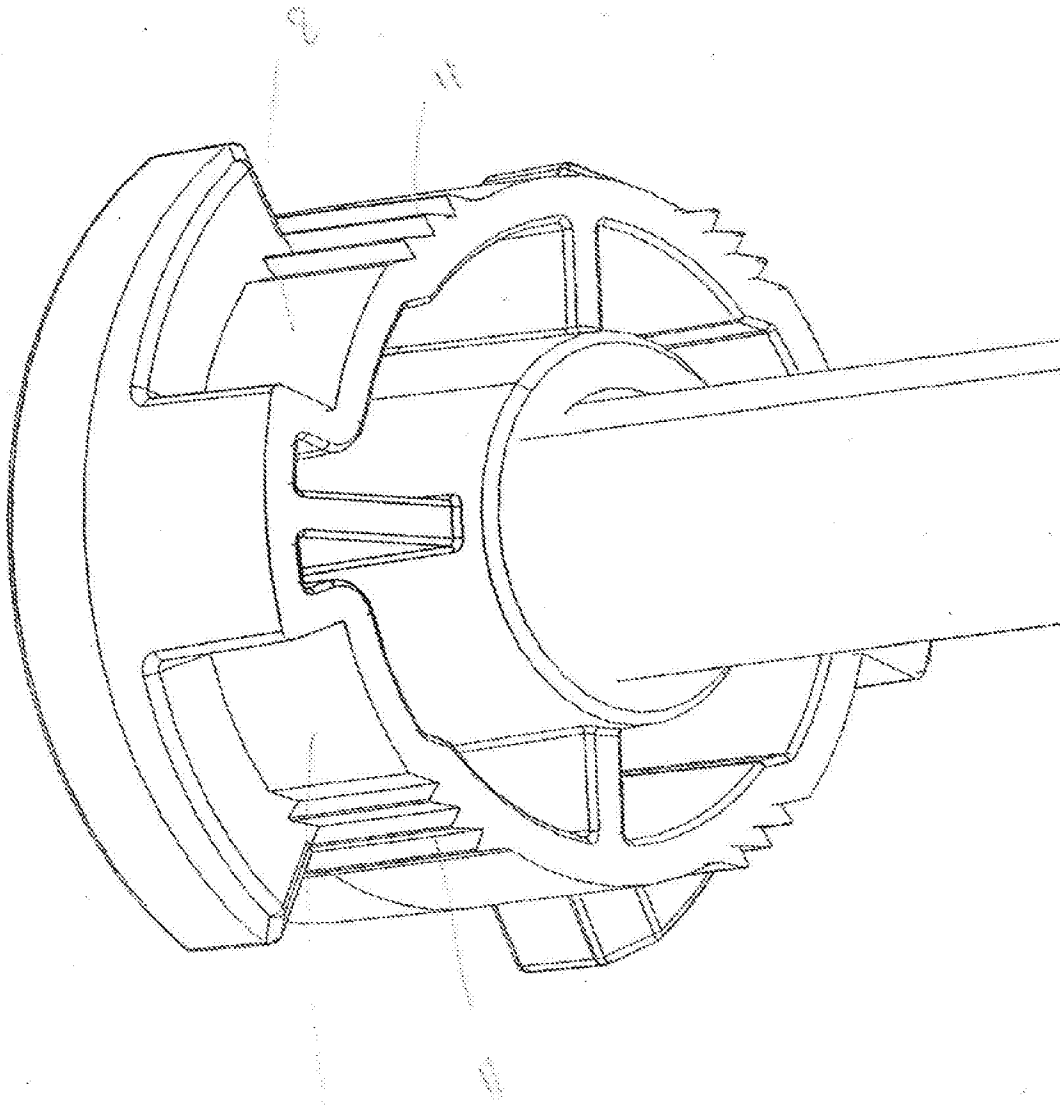


Fig 4

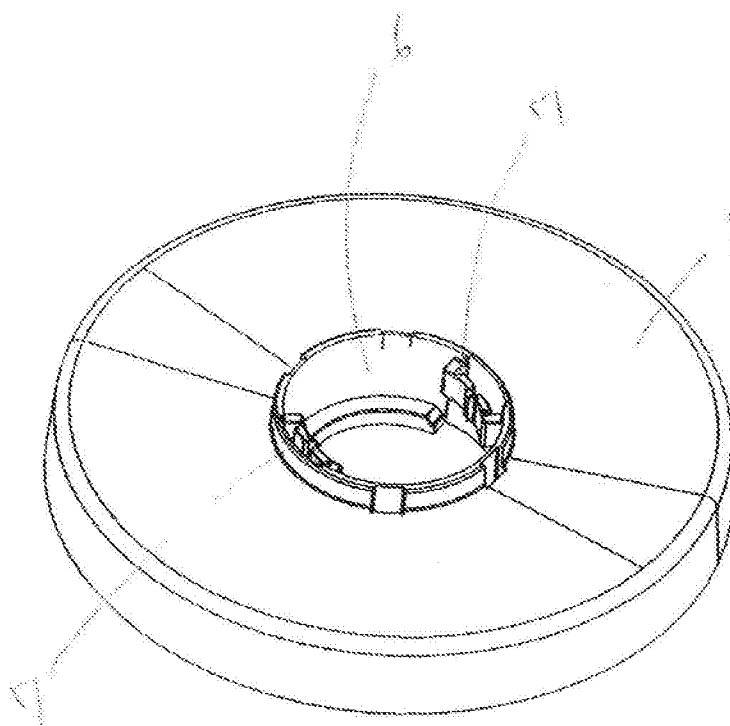


Fig. 5

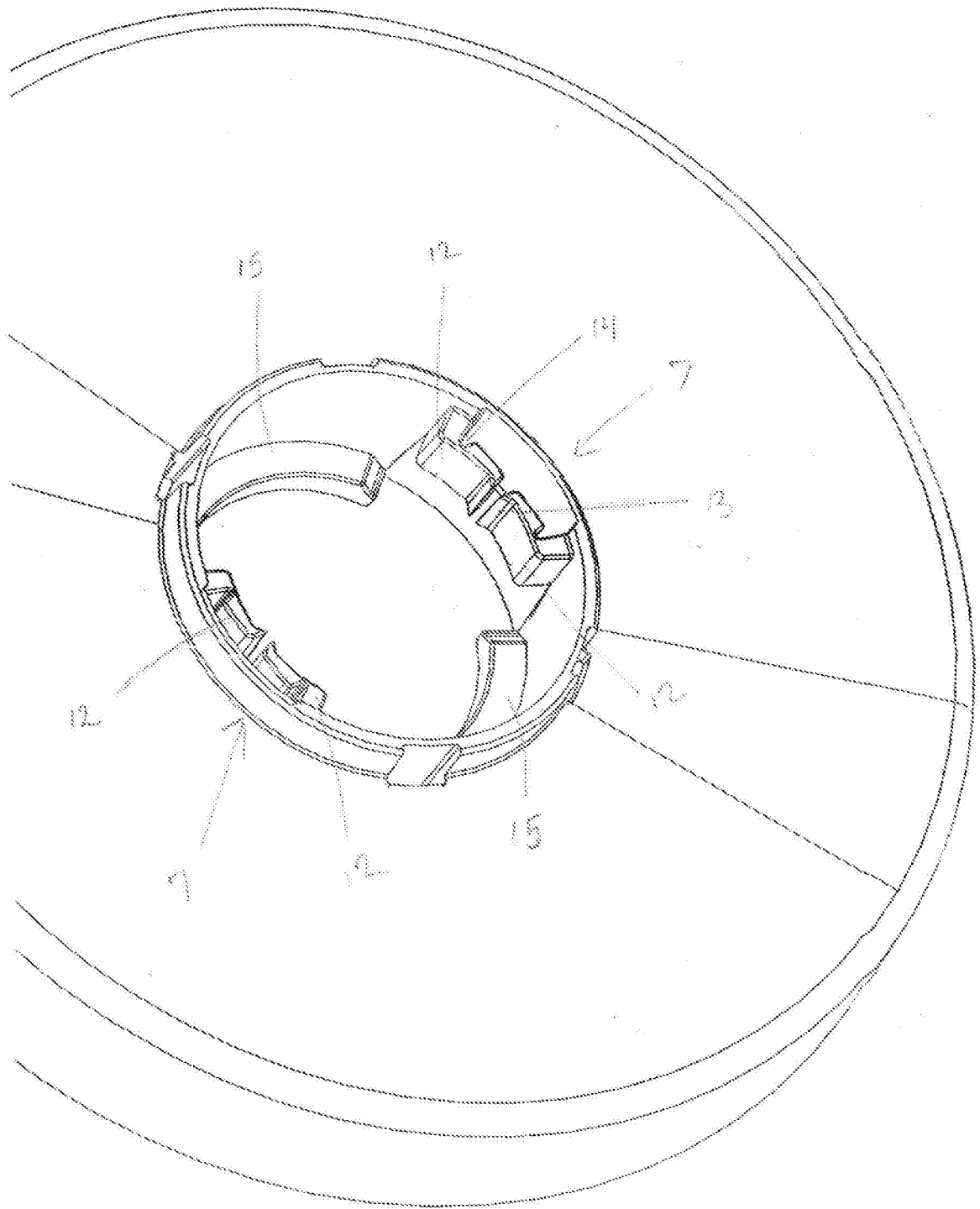


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2017/050179

A. CLASSIFICATION OF SUBJECT MATTER B24B 45/00 (2006.01) According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC/CPC: B24B, B24D, F16B, F16D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched DK, NO, SE, FI: Classes as above.		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4661009 A (TRIPP) 1987.04.28, abstract and the figures.	1 – 10
A	EP 0147545 A2 (C & E FEIN GMBH) 1985.07.10	1 – 10
A	DE 4430229 A1 (GERD EISENBLÄTTER GMBH) 1996.02.29	1 – 10
A	EP 1795301 A1 (FESTOOL GMBH) 2007.06.13	1 – 10
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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