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(54) **PORTABLE POLISHING MACHINE FOR POLISHING CYLINDERS**

(57) A portable polishing machine (10) for polishing cylinders is described, and comprises: a centering support (11) configured to be fixed on a cylinder support and a frame (12) connected to the centering support (11) and configured to support a tool holder spindle (41) connectable to a cylinder polishing tool, said spindle (41) being slidably connected to said frame (12) and moved by motor means (13, 14).

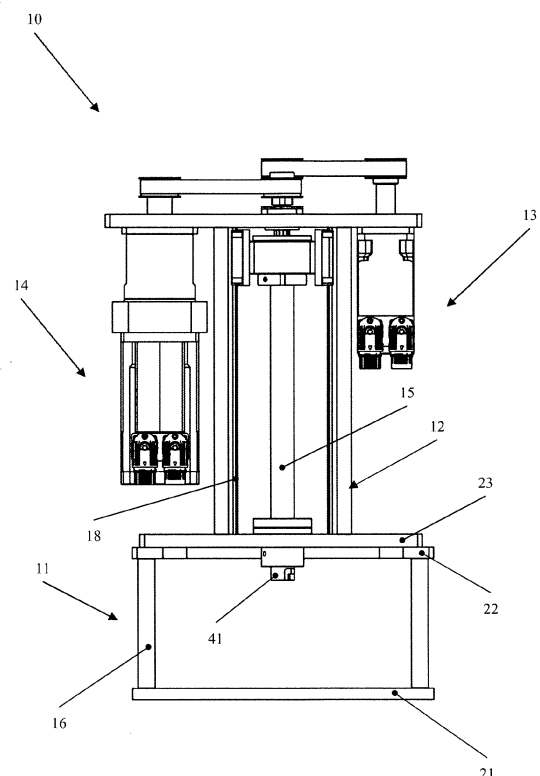


FIG. 1

Description

[0001] The present invention refers to a portable polishing machine for polishing cylinders, for example of an internal combustion engine or an air compressor.

[0002] In particular, the invention refers to a portable polishing machine that can be installed on a cylinder support, for example on a cylinder locking device or on the engine block to perform cylinder polishing without requiring the engine to be removed from the installation site, for example a vehicle or a boat.

[0003] Polishing machines are known for the polishing of cylinders which allow to intervene in a workshop with the engine uninstalled, restoring the surface finish of the cylinders in order to guarantee the adhesion of oil on the walls of the same during the operation of the engine: in particular, there are machines that recreate a rough surface with only negative peaks or valleys and a trace of crossed processing, known as cross-hatch, with a crossing angle defined by the manufacturer.

[0004] However, these known machines have the limit of not being able to intervene with the engine installed, for example on a motor vehicle or boat, while ensuring precise processing both in terms of surface roughness and shape (roundness and cylindricity).

[0005] Manual polishing machines are also known, which allow to proceed with the polishing of the engine cylinders without requiring that it be uninstalled.

[0006] However, these known manual polishing machines have the problem of not guaranteeing a precise machining that maintains the shape of the cylinder (roundness and cylindricity) and that recreates the surface roughness and the trace of cross-hatch cross-machining initially performed by the manufacturer and indispensable in order to ensure optimum engine lubrication.

[0007] Object of the present invention is to provide a portable polishing machine for polishing cylinders which, having reduced weight and small dimensions, is easy to transport and allows to operate in small spaces, for example without requiring the engine to be removed.

[0008] The aforementioned and other objects and advantages of the invention, which will emerge from the following description, are achieved with a portable polishing machine such as the one described in claim 1. Preferred embodiments and non-trivial variants of the present invention form the subject of the dependent claims.

[0009] It is understood that the attached claims form an integral part of the present description.

[0010] It will be immediately obvious that innumerable variations and modifications (for example relating to shape, dimensions, arrangements and parts with equivalent functionality) can be made to what is described, without departing from the scope of the invention as appears from the attached claims.

[0011] The present invention will be better described by a preferred embodiment, given by way of nonlimiting example, with reference to the attached drawings, in

which:

- Figure 1 shows a side view of a portable polishing machine for polishing cylinders according to the present invention;
- Figure 2 shows a perspective view from above of a portable polishing machine for polishing cylinders according to the present invention;
- Figure 3 shows a bottom perspective view of a portable polishing machine for polishing cylinders according to the present invention; and
- Figure 4 shows a perspective view in a rotated configuration of a portable polishing machine for polishing cylinders according to the present invention.

[0012] With reference to the Figures, a preferred embodiment of the portable polishing machine 10 for polishing cylinders, for example of an internal combustion engine, of the invention is shown and described, and comprises: a centering support 11 configured to be fixed on a support of the cylinders, for example to the monobloc of a motor, and a frame 12 connected, preferably in a rotatable way around a vertical axis, to the centering support 11 and configured to support a tool holder spindle 41 of a known type which can be connected to a tool 40 for polishing cylinders, in particular the internal surface of the cylinders, said mandrel 41 being slidably connected to said frame 12 and moved by motor means 13, 14.

[0013] Preferably, said centering support 11 comprises a lower plate 21 comprising an opening 31, preferably circular, aligned with the tool holder spindle 41, said lower plate 21 being configured to be fixed on a cylinder support, for example to the monobloc of an engine, preferably through the threaded holes or studs that are used to lock the engine head.

[0014] Alternatively, the lower plate 21 can be fixed to a base spacer which is in turn secured to the cylinder support, for example to the engine block.

[0015] The opening 31 of the centering support 11 is also aligned with the cylinder so that said tool 40, sliding along its own vertical axis both with respect to the frame 12 and with respect to the centering support 11, is inserted into the opening 31 of the centering support 11 and consequently in the cylinder aligned with said opening 31, proceeding to smooth it.

[0016] Preferably, said centering support 11 further comprises an upper plate 22 to which the frame 12 is connected, preferably in a rotatable way, said upper plate being connected to the lower plate 21, for example by means of columns 16 and comprising an opening 32 obtained at the opening 31 of the lower plate 21 so as to allow the tool holder spindle 41 to slide with respect to the centering support 11 in the aligned openings 31, 32.

[0017] Preferably, the frame 12 comprises a base 23 rotatably connected to the upper plate 22 of the centering support 11, for example on a pin connected to the upper plate 22, to allow the rotation of the frame 12 with respect

to the centering support 11 around a vertical axis Y, and the opening 32 has such a configuration as to allow the passage of the mandrel 41 during the rotation of the frame 12 with respect to the centering support 11 to arrive at a rotated position of the frame 12 shown in Fig. 4.

[0018] Preferably, the motor means 13, 14, for example brushless electric motors of the known type, connected to the tool holder spindle 41, are configured to move it, for example by means of a belt system, with a rotary motion around its vertical axis combined with a reciprocating motion along its vertical axis in a direction substantially parallel to the axis of the engine cylinder; preferably, the motor means comprise a primary or master motor 13, configured to translate the tool holder spindle 41 along the vertical axis, and a secondary or slave motor 14 configured to rotate the tool holder spindle 41 around its vertical axis in a manner to allow the tool 40 to stop the rotation about its vertical axis at the moment of the inversion of the alternate movement in order to obtain a better cross-hatch machining. Preferably the motor means 13, 14, fixed on the frame 12, are connected to the tool holder spindle 41 by means of a connecting element 15, for example a shaft, configured to transmit the tool holder spindle 41 and consequently to the tool 40 the rotation and translation movement imparted by the motor means 13, 14.

[0019] Preferably, the connecting element 15 of the motor means 13, 14 to the tool holder spindle 41 is slidable with respect to the frame 12 on guide means 18 and preferably operated along its vertical axis by actuation means 17, for example a system with ball screw.

[0020] Preferably, the tool 40 is of the floating type (angularly and/or laterally) to facilitate its alignment with the axis of the cylinder to be polished.

[0021] The operation of the portable polishing machine 10 according to the present invention comprises: a step of fixing the centering support 11 to the cylinder support, for example to the engine block, so that the tool holder spindle 41 of the polishing machine is aligned with the cylinder; a starting step of the processing by moving the tool holder spindle 41 so that with a rotary motion around its vertical axis and an alternate motion along its vertical axis proceeds to the machining of the cylinder by the tool 40; a possible step of interruption of the processing, of rotation of the frame 12 of the polishing machine with respect to the centering support 11 to free up the space above the cylinder and check its diameter, shape and surface roughness, of repositioning of the frame 12 by means of a new rotation with realignment of the tool 40 of the polishing machine with the cylinder, and resumption of machining.

[0022] Advantageously, in the portable polishing machine according to the present invention, the frame that can be rotated with respect to the centering support allows, once the processing of the cylinder has been interrupted, to rotate the frame around the Y axis, freeing up the space above the cylinder to measure its diameter and check its roughness. surface and then rotate the frame

back into position to continue with the machining.

[0023] Another advantage of the portable polishing machine according to the present invention is that the lower plate of the centering support facilitates the centering of the polishing machine, in particular of the tool, on the cylinder.

[0024] Another advantage of the portable polishing machine according to the present invention is the low weight (18 kg for the frame 12 and the polishing machine + 5 kg for the centering support 11) which allows it to be transported with a simple travel trolley even on board a boat, and with small dimensions that make it possible to use it even in extremely small spaces (400 mm) such as those available above the engine block in the case of an engine installed on a boat.

[0025] A further advantage is given by the presence of two independent motors, one master for vertical translation and one slave for rotation of the tool holder spindle, which allow the tool to stop rotation around its vertical axis at the moment of inversion of the alternate movement along its vertical axis so that cross-hatch machining is better, since the sections inclined in one direction and in the other are connected by sharp edges rather than by curves.

Claims

1. Portable polishing machine (10) for polishing cylinders which includes: a centering support (11) configured to be fixed on a cylinder support and a frame (12) connected to the centering support (11) and configured to support a tool holder spindle (41) connectable to a tool (40) for polishing cylinders, said spindle (41) being connected slidably to said frame (12) and moved by motor means (13, 14).
2. Portable polishing machine (10) for polishing cylinders according to claim 1, **characterized in that** said centering support (11) comprises a lower plate (21) comprising an opening (31) aligned with the mandrel (41) for carrying tool, said lower plate (21) being configured to be fixed on a cylinder support, said opening (31) also being aligned with the cylinder so that said tool (40) fits into the opening (31) of the centering support (11) and consequently in the cylinder aligned with it, proceeding to smooth it.
3. Portable polishing machine (10) for polishing cylinders according to claim 2, **characterized in that** the lower plate (21) is fixed to a base spacer which is in turn secured to a cylinder support.
4. Portable polishing machine (10) for polishing cylinders according to claim 2 or 3, **characterized in that** said centering support (11) further comprises an upper plate (22) to which the frame (12) is connected, said upper plate (22) being connected to the lower

plate (21) and comprising an opening (32) obtained in correspondence with the opening (31) of the lower plate (21) so as to allow the tool holder spindle (41) to slide with respect to the centering support (11) in the aligned openings (31, 32).

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5. Portable polishing machine (10) for polishing cylinders according to claim 4, **characterized in that** the frame (12) comprises a base (23) rotatably connected to the upper plate (22) of the centering support (11), to allow the rotation of the frame (12) with respect to the centering support (11) around a vertical axis Y, said opening (32) having a shape such as to allow the passage of the mandrel (41) during the rotation of the frame (12). 10 15
6. Portable polishing machine (10) for polishing cylinders according to any one of the preceding claims, **characterized in that** the motor means (13, 14) are connected to the tool holder spindle (41) to move it with a rotary motion around its vertical axis combined with an alternate motion along its vertical axis in a direction substantially parallel to the axis of the cylinder to be polished. 20 25
7. Portable polishing machine (10) for polishing cylinders according to claim 6, **characterized in that** the motor means comprise a primary or master motor (13) configured to translate the tool holder spindle (41) along the vertical axis, and a secondary or slave motor (14) configured to rotate the tool holder spindle (41) around its vertical axis so as to allow the tool (40) to stop rotation around its vertical axis upon reversing the alternate movement to obtain a better processing. 30 35
8. Portable polishing machine (10) for polishing cylinders according to any one of the preceding claims, **characterized in that** the motor means (13, 14) are fixed to the frame (12) and are connected to the tool holder spindle (41) by means of a connecting element (15) configured to transmit to the spindle (41) and consequently to the tool (40) the movement of rotation and translation imparted by the motor means (13, 14). 40 45
9. Portable polishing machine (10) for polishing cylinders according to claim 8, **characterized in that** the connecting element (15) of the motor means (13, 14) to the tool holder spindle (41) is sliding relative to the frame (12) on guide means (18) and driven along its vertical axis by drive means (17). 50
10. Portable polishing machine (10) for polishing cylinders according to any of the preceding claims, **characterized in that** the tool (40) is of the floating type to facilitate alignment with the axis of the cylinder to be polished. 55

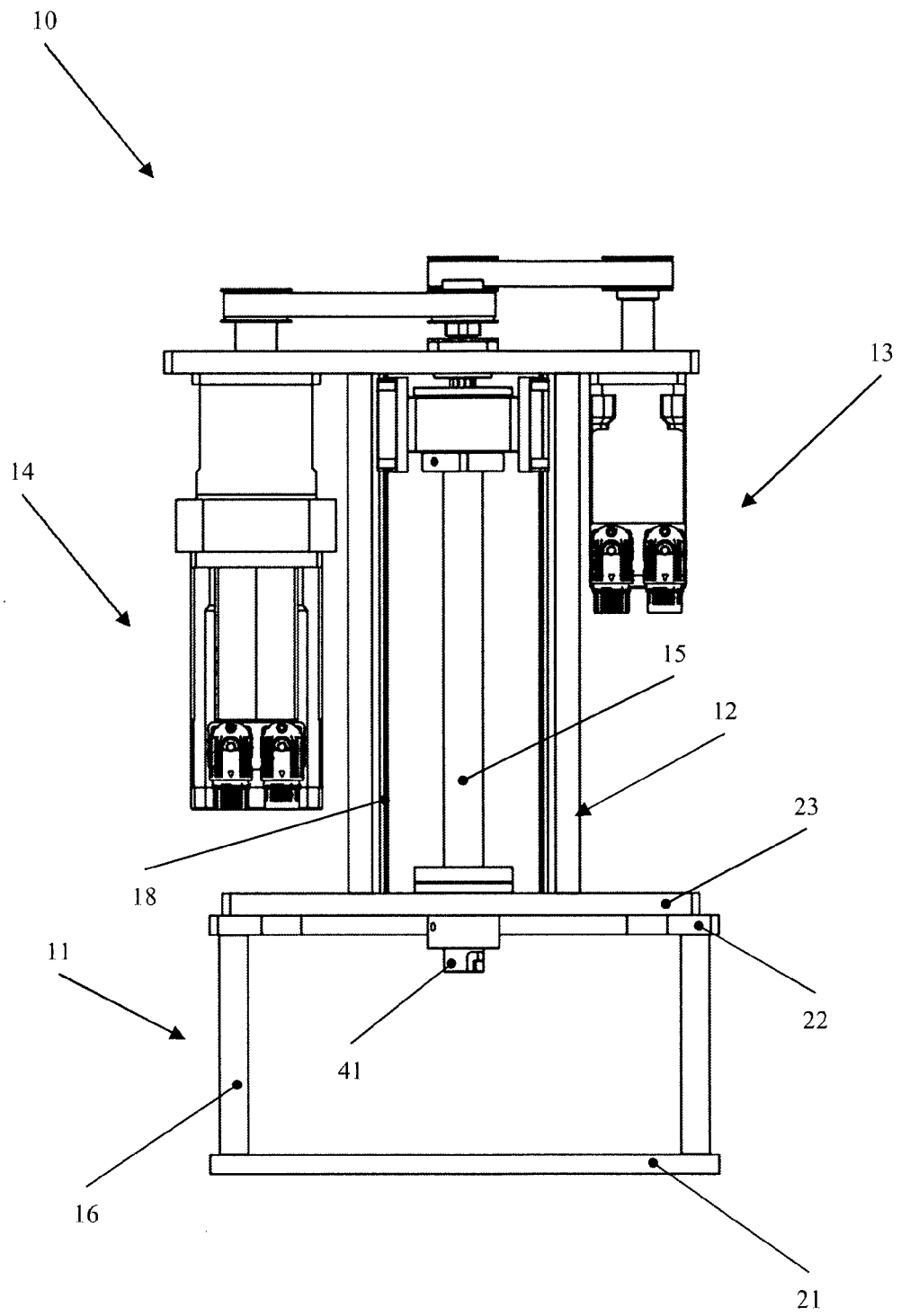


FIG. 1

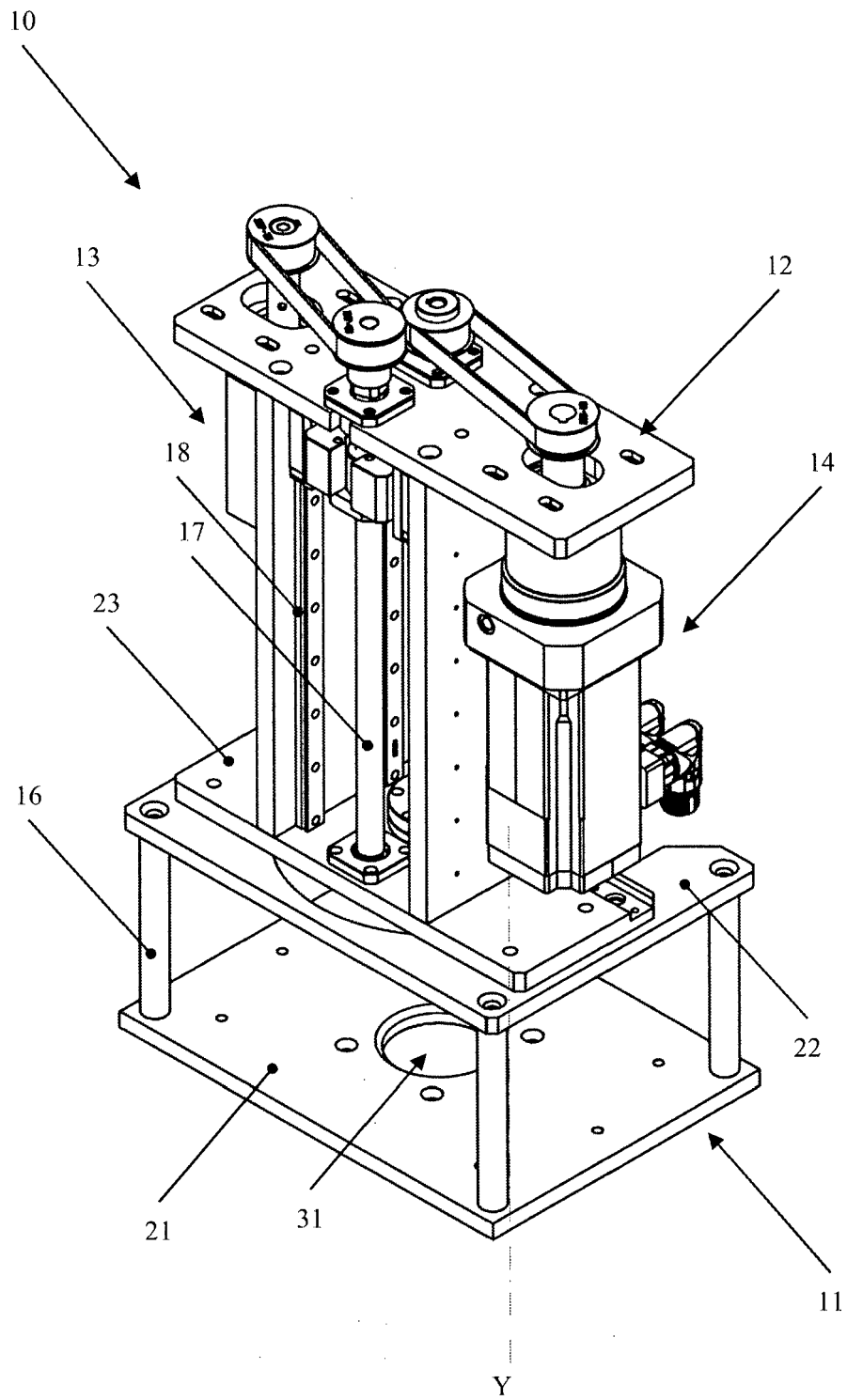


FIG. 2

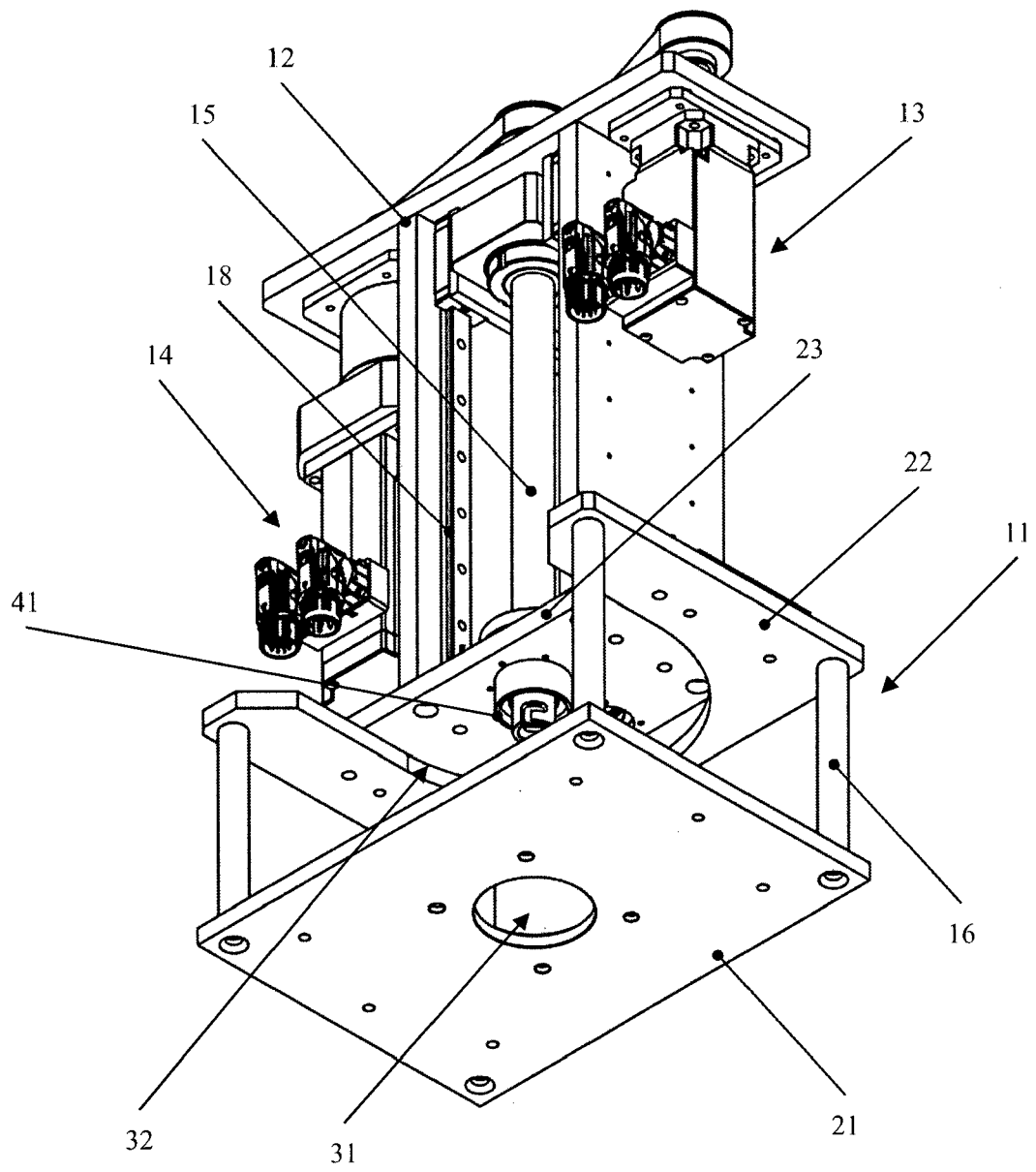


FIG. 3

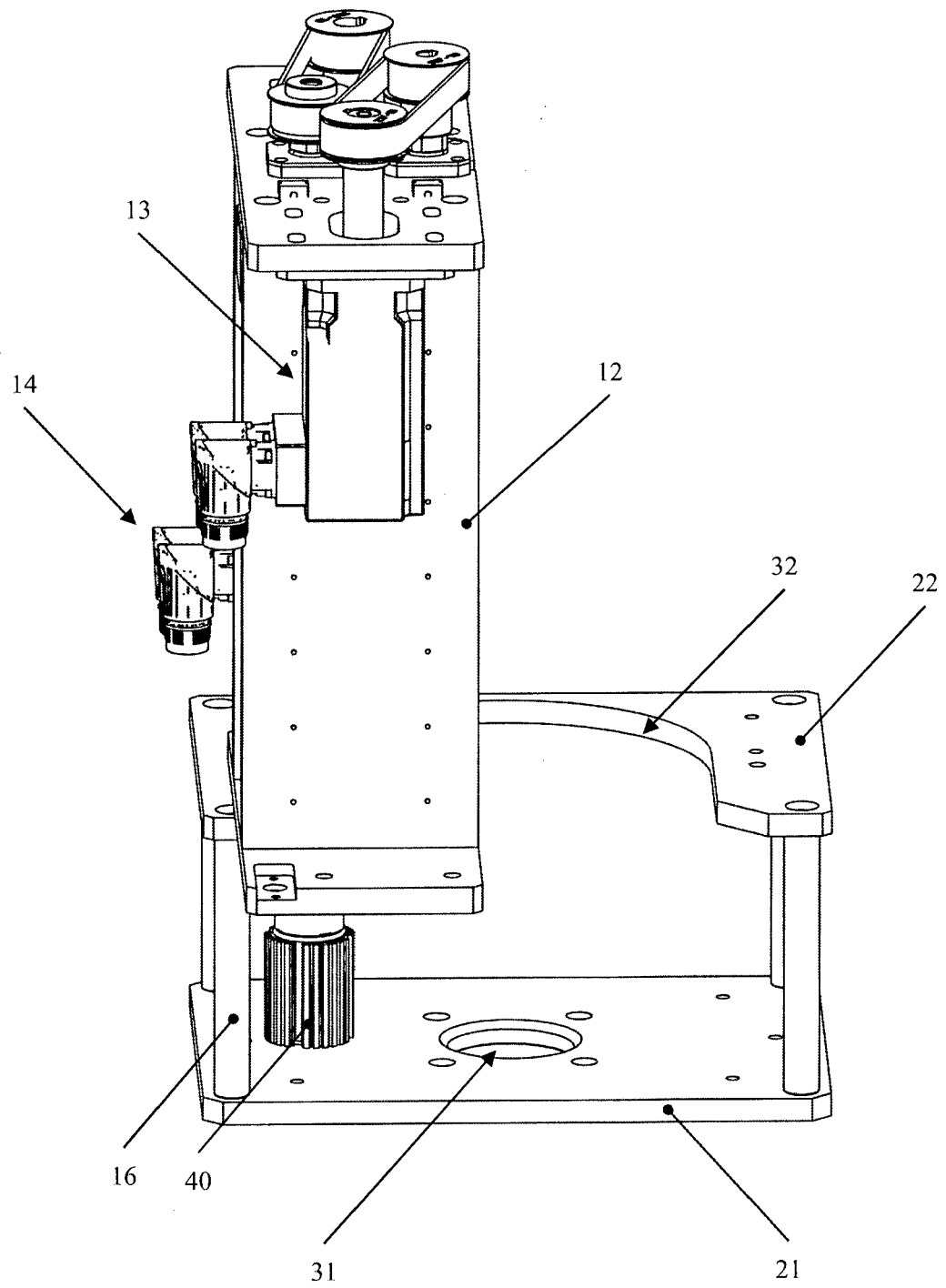


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 21 00 0278

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A	* claims 1-6; figures 1-5 * -----	5	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 November 2021	Examiner Herrero Ramos, J
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