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(54) ROTARY TOOL WITH ADJUSTABLE THICKNESS

(57) A rotary tool with adjustable thickness, which is configured to be used in squaring machines for panels made of composite material, comprising cutters holders (1, 2), connected with a hydraulic-expansion hub (4), which are coaxially arranged and which are rotated together at the same time; in particular, a double rack is placed between said cutters holders (1, 2), said rack having a single shaped profile (5), associated with a first portion (3) of said tool connected to a first cutter holder (1), and two conjugate profiles (6, 61), associated with a second portion (11) of said tool connected to a second cutter holder (2), respective adjustment pins (7) being coupled with said rack and moving along said profiles (5, 6, 61) at discrete steps thanks to the pressure of at least one annular chamber (13) defined by said first portion (3) of the tool and adjacent to said profiles (5, 6, 61), so as to make an adjustment at discrete steps of the distance between said cutters holders (1, 2).

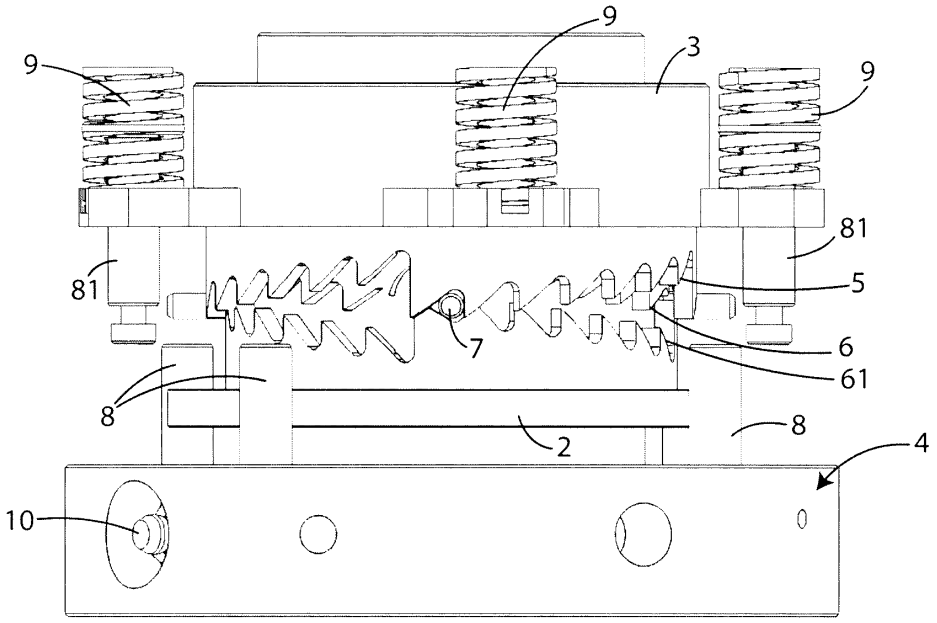

Fig. 6

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Description

[0001] The present invention generally relates to a rotary tool with adjustable thickness which can be used in machines for operating generic composite materials.

[0002] More particularly, the invention concerns a rotary tool with high performance, which executes planing and squaring of panels or strips of wood and the like, comprising two coaxial cutters which are mounted on cutters holders and whose distance is simply and quickly adjustable by discrete steps.

[0003] The common rotary tools with side cutters which are used in machines for working wood and generic composite materials normally provide the use of two cutters, which are mounted on respective shafts and which are set in rotation towards a specific direction by means of a suitable spindle connected to kinematic organs which drive the spindle to rotate, while the object being machined can be stably fixed to a reference slab or moved with respect to the cutters.

[0004] In particular, the cutters, which are provided with respective cutting edges, are placed on two separate disc-shaped bodies which are coaxial and facing each other and which are interconnected by suitable spacers, for allowing the mutual approaching and the mutual spacing to adjust the width of the tool.

[0005] This adjustment is necessary as a result of the wearing of the cutting edges of said cutters and/or in order to change the thickness of the processing and said adjustment is specifically carried out by removing the central shaft and the relative cutters and by inserting or removing one or more of the aforesaid spacers.

[0006] It follows an undoubted inconvenience and slowness of such operations, to which is added the drawback related to the fact that it is not possible to ensure a sufficient accuracy of handling and positioning of the two mobile bodies associated with the cutters.

[0007] The present invention aims therefore to obviate the drawbacks of the prior art mentioned above and, in particular, the main object of the invention is to provide a rotary tool with adjustable thickness, which allows to safely and quickly adjust the distance between a cutter and the other, without having to use spacers between the above mentioned cutters, nor having to provide for the intervention of specialized personnel.

[0008] Another object of the invention is to provide a rotary tool with adjustable thickness, which allows to perform workings (internal or external) on panels or strips of generic composite material having different geometries and/or dimensions.

[0009] Another object of the present invention is to provide a rotary tool with adjustable thickness, which allows to obtain an indexed and accurate adjustment of the cutters, without dismantling the tool from the hubs, avoiding the use of spacers and thus increasing the flexibility of the machine, with respect to the prior art.

[0010] A further object of the invention is to provide a rotary tool with adjustable thickness, which is particularly effective, reliable, convenient and economical, with respect to the prior art, and which can be used for any new or existing machine, for internal and/or external machining and for squaring panels made of wood or generic composite material.

[0011] These and other objects are achieved by a rotating tool with adjustable thickness according to the enclosed claim 1.

[0012] Further technical features of the rotary tool with adjustable thickness, which is the object of the invention, are given in the further dependent claims.

[0013] Advantageously, the rotary tool according to the present invention allows an indexed adjustment of the cutters, which are mounted on respective cutters holders, by sending pulses of compressed air.

[0014] The whole is driven by a double rack and by special pins, which, by rotating within the slide (constituted by the profile of the double rack) each time it is given a pulse of compressed air, allow an accurate adjustment of the distance between the cutters.

[0015] Further purposes and advantages of this invention will become more clear from the following description relating to a preferred embodiment of the rotary tool with adjustable thickness, according to the present invention, and to the appended drawings, given as a preferred embodiment, in which:

- figure 1 is a perspective view of the rotary tool with adjustable thickness, according to the present invention;
- figures 2 and 3 show exploded views of some components of the rotary tool with adjustable thickness of figure 1, according to the present invention;
- figure 4 is a front partially sectioned view of the rotary tool with adjustable thickness of figure 1, according to the present invention;
- figure 5 is a bottom perspective and partially sectioned view of the rotary tool with adjustable thickness of figure 1, according to the present invention;
- figures 6, 7 and 8 show a series of front views of the rotary tool of figure 1, free of the hub and placed in different adjustment positions, according to the present invention;
- figure 9 is a partial cross section view of the rotary tool of figure 1, according to the present invention;
- figures 10A, 10B and 10C show a series of front views of the rotary tool of figure 1, placed in different adjustment positions, according to the present invention;
- figure 11 is a schematic view of the path followed by the adjustment pins during the adjustment of the rotary tool of figure 1, according to the present invention.

[0016] With reference to the mentioned figures, the rotary tool with adjustable thickness, according to the invention, is mainly used, as said, in machines for squaring panels made of wood or generic composite material for

carrying out internal and/or external workings and comprises two cutters holders 1, 2, on which two respective cutters are mounted (not shown in the appended drawings).

[0017] The cutters holders 1, 2 are arranged coaxially, are rotated simultaneously between them and are also supported by a known hydraulic expansion hub 4, on which the spindle of the drive motor of the tool is engaged by means of the tightening screw 10 (fig. 1 and 10A-10C).

[0018] According to the present invention, a double rack is provided inside the cutters holders 1, 2 and said rack is formed by a first single profile 5, which is shaped as a saw-tooth and which is coupled with an upper portion 3 of the tool, and by a pair of conjugate profiles 6, 61, which are coupled with a lower portion 11 of the tool, so that the lower cutter holder 2 is integral with the rack provided with the conjugate profiles 6, 61 and the upper cutter holder 1 is integral with the rack provided with the single profile 5. Respective pins 7 engage within the profiles 5, 6, 61 and said pins 7 rotate according to discrete steps, and, as described more in detail below, by a distance equal to the pitch P of the conjugate profiles 6, 61 of the rack.

[0019] It should be noted, in any case, that the profiles 5, 6, 61 of the double rack can be varied at will, both in geometry and in the distance and/or pitch P, according to the user's requirements.

[0020] The pins 7 are fixed and integral with a central ring 12, which is also fixed, which maintains the centerline and which allows the regulation of the tool with respect to a plane passing centrally to the tool; in turn, the central ring 12 is fixed to the pins 8 connecting it to the hydraulic expansion hub 4.

[0021] In particular, a series of pulses of compressed air are used for moving the pins 7, so as to perform an indexed and accurate adjustment of the distance between the hubs 1, 2 and, therefore, of the thickness between the cutters of the tool.

[0022] Figures 6, 7 and 8 show the rotary tool, according to the present invention, in a position according to which the distance between the cutters holders 1, 2, is, respectively, maximum, minimum and intermediate.

[0023] Said opening conditions between the cutters are achieved through the movement of the adjustment pins 7, which perform a predetermined path determined by the geometry of the grooves of the profiles 5, 6, 61 of the double rack and, in particular, the path followed by the adjustment pins 7, between the positions of maximum and minimum opening between the cutters holders 1, 2 and therefore between the cutters, is the one indicated by the solid line L of fig. 11.

[0024] Specifically, starting from the lowest position of each pin 7, by sending a pulse of compressed air inside the chamber 13, which is delimited by the upper portion 3 of the tool and by the upper surface of the ring 12 (shown in detail in the appended fig. 9), it is possible to overcome the force of the contrast springs 9, positioned between the cutters holders 1, 2 and configured to slide inside the pins 81, so as to position the pin 7 in the highest point of the profile 6 of the rack coupled with the lower portion 11 of the tool, once the pressure is released (first point of adjustment, with the tool completely open, fig. 6).

[0025] Practically, the lower portion 11 of the tool is provided for being positioned on the pins 7 and, consequently, for regulating the distance between the cutters holders 1, 2, while the upper portion 3 of the tool is provided for being moved on the pins 7 and for regulating the distance between the cutters holders 1, 2.

[0026] When other pulses of compressed air are delivered within the pressure chamber 13, it is possible to obtain a step adjustment of the thickness between the cutters holders 1, 2 (and, therefore, between the cutters of the rotating tool), until the lowest position shown in the appended fig. 7 (last point of adjustment, with the tool completely closed), after which each pin 7 has followed the whole path identified by the line L of fig. 11. Therefore, when the lowest point is reached, the adjustment can start again thanks to the geometry of the conjugate profiles 6, 61 of the rack.

[0027] In this regard, figures 10A, 10B, 10C show the tool according to the present invention with the cutters holders 1, 2 in a position which is, respectively, completely open, intermediate and completely closed.

[0028] It follows that the user is able to widen or narrow the distance between the cutters from a minimum opening value to a maximum opening value, simply by stopping the machine and by pressurizing the chamber 13; said opening values are determined by the geometry of the profiles 5, 6, 61 of the double rack.

[0029] Thus, there is a discrete adjustment of the distance between the cutters and, consequently, a discrete variation of the cutting profile, simply by sending compressed air from the outside and by controlling the flow of said compressed air within the annular chamber 13.

[0030] In particular, the above mentioned mechanism allows the adjustment of the distance between the cutters without disassembling the above-mentioned cutters from their respective cutters holders 1, 2 and also avoiding the use of spacers between said cutters holders 1, 2, so as to obtain a clear increase of flexibility of the machine on which is mounted the tool; it is also maintained the center line of the tool, so that the adjustment can always take place with respect to a central reference with respect to the cutters, through the use of the ring 12.

[0031] The technical features of the rotary tool with adjustable thickness, which is the object of the present invention, are clear from the above description, as well as the advantages are also clear.

[0032] Finally, it is also clear that other variations may be made to the rotary tool of the invention, without departing from the principles of novelty inherent in the inventive idea as mentioned in the appended claims, as well as it is also clear that in the practical implementation of the invention, materials, shapes and dimensions of the features illustrated may be any according to requirements and these may be replaced with other equivalents.

Claims

1. Rotary tool with adjustable thickness, which is configured to be used in squaring machines for panels made of composite material, comprising cutters holders (1, 2), connected with a hydraulic-expansion hub (4), which are coaxially arranged and which are rotated together at the same time, **characterized in that** a double rack is placed between said cutters holders (1, 2), said rack having a single shaped profile (5), associated with a first portion (3) of said tool connected to a first cutter holder (1), and two conjugate profiles (6, 61), associated with a second portion (11) of said tool connected to a second cutter holder (2), respective adjustment pins (7) being coupled with said rack and moving along said profiles (5, 6, 61) at steps thanks to the pressure of at least one annular chamber (13) defined by said first portion (3) of the tool and next to said profiles (5, 6, 61), so as to make an adjustment at steps of the distance between said cutters holders (1, 2).

2. Rotary tool as claimed in claim 1, **characterized in that** said adjustment pins (7) perform a predetermined path between a plurality of recesses provided on said profiles (5, 6, 61) of said rack, said recesses being located at a fixed distance (P) between them.

3. Rotary tool as claimed in at least one of the preceding claims, **characterized in that** a plurality of pulses of compressed air are sent to said annular chamber (13), in order to counteract the elastic force of springs (9) and to place said adjustment pins (7) within prefixed recesses of said rack, said pins (7) thus assuming a plurality of operating positions, according to which said tool is completely open and said cutters holders (1, 2) are placed at a maximum distance between them and according to which said tool is completely closed and said cutters holders (1, 2) are placed at a minimum distance between them, and a plurality of intermediate operating positions, a step adjustment of the distance between said cutters holders (1, 2) is provided.

4. Rotary tool as claimed in at least one of the preceding claims, **characterized in that** said adjustment pins (7) rotate inside the profiles (5, 6, 61) of the rack.

5. Rotary tool as claimed in at least one of the preceding claims, **characterized in that** said profiles (5, 6, 61) of the rack (5, 6) have different shape.

6. Rotary tool as claimed in at least one of the preceding claims, **characterized in that** said adjustment pins (7) are fixed and integral with a fixed central ring (12), which maintains the center line and that allows adjustment of the tool with respect to a plane passing centrally to said tool.

7. Rotary tool as claimed in claim 6, **characterized in that** said central ring (12) is fixed to connecting pins (8) which connect the ring (12) to said hydraulic expansion hub (4).

8. Rotary tool as claimed in at least one of the preceding claims, **characterized in that** said second portion (11) of the tool causes the positioning of the tool with respect to said pins (7), while said first portion (3) of the tool causes the movement of the tool with respect to said pins (7).

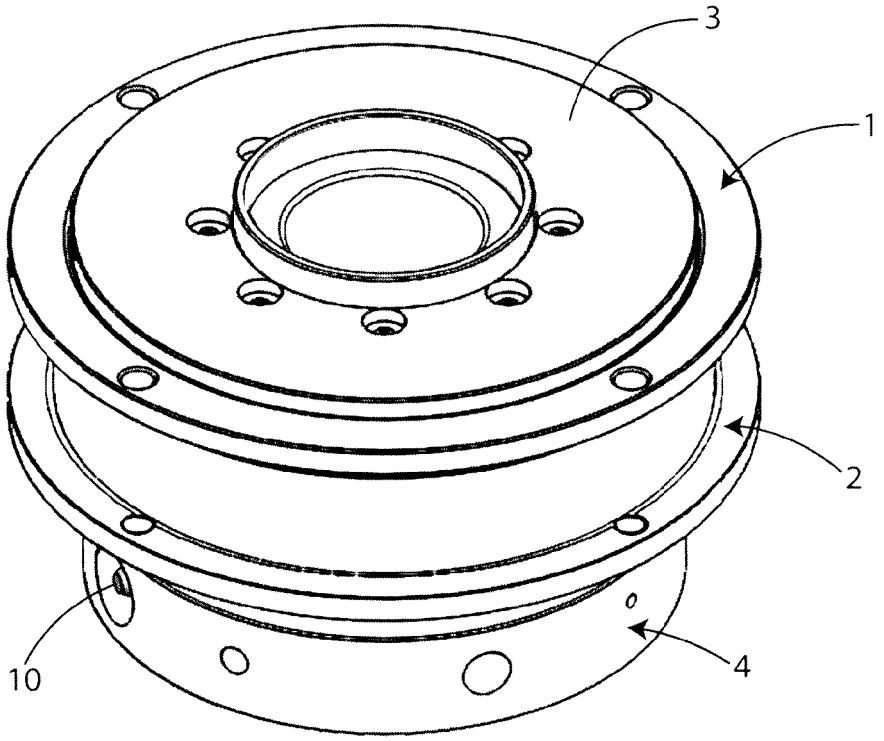

Fig. 1

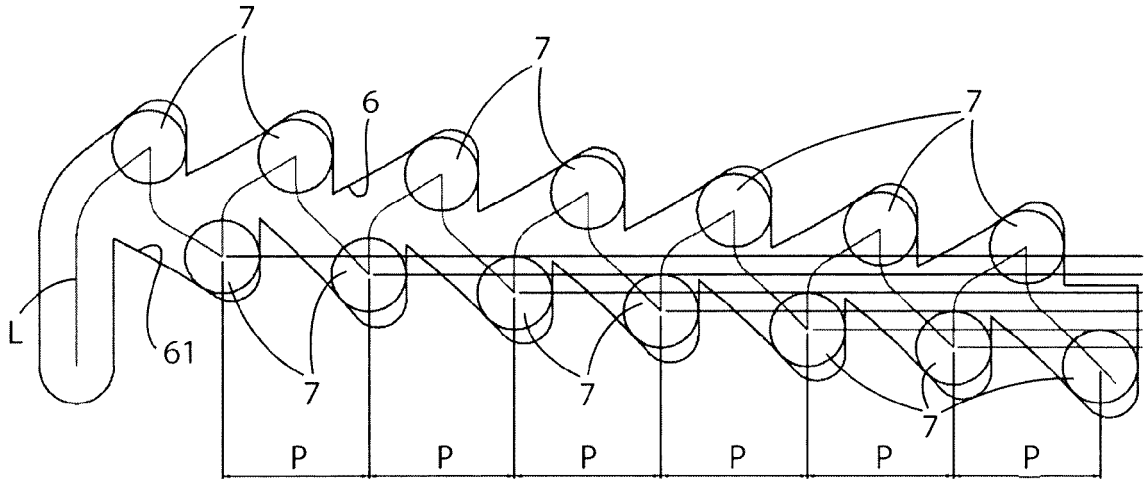

Fig. 11

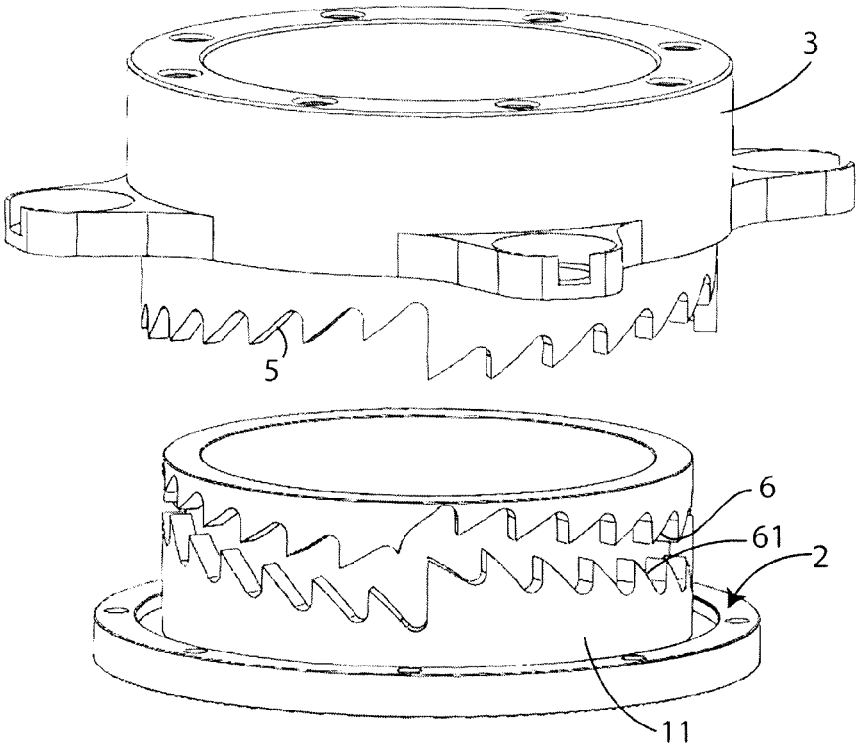

Fig. 2

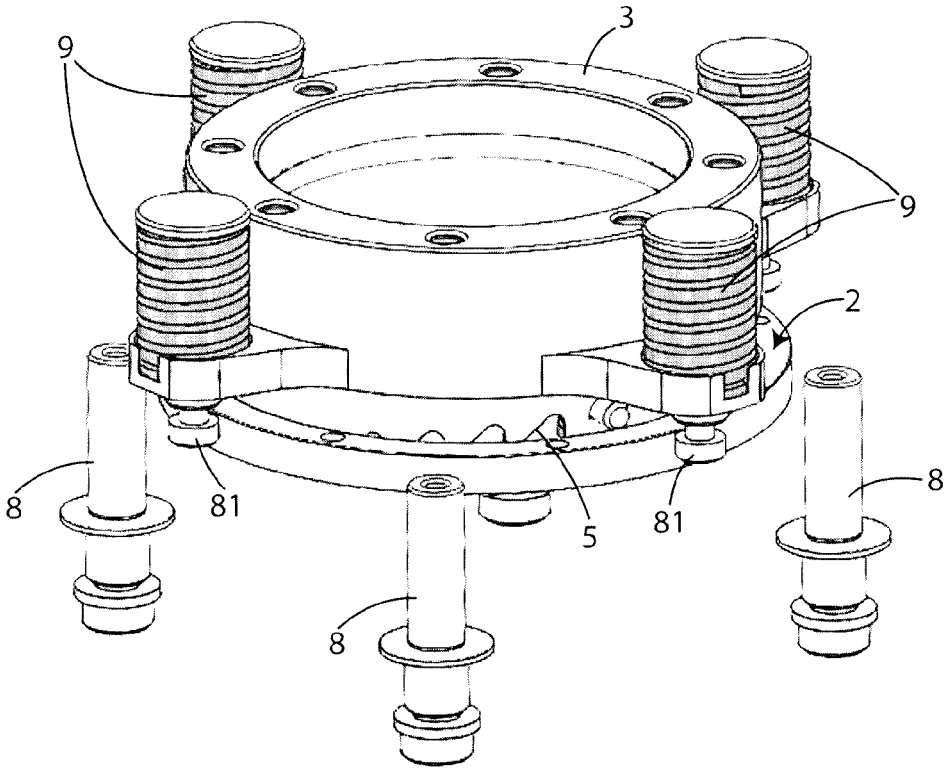

Fig. 3

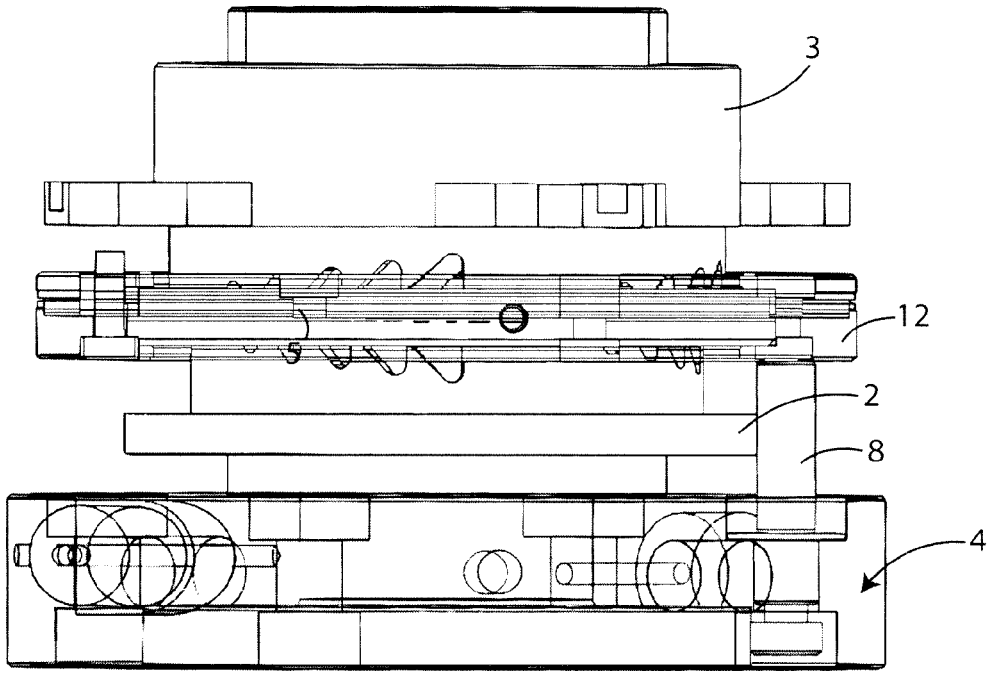

Fig. 4

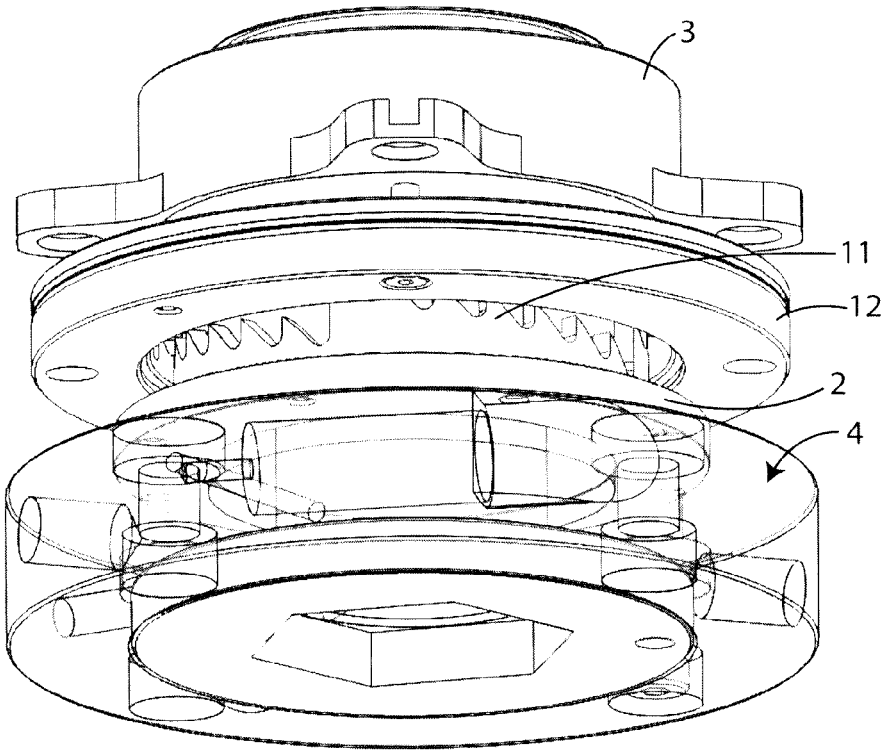

Fig. 5

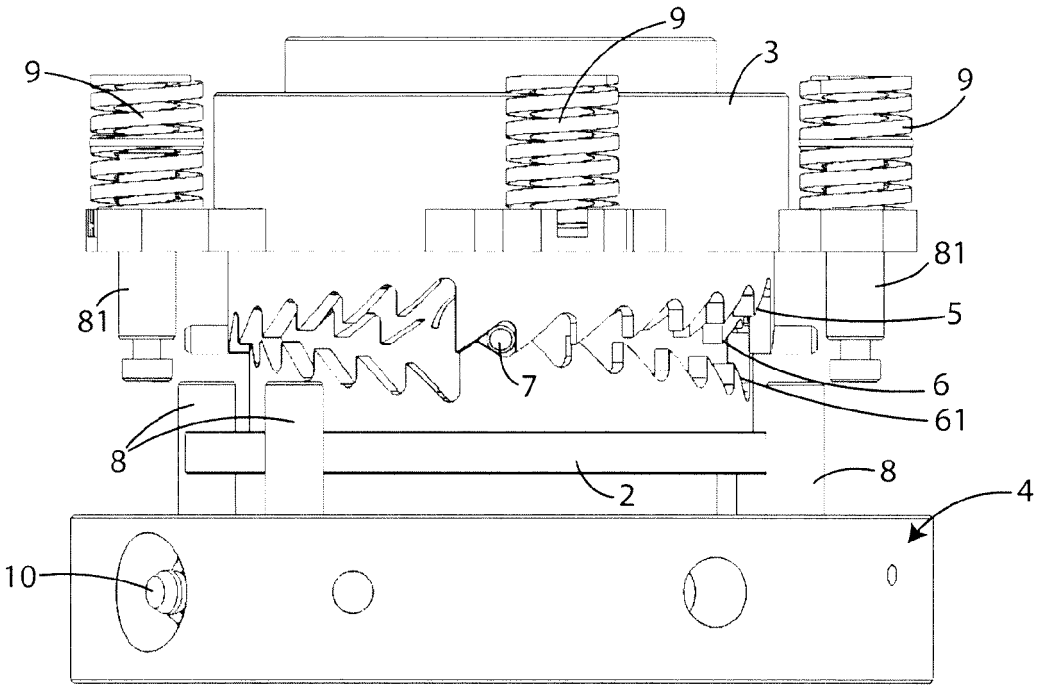

Fig. 6

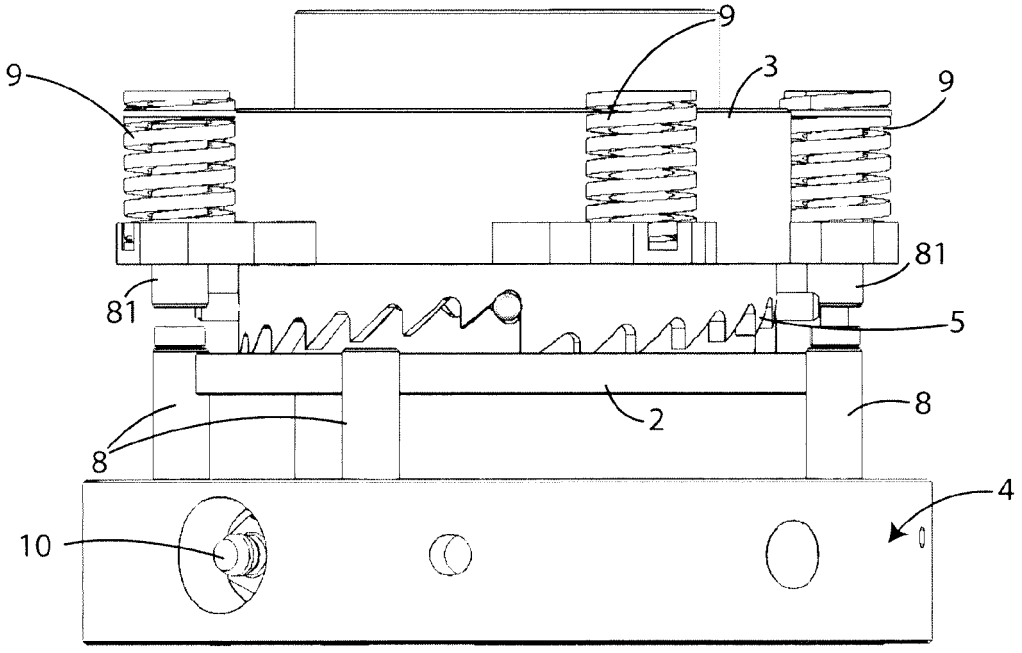

Fig. 7

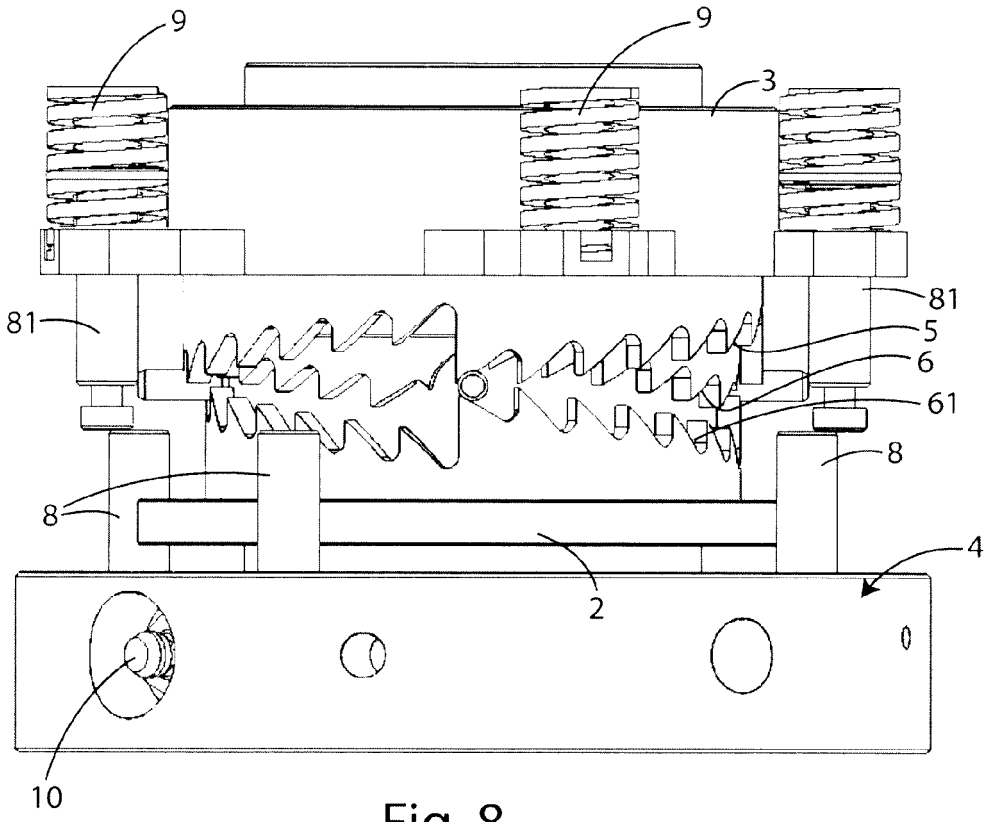

Fig. 8

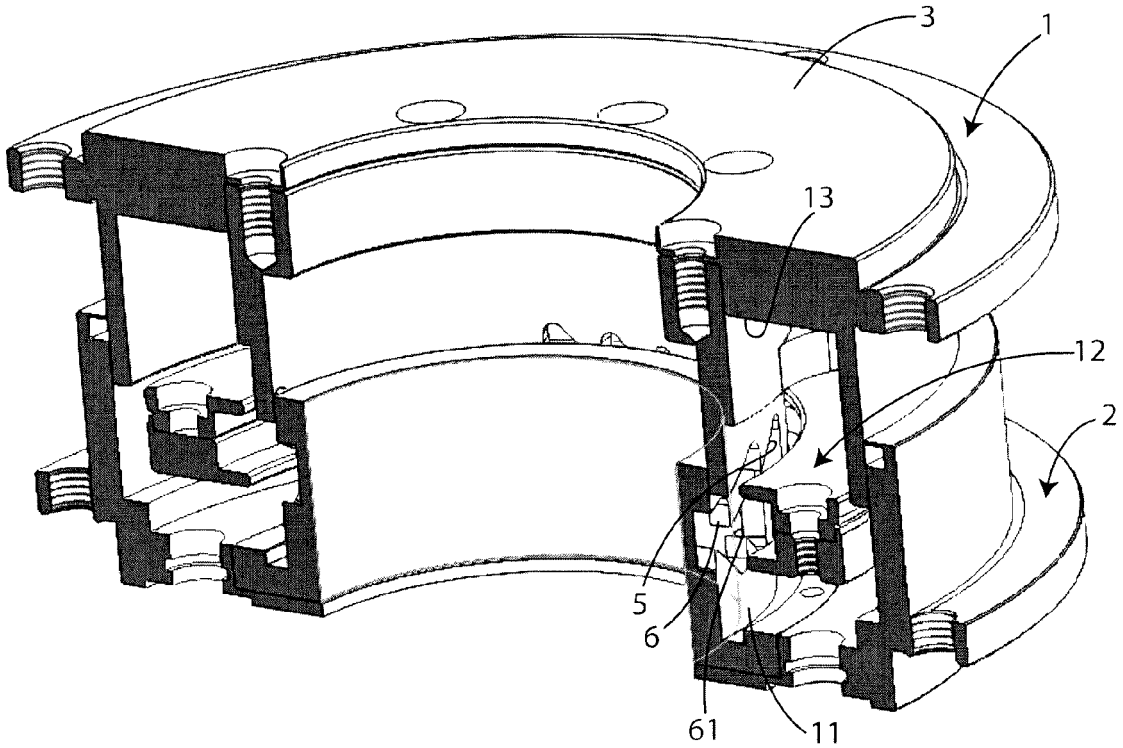

Fig. 9

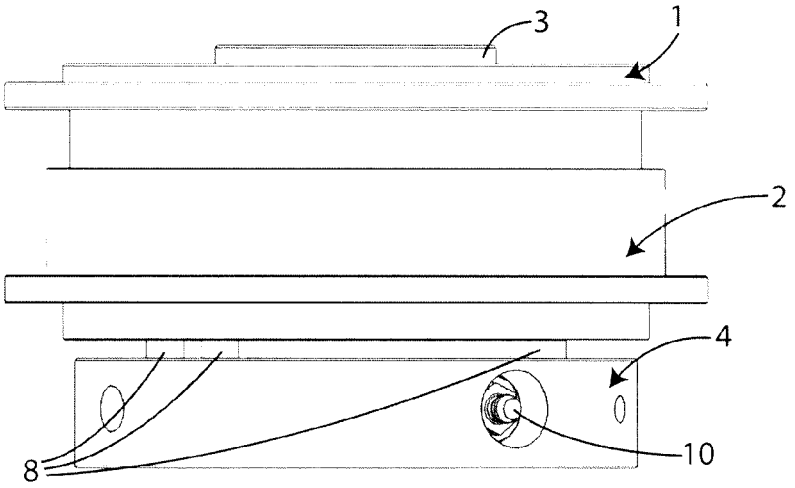

Fig. 10A

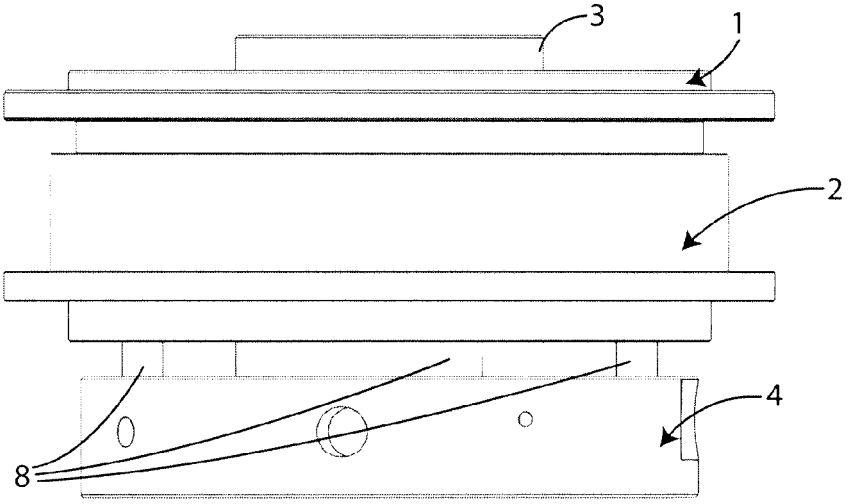

Fig. 10B

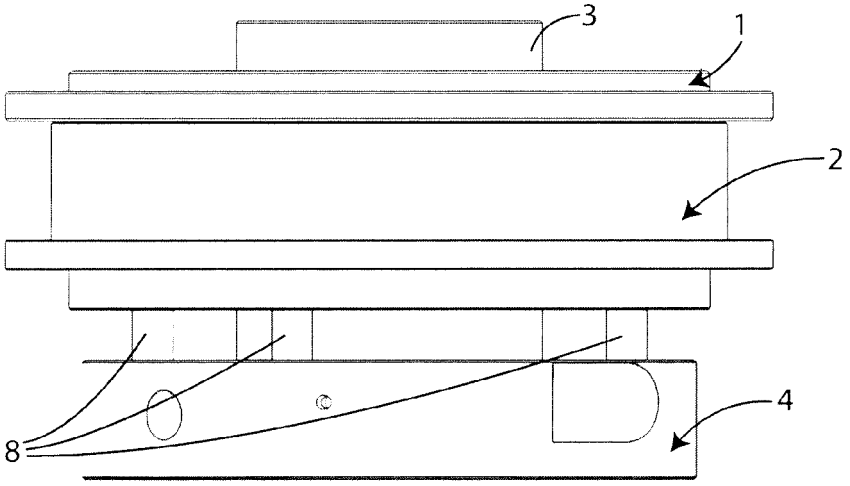

Fig. 10C

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EUROPEAN SEARCH REPORT

Application Number
EP 15 42 5047

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 730 962 A (JOHANNESSON LENNART [SE]) 15 March 1988 (1988-03-15) * column 2, line 36 - column 4, line 8; figures 1,4 *	1	INV. B27G13/00
A	US 4 547 997 A (KIMMELAAR RUDOLF J A [NL] ET AL) 22 October 1985 (1985-10-22) * abstract; figures *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B27G
B23Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 November 2015	Huggins, Jonathan

CATEGORY OF CITED DOCUMENTS

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06-11-2015

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