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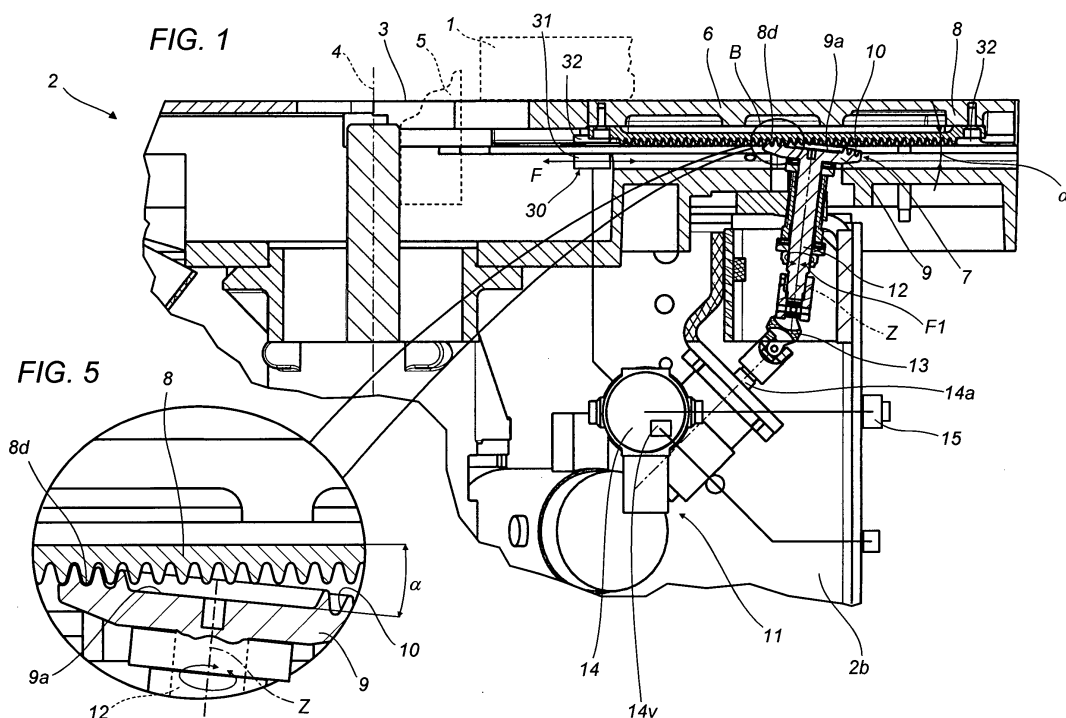
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(54) **A machine for working wooden panels or similar workpieces**

(57) A machine for working wooden panels (1) or similar workpieces comprises: a horizontal work table (3) on which the panel (1) rests; a vertical machining axis (4) projecting from the work table (3) and presenting a tool (5) for machining the panel (1); a work table (3) sector (6), located close to the machining axis (4) and translationally driven by suitable means (7) towards and away from the machining axis (4) along an axis (Y) perpendicular to a direction (A) of panel (1) feed in such a

way as to adapt at least to the different diameters of different tools (5). The means (7) for driving the table (3) sector (6) comprise a rack (8) mounted on the sector (6) and a toothed element (9) having a helical profile (10) for meshing with the rack (8). The toothed element (9) is connected to drive means (11) that move it about its axis (Z) in both directions in such a way as to produce a continuous sliding contact between the rack (8) and the toothed element (9), thereby translationally driving the sector (6).



Description

[0001] The present invention relates to a machine for working wooden panels or similar workpieces.

[0002] The machine forming the subject-matter of this specification is called a lower vertical router or, in the jargon of the trade, "spindle moulder".

[0003] This type of machine is used for various types of machining operations on wooden panels (for example, moulding or cutting tenons on crosspieces or up-rights which will be used to make door or window frames) and has average productivity.

[0004] The machine basically comprises a horizontal work table on which the wooden panels rest and a vertical machining axis protruding from the horizontal work table, both supported by a base.

[0005] The machining axis comprises a power-driven spindle, which supports and drives one or more coaxial tools for machining the panels. On both sides of the machining axis, there are fences adjustably mounted relative to the cutting tool, perpendicular to the work table and designed to define the position at which the panel stops relative to the tool (thus determining the cutting depth) and to guide the panel towards the tool.

[0006] Normally, in simple machine models, the panel is fed manually by an operator.

[0007] The sector of the work table in the working area of the tool is mobile along an axis perpendicular to the panel feed direction so that it can adapt to cutting tools of different sizes and, when necessary, to tilting of the power-driven spindle.

[0008] This sector, usually known as "extension table" is slidably coupled with guides on both sides of the main table, which enable it to be moved and adjusted.

[0009] To move the extension table towards and away from the tool, the operator has to use a handwheel provided for this purpose on the machine. The handwheel drives a customary lead nut and screw mechanism operating between the extension table and the fixed structure of the machine.

[0010] Another arrangement aimed at facilitating machine setting up procedures includes a motor and related mechanisms for automatically driving the extension table.

[0011] This arrangement, however, has some disadvantages due to the large amount of space required by the motor and automatic drive parts.

[0012] In addition to this, the drive parts themselves, consisting for example of a customary rack and a power-driven straight-tooth crown gear, have proved unreliable in time on account of shavings (or other process waste) getting trapped between the teeth (owing to the shape of the teeth themselves), making it difficult for the teeth to mesh properly and creating drive problems. This may eventually lead to stiffness, erratic operation and jamming of the system that drives the extension table.

[0013] The aim of the present invention is, therefore, to overcome the above-mentioned disadvantages by

providing a machine for working wooden panels or similar workpieces equipped with an extension table driven by an extremely practical, reliable and precise system that occupies very little space.

[0014] According to the invention, this object is achieved by a machine for working wooden panels or similar workpieces and comprising: a horizontal work table on which the panel rests; a vertical machining axis projecting from the work table and presenting a tool for machining the panel; a work table sector, located close to the machining axis and translationally driven by suitable means towards and away from the machining axis along an axis perpendicular to a direction of panel feed in such a way as to adapt at least to the different diameters of different tools; the means for driving the table sector comprise a rack mounted on the sector and a toothed element having a helical profile for meshing with the rack; the toothed element is controlled by drive means that move it about its axis in both directions in such a way as to produce a continuous sliding contact between the rack and the toothed element, thereby translationally driving the sector.

[0015] The technical characteristics of the invention, with reference to the above objects, are clearly described in the claims below and its advantages are apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 illustrates a machine according to the present invention, for working wooden panels or similar workpieces, in a front view with some parts in cross section and others cut away in order to better illustrate others;
- Figure 2 is a perspective exploded view of the machine of Figure 1;
- Figure 3 is a detail illustrating, in a partial plan view from below and with some parts cut away, the drive means of the machine shown in the figures listed above;
- Figure 4 illustrates a component of the drive means of the machine shown in the figures listed above in a perspective view with some parts cut away;
- Figure 5 is a scaled-up detail B from Figure 1.

[0016] With reference to the accompanying drawings, in particular Figures 1 and 2, the machine according to the invention, denoted in its entirety by the numeral 2, is used for machining wooden panels 1 or similar workpieces. It is a machine of the type known as lower vertical router or, in the jargon of the trade, "spindle moulder".

[0017] This type of machine is normally used for various types of machining operations on wooden panels (for example, moulding or cutting tenons on crosspieces or uprights which will be used to make door or window

frames) and has average productivity.

[0018] The machine 2 essentially comprises:

- a horizontal work table 3 on which the panel 1 rests (shown partly by the dashed line in Figure 1);
- a vertical machining axis 4 projecting from the work table 3 and presenting a tool 5 for working on the panel 1 (the tool is illustrated partly by a dashed line in Figure 1);
- a work table 3 sector 6, located close to the machining axis 4 and translationally driven (see arrows F in Figure 1) by suitable means 7 towards and away from the machining axis 4 along an axis Y perpendicular to a direction A of panel 1 feed in such a way as to adapt at least to the different diameters of the different tools 5 that may be fitted.

[0019] As shown in Figure 2, the sector 6 constitutes an independent extension that runs in guides 3a made in the table 3.

[0020] As shown in Figures 1 to 5, the means 7 for driving the sector 6 of the work table 3 comprise:

- a rack 8 mounted on the underside of the sector 6, and
- a toothed element 9 having a helical profile 10 for meshing with the rack 8.

[0021] Further, the toothed element 9 is connected to drive means 11 that move it about its axis Z in both directions in such a way as to produce a continuous sliding contact between the rack 8 and the toothed element 9, thereby translationally driving the sector 6.

[0022] As clearly shown in Figure 3, each tooth 8d of the rack 8 has an arc-shaped profile so as to create tooth spaces matching the shape of the contact portion of the helical profile 10 of the toothed element 9.

[0023] Looking in more detail, the toothed element 9 consists of a disc on whose top surface 9a the aforementioned helical profile 10 is made and forms a circular channel that meshes with the rack 8 (see also Figures 3 and 4).

[0024] The helical top contact surface 9a of the disc 9 is inclined by an angle α with respect to the plane in which the sector 6 extends: in this way, it meshes with the rack 8 at a single arc-shaped section of it, that is to say, acting on one rack 8 tooth 8d at a time when it is rotated by the drive means 11. The disc 9 further comprises a mounting shaft 12 connected to the drive means 11 located in a base 2b of the machine 2.

[0025] The shaft 12 may be kinematically connected to the drive means 11, for example, by a corner joint 13.

[0026] In a preferred, non-restricting embodiment, the drive means 11 may comprise a motor 14 connected to the shaft 12 through the corner joint 13 and kinematically connected to the joint 13 by its output shaft 14a.

[0027] The motor 14 is in turn connected to a control unit 15 outside the machine 2 used by the operator to

adjust the position of the sector 6.

[0028] Advantageously, the machine 2 may also be equipped with means 14v for displaying the position of the sector 6 with respect to the power-driven axis 4 and acting between the motor 14 and the sector 6. These means may be embodied, for example, by an encoder associated with the motor 14 and connected to a display device located outside the machine 2 (in Figure 1, the encoder is illustrated as a block).

[0029] Similarly, the invention also contemplates the provision of limiting means 30 acting between the work table 3 and the sector 6 to stop the motor 14 when the sector 6 reaches its limit positions, as far forward or as far back as possible: in this case (see Figure 1), there may be inductive sensors 31 located on the surface under the sector 6 and equipped, for example, at the rack 8 with respective metal reference plates 32 for the sensors 31. The sensors 31 are connected to the motor 14 and are designed to stop it when the sector 6 reaches one of the limit positions.

[0030] In practice, therefore, the extension table 6 may be moved automatically by activating the motor 14 which rotationally drives the disc 9 in a desired direction which in turn acts on the rack 8 in such a way as to drive the extension table 6 towards or away from the machining axis 4 depending on the direction of rotation.

[0031] A machine structured as described above therefore achieves the aforementioned thanks to an extremely practical and compact kinematic system for driving the extension table.

[0032] The use of a disc with a helical spiral that meshes with a rack having arc-shaped teeth makes it possible to obtain a smooth, sure movement without jamming since the passage of the teeth in the helical path produces a sliding contact that keeps the spaces where the two elements mesh clean.

[0033] Moreover, the disc creates a face coupling that requires little working space and enables the disc itself to be connected to a drive motor relatively far from the meshing area so as to optimise space.

[0034] The invention described has evident industrial applications and may be subject to modifications and variations without thereby departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A machine for working wooden panels (1) or similar workpieces; the machine (2) being of the type comprising at least:

- a horizontal work table (3) on which the wooden panel (1) rests;
- a vertical machining axis (4) projecting from the work table (3) and presenting at least one tool

- (5) for machining the panel (1);
- a work table (3) sector (6), located close to the machining axis (4) and translationally driven by suitable means (7) towards and away from the machining axis (4) along an axis (Y) perpendicular to a direction (A) of panel (1) feed in such a way as to adapt at least to the different diameters of different tools (5); the machine (2) being **characterised in that** the means (7) for driving the table (3) sector (6) comprise:
 - a rack (8) mounted on the sector (6); and
 - a toothed element (9) having a helical profile (10) for meshing with the rack (8); the toothed element (9) being connected to drive means (11) that move it about its axis (Z) in both directions in such a way as to produce a continuous sliding contact between the rack (8) and the toothed element (9), thereby translationally driving the sector (6).
2. The machine according to claim 1, **characterised in that** the toothed element (9) consists of a disc on whose upper surface (9a) the aforementioned helical profile (10) is made and forms a channel that meshes with the rack (8); the helical top contact surface (9a) of the disc (9) being inclined by an angle (α) with respect to the plane in which the sector (6) lies, in such a way as to mesh with the rack (8) at a single arc-shaped section of it.
3. The machine according to claim 2, **characterised in that** the single section of the helical top surface (9a) meshes with one rack (8) tooth (8d) at a time when rotated by the drive means (11).
4. The machine according to claim 1, **characterised in that** the rack (8) is mounted on the underside of the sector (6) each of its teeth (8d) has an arc-shaped so as to create tooth spaces matching the shape of the contact portion of the helical profile (10) of the circular element (9).
5. The machine according to claim 2, **characterised in that** the disc (9) comprises a mounting shaft (12) connected to the drive means (11) located in a base (2b) of the machine (2); the shaft (12) being kinematically connected to the drive means (11) through a corner joint (13).
6. The machine according to claim 5, **characterised in that** the drive means (11) comprise a motor (14) connected to the shaft (12) through the corner joint (13) and kinematically linked to the corner joint (13) by its output shaft (14a); the motor (14) being in turn connected to a control unit (15) mounted outside the machine (2).
7. The machine according to claims 5 and 6, **characterised in that** it comprises means (14v) for displaying the position of the sector (6) with respect to the power-driven axis (4) and acting between the motor (14) and the sector (6) itself.
8. The machine according to claim 1, **characterised in that** it comprises limiting means (30) acting between the work table (3) and the sector (6) and connected to the drive means (11) so as to stop the sector (6) when it reaches its limit positions, closest to and furthest from the power-driven axis (4).

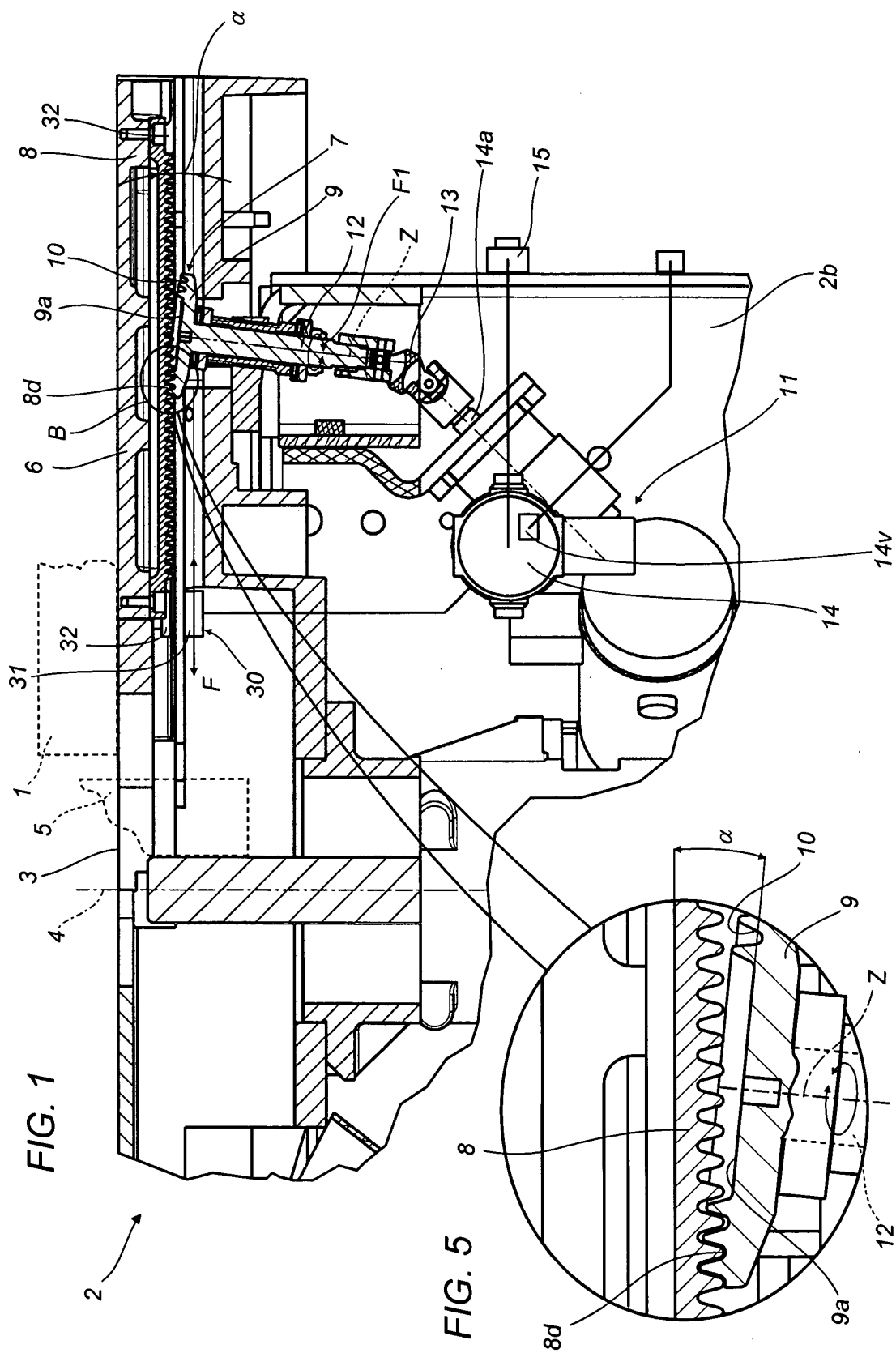


FIG. 2

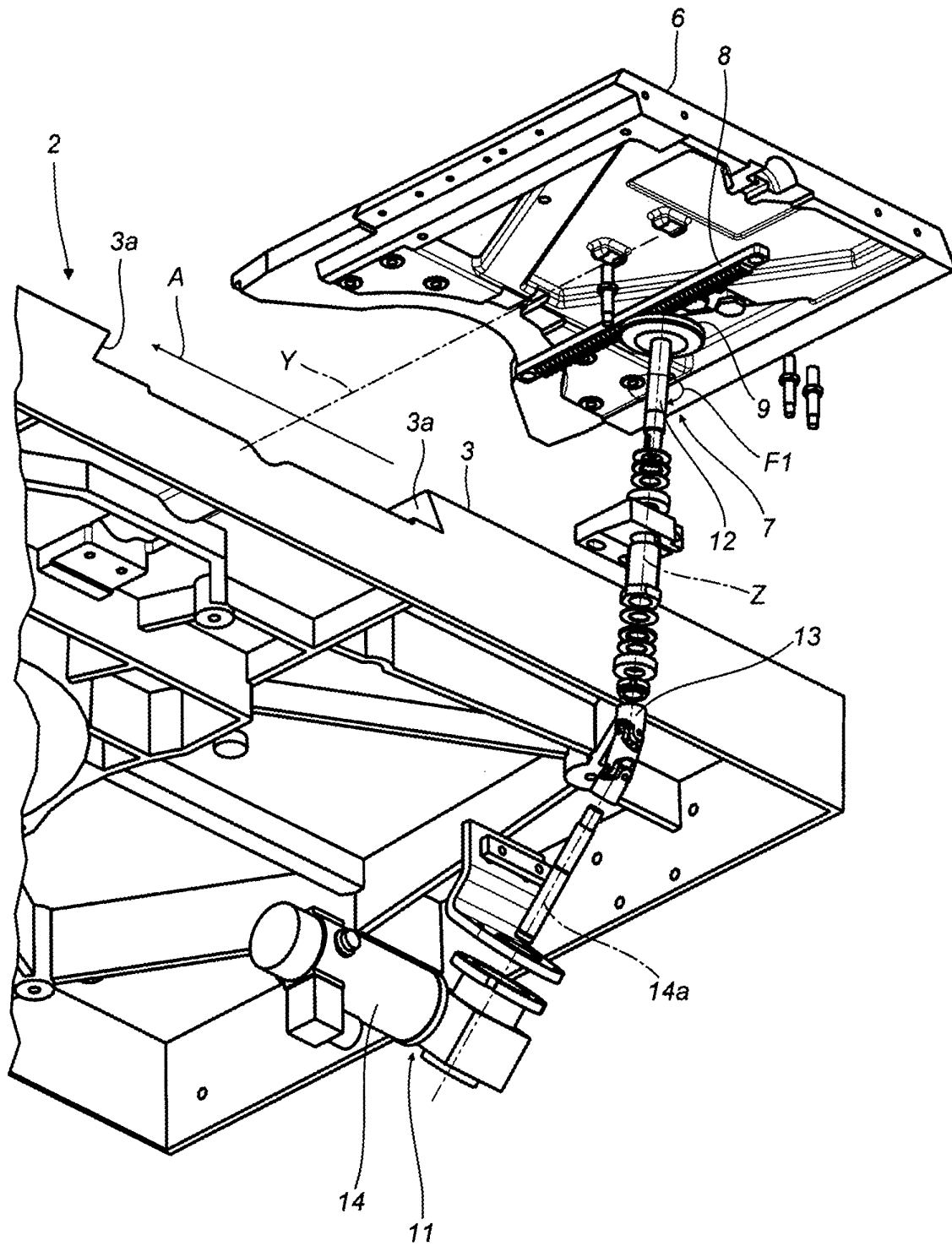


FIG. 3

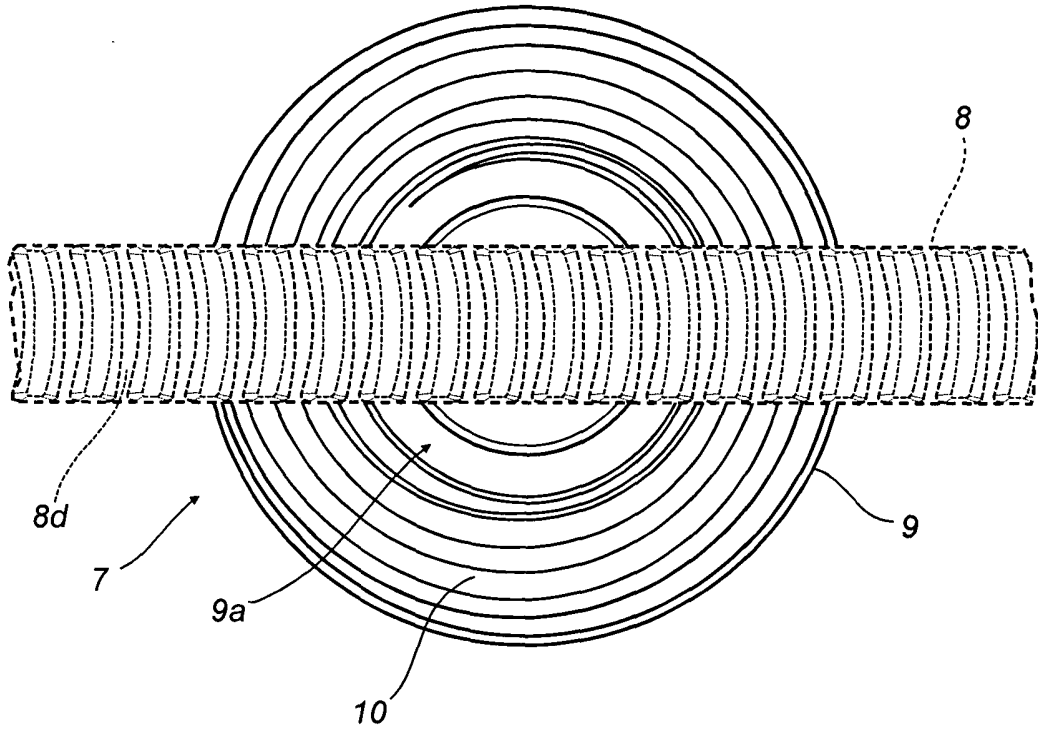
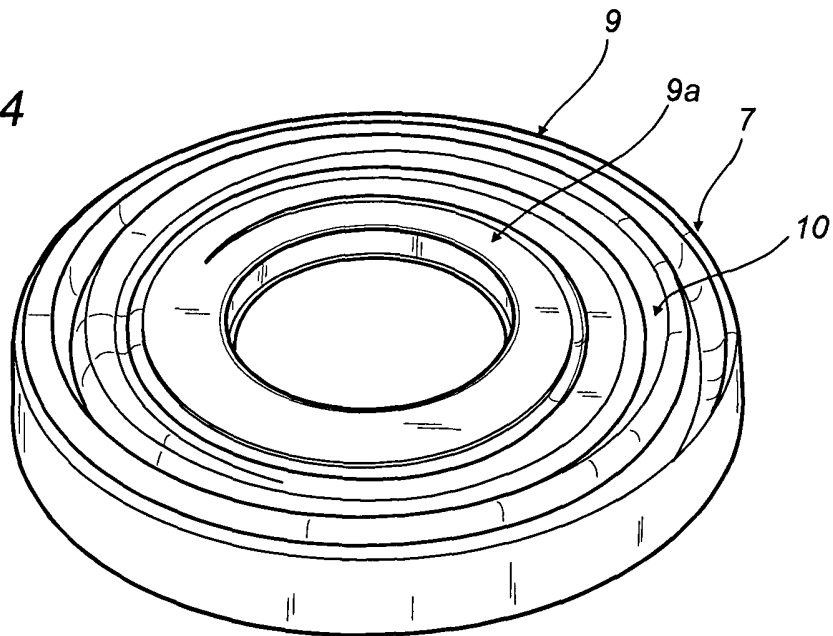


FIG. 4





European Patent
Office

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Application Number
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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