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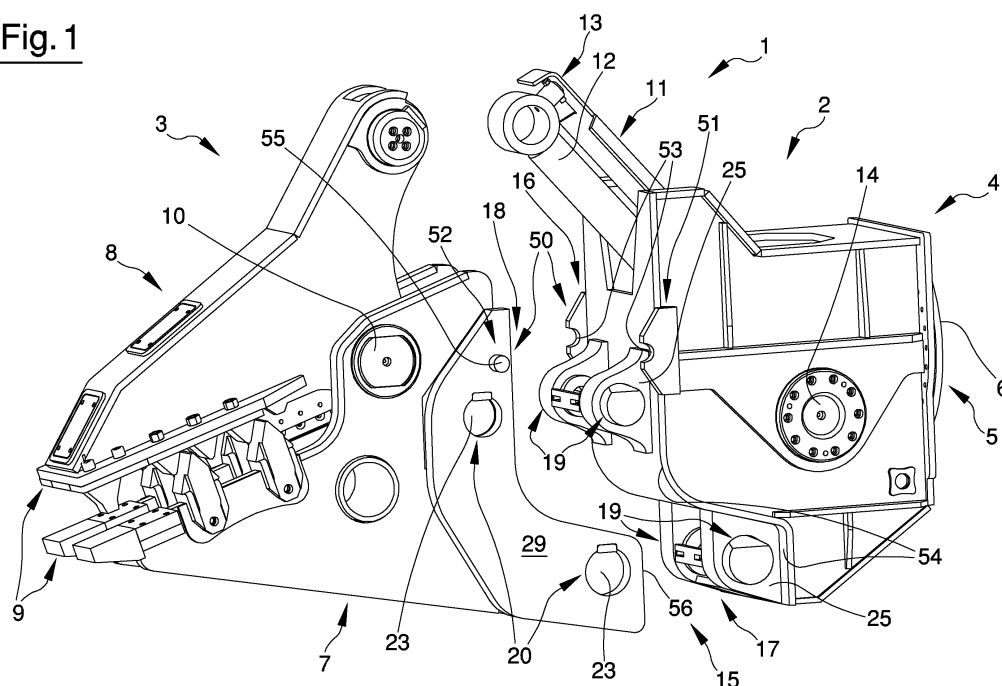
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(54) **Support for a tool for material treatment**

(57) A support (2) for removably mounting a demolition tool (3), the tool comprising a first fixed jaw (7) to be stiffly mounted onto the support and a second movable jaw (8) matching with the first jaw, provided with at least one rotational degree of freedom with respect to the first jaw, the support being intended to be firmly mechanically coupled with the movable arm of an operating machine, wherein the support comprises four anchoring points (19), opposed two by two with respect to the support itself and intended to engage four corresponding anchoring points (20) belonging to the first jaw of the tool, so as to

establish a stiff coupling between the first jaw and the support, wherein the four anchoring points of the the support include each a pin (21) and an actuator (22) associated thereto for shifting the latter from a first position in which it is not apt to engage a respective hollow (23) of the first jaw of the tool, to a second position in which it is apt to engage the respective hollow (23) of the first jaw, wherein said actuators are configured for moving the two respective opposed pins along two respective trajectories of movement (D) having opposite sense, in the movement from the first to the second position.

Fig. 1



Description

[0001] The present invention relates to a support for a tool for material treatment by means of machines, e.g. for material treatment during the demolition of natural structures or building or industrial constructions, wherein the tool typically comprises a fixed jaw and a movable jaw. In particular, the wording "material treatment" refers - among the various steps of demolition - at least to the steps of primary demolition (knocking down of a building or of a natural structure and removal of materials) and/or of secondary crushing of material and/or of separation thereof and/or of cutting of material such as profiles, pipes, sheet plates, means of transport (ships, aeroplanes, railway carriages, etc.). The present invention can advantageously apply to any tool suitable for material treatment of the type comprising a fixed and a movable jaw, i.e. comprising a first ("fixed") jaw intended to be stiffly mounted onto the tool support, so as not to have any degree of freedom with respect thereto, and a second ("movable") jaw, matching with the first jaw, provided with at least one degree of freedom, typically rotational, with respect to the support and/or to the first jaw. The rotation of the second jaw makes the latter alternatively approach the first jaw, until they are mutually near or in contact, for treating the material which happens to be between the two jaws, or get away from it. The present invention also relates to a device for material treatment comprising the aforesaid support and tool, and to a related machine for material treatment provided with such a device.

[0002] It is known (e.g. in EP1571265) about a demolition machine comprising a machine body, movable on the operating ground and provided with a control cab for an operator and suitable handling and control means (motors, electric, hydraulic and pneumatic systems, etc.) and with a movable arm, typically hinged in one or more points, onto whose free end is mounted a support or frame onto which is mounted a tool for material treatment of the type comprising a fixed and a movable jaw. In order to obtain the interchangeability of more tools (e.g. with different functions) on the same support, both the latter and the first jaw have respective coupling means for removably mounting the first jaw onto the support by mutual engagement. These coupling means enable the assembly and disassembly of the tool and its replacement, if necessary, with another tool with similar respective coupling means. In particular, the known coupling means consist of two pairs of hooks on the support and two corresponding pairs of pins projecting from the fixed jaw, intended for mutual engagement, and of fixing means for keeping the hooks engaged onto the pins. The fixing means comprise, mounted onto the support, a pair of hydraulically actuated prongs extending in linear direction, after all the hooks are engaged with the respective pins, until abutting against a (flat surface of a) pair of pins on the opposite side of the respective hooks, so as to prevent the pins from getting out of the respective hooks and obtain an interlocking between the tool and the

frame.

[0003] The Applicant has found that the device for material treatment comprising the aforesaid support and the aforesaid tool, and/or the related method for mounting the tool onto the support, as well as other known devices, have some drawbacks. Among these, the aforesaid hooks can represent a structurally weak area since, because they must necessarily have a free end on the opening, they are connected to the support only on the side opposite the free end. Moreover, the Applicant thinks that the aforesaid hooks, since they are all pointing in the same direction, resist the forces exerted by the jaws during operation and/or by the actuating cylinder in one direction only, leaving the task to resist the forces pointing in the opposite direction to the movable prongs only. The latter are further subjected to a force pointing transversally to their main development, in correspondence of a free end thereof, which results in a lever effect generating a couple of forces on the prongs themselves, which couple must be completely absorbed by the system connecting the prongs to the support. More to the point, according to the Applicant the known device does not compensate in a sufficiently effective manner possible clearances between hooks and pins and/or possible slight misalignments between support and tool. The aforesaid device, however, appears structurally complex and/or expensive and/or difficult as far as manufacturing and/or assembly and/or maintenance and/or operation are concerned.

[0004] In this context, the technical task underlying the present invention is to propose a support for a tool for material treatment, a related device comprising the support and the tool and a related method for mounting the tool onto the support, which are able to overcome beyond the rest one or more of the drawbacks of prior art as referred to above.

[0005] One of the aims of the present invention in one or more of its various aspects is to provide a support configured for removably mounting a tool for material treatment (and/or a related device containing the support and the tool), having a solid structure and/or able to effectively bear the forces which it is subjected to during operation, and at the same time with a reduced overall size and/or weight.

[0006] One of the aims of the present invention in one or more of its various aspects is to provide a support for a tool, and/or a related device, for material treatment, which can effectively compensate possible clearances and/or possible slight misalignments between support and tool.

[0007] One of the aims of the present invention in one or more of its various aspects is to provide a support for a tool and a related device for material treatment with a simple structure and/or which is simple and/or cheap as far as manufacturing and/or storage and/or transport and/or assembly and/or use and/or disassembly and/or maintenance are concerned.

[0008] One of the aims of the present invention in one or more of its various aspects is to provide a method for

mounting a tool for material treatment onto a related support, which is simple and/or cheap and/or rapid as far as execution is concerned.

[0009] One or more of the technical tasks and/or aims referred to are basically achieved by a support for a tool for material treatment, a related device comprising the support and the tool and a related method for mounting the tool onto the support, comprising the technical characteristics of one or more of the appended claims (considered individually apart from their subordinate relation, if any, or variously combined) and/or of one or more of the aspects disclosed below, variously combined with one another.

[0010] In one aspect, the invention relates to a support (or frame) for a tool for material treatment, typically for the demolition of structures and/or for crushing and/or cutting of material, in particular building and/or industrial material, the support being intended to be stiffly mechanically coupled, typically on a first end thereof, with the movable arm of an operating machine and, typically on a second end thereof opposite the first one, with said tool.

[0011] In one aspect, the tool comprises a first ("fixed") jaw intended to be stiffly mounted onto the tool support, so as not to have any degree of freedom with respect thereto, and a second ("movable") jaw, matching with the first jaw, provided with at least one degree of freedom with respect to the support and/or to the first jaw. Preferably, the second jaw can be rotated with respect to the support and/or to the first jaw, typically around a fixed pin provided on the tool itself.

[0012] In one aspect, the support comprises an actuating cylinder (e.g. of hydraulic or pneumatic type) having a first portion (e.g. piston or jacket) mounted onto the support itself and a second portion (e.g. jacket or piston, respectively) intended to be mounted, typically on a respective end thereof, onto said second jaw for rotating the latter with respect to the support and/or to the first jaw. Typically, the rotation of the second jaw makes the latter alternatively approach the first jaw, until they are mutually near or in contact, for treating the material which happens to be between the two jaws, and get away from it.

[0013] In one aspect, the support comprises, typically on the first end thereof, a coupling system, e.g. a circular flange, for mounting the support onto the movable arm of an operating machine.

[0014] In one aspect, the support comprises, typically on the second end thereof, a first portion of a (further) coupling system for removably mounting the tool onto the support.

[0015] In one aspect, the first portion of the coupling system comprises four anchoring points, opposed two by two (i.e. on opposite sides) with respect to the support itself, intended to engage four corresponding anchoring points of a second portion of the coupling system belonging to the first jaw of said tool, so as to establish a stiff coupling (e.g. without any degree of freedom) between the first jaw and the support. Preferably, the four anchor-

ing points are two by two symmetrically opposed with respect to the support itself, e.g. they are two by two aligned along a respective line orthogonal to the plane of main development of the support.

[0016] In one aspect, at least two of the four anchoring points of the first portion comprise each a pin and an actuator associated thereto for moving the latter from a first position in which it is not apt to engage a corresponding hole or hollow of the first jaw of the tool (e.g. it does not get out of the overall size of the support, without considering the pin), to a second position in which it is apt to engage said respective hollow of the first jaw (e.g. it gets out of the overall size of the support). Preferably, said two actuators are configured for moving the two pins along two respective trajectories of movement having opposite direction, in the movement from the first to the second position. In the movement from the second to the first position the respective direction of movement is inverted. By way of example, the trajectory of movement lies on a straight line.

[0017] In one aspect, said at least two of the four anchoring points comprise each a sliding guide, stiffly connected to the support, within which the pin can slide in the movement from the first to the second position and for partially housing the respective pin at least in the second position. Preferably, the aforesaid guide consists of a through opening obtained in a respective wall of the support. Typically, each pin is housed inside the respective guide basically without clearance, or in contact with (the inner lateral surface of) the latter, for a main part of its peripheral development, taken on a cross section of the pin in correspondence of the slide. Preferably, when the pin is in the second position, it lies basically without clearance with respect to, or in contact with, the inner surface of the guide for its whole peripheral development. Advantageously, the sliding guide also acts as a support for the pin (and for the tool) in the second position. The Applicant thinks that such anchoring points advantageously enable to effectively discharge forces generated by the jaws during operation directly to the main body of the support.

[0018] In one aspect, each pin has a basically cylindrical shape with a basically circular section, having a longitudinal axis parallel to the aforesaid trajectory of movement. Preferably, each through opening which the pin guide consists of has a basically circular section.

[0019] In one aspect, each actuator is either hydraulic or pneumatic. Preferably, each actuator comprises a cylinder, e.g. of known type, comprising a jacket (or hollow body) with a sealed chamber and a piston movable with respect to the chamber, an end of the piston hermetically dividing the chamber into two compartments. One between the jacket and the piston is mechanically coupled with the respective pin. In one aspect, said at least two of the four anchoring points are opposed one to the other with respect to the support. Preferably, said at least two of the four anchoring points are symmetrically opposed with respect to the support, e.g. the respective trajectory-

ries of movement of the respective pins lie on the same straight line. Preferably, the actuator of one of the two pins and the actuator of the other one of said two pins coincide in a single actuator, e.g. consisting of a cylinder comprising a jacket mechanically constrained to one of the two pins and of a piston mechanically constrained to the other one of two pins. Preferably, the piston and/or the jacket are connected to the respective pin in a radially central or axial position of the pin.

[0020] In one aspect, said at least two of the four anchoring points comprise each a projection, stiffly connected to the respective pin and extending transversally (e.g. radially) to the pin, which slidably engages a further guide developing parallel to the trajectory of movement of the pin, said further guide of the projections being integral with the support. Preferably, each one of the aforesaid further guides has a respective end stop for the corresponding projection on both ends of its main development. The two most adjacent end stops of the two further guides can advantageously determine the minimum distance between the two pins (corresponding to the first position for both pins). The two most distal end stops of the two further guides advantageously determine the maximum distance between the two pins, without the tool.

[0021] In one aspect, the free end of each pin has a portion of the outer lateral surface which is flat (typically obtained by milling of a cylinder) and arranged so as to form an angle of about 5° to 20°, preferably of about 10° to 15°, with respect to the longitudinal axis of the pin (or to its direction of movement). Preferably, this flat portion extends along the longitudinal axis of the pin for less than half the axial length of the pin, preferably for about, or less than, one third.

[0022] Typically, each pin has an outer diameter of about 60 mm or above, preferably of about 80 mm or above, more preferably of about 100 mm or above. Typically, each pin has an outer diameter of about 200 mm or below, preferably of about 180 mm or below, more preferably of about 160 mm or below. Typically, each pin has an axial length of about 100 mm or above, preferably of about 125 mm or above, more preferably of about 150 mm or above. Typically, each pin has an axial length of about 300 mm or below, preferably of about 250 mm or below, more preferably of about 200 mm or below.

[0023] In one aspect, all of the aforesaid four anchoring points have one or more of the above characteristics. For instance, also the remaining two of the four anchoring points comprise each a pin and an actuator associated thereto for shifting the latter from a first position in which it does not get out of the overall size of the support, to a second position in which it gets out of the overall size of the support for engaging two further respective holes or hollows of the first jaw of the tool, wherein said two actuators of the two remaining anchoring points are configured for moving the two respective pins along two trajectories of movement having opposite direction, in the movement from the first to the second position. In one

aspect, said remaining two of the four anchoring points are opposed to one another with respect to the support. Preferably, the actuator of one of the two pins of said two remaining anchoring points and the actuator of the other one of the two pins coincide in one only actuator, e.g. of the type referred to above. In one aspect, the support comprises a first portion of an alignment system, intended to match, and countershaped to, with a second portion of the alignment system belonging to the tool. Preferably, said first portion of the alignment system comprises a pair of recesses opposed with respect to the support and/or a pair of abutment surfaces parallel to one another and opposed with respect to the support.

[0024] In one aspect, the tool is a gripper for primary demolition or a shredder for reducing material into smaller fragments, or a shear or a cutter for cutting material or a tool combining one or more of the above functions.

[0025] In one aspect, the fixed jaw comprises a second portion of said coupling system, comprising four respective anchoring points arranged correspondingly to the respective anchoring points of the first portion of the coupling system. In one aspect, at least two of said anchoring points comprise each a respective hollow for housing at least one free end of the respective pin, when the latter is in the second position. Preferably, each of said respective hollows consists of a through opening, preferably a substantially (i.e. for a main part of its circumferential development) circular hole, obtained on a respective wall of the fixed jaw. Preferably, when the pin is in the second position, it is substantially without clearance with respect to, or in contact with, the inner surface of the respective hollow for its whole peripheral development.

[0026] In one aspect, said hollow has a portion of the respective inner lateral surface (e.g. having a peripheral development which is smaller than one fourth of the total peripheral development of the opening) which is flat and inclined with respect to the axis of the opening correspondingly to the inclination of the corresponding flat portion of the respective pin of the support.

[0027] In one aspect, all of the aforesaid four anchoring points of the second portion of the coupling system have one or more of the above characteristics.

[0028] In one aspect, the fixed jaw comprises the aforesaid second portion of the alignment system. Preferably, the second portion of the alignment system comprises a pair of pins opposed with respect to the fixed jaw and/or a pair of abutment surfaces parallel to one another and opposed with respect to the fixed jaw, arranged correspondingly to the respective pair of recesses and/or pair of abutment surfaces of the first portion of the alignment system.

[0029] In one aspect, said fixed rotation pin of the movable jaw with respect to the fixed jaw is distinct from each one of the four anchoring points of the tool.

[0030] In one further aspect, the present invention relates to a device for material treatment comprising the support and the tool, typically mounted onto the support, both according to any one of the above aspects. Prefer-

ably, said wall in which the sliding guide of the pin is obtained and said respective wall of the fixed jaw in which said through opening is obtained are mutually near or in contact when the tool is mounted on the support. Preferably, for each pair of opposed anchoring points, the two respective walls of the fixed jaw are on opposite sides of the two respective walls of the support.

[0031] In one further aspect, the present invention relates to an assembly comprising the support according to any one of the above aspects and a plurality of tools, each one according to any one of the above aspects, wherein the respective second portion of the coupling system is the same for each tool.

[0032] In one further aspect, the present invention relates to a machine for material treatment, in particular for knocking down building or industrial structures and/or constructions, comprising a machine body, typically movable on the operating ground, e.g. thanks to wheels or tracks, comprising a control cab for an operator and suitable handling and control means (motors, electric, hydraulic and pneumatic systems, etc.) and a movable arm, typically hinged in one or more points, onto whose free end is mounted a device for material treatment according to the above description.

[0033] In still one further aspect, the present invention relates to a method for mounting the tool, according to any one of the above aspects, onto the support, according to any one of the above aspects.

[0034] Further characteristics and advantages of the present invention will be more evident from the indicative, and therefore non-limiting, description of some preferred embodiments of a support for a tool for material treatment, a related device comprising the support and the tool, and a related method for mounting the tool onto the support, according to the present invention, thanks to the accompanying drawings, in which:

- Figure 1 is a schematic perspective view of an embodiment of the device for material treatment according to the present invention, with the tool disassembled from the support and some parts removed;
- Figure 2 is a schematic perspective view of a detail of the support of the device of Figure 1, with some parts removed;
- Figure 3 is a schematic perspective view of the device of Figure 1, with the tool mounted onto the support, and sectioned along a section surface getting through the two pairs of pins.

[0035] With reference to the accompanying figures, the numeral 1 globally refers to a device for material treatment according to the present invention. In the following the same numeral is used for the same elements.

[0036] The device comprises a support 2 (or frame) for a tool 3 for material treatment, and the tool 3 itself. The device 1 is typically intended for knocking down structures and/or for crushing and/or cutting material, in particular building material.

[0037] The support 2 typically comprises, on a first end 4 thereof, a coupling system 5, e.g. a circular flange 6, for mounting the support onto the free end of a movable arm (not shown) of an operating machine (not shown). Typically, a rotation system (not shown) for the support 2 is interposed between the free end of the movable arm and the support itself, the rotation system comprising e.g. a fifth wheel with two concentric rings onto one of which is fastened, during operation, the aforesaid flange 6 for enabling the support 2 to rotate around an axis thereof.

[0038] The tool 3 typically comprises a first "fixed" jaw 7 intended to be stiffly mounted onto the support, so as not to have any degree of freedom with respect thereto, and a second "movable" jaw 8 matching with the first jaw in the respective operating portions 9 (comprising teeth and/or blades, etc.), provided with at least one degree of freedom with respect to the support (when mounted) and/or to the first jaw. Preferably, the second jaw can be rotated with respect to the support and/or to the first jaw, typically around a fixed pin 10 provided on the tool and acting as a pivot point.

[0039] Typically, the support comprises an actuating cylinder 11 (e.g. of hydraulic or pneumatic type), having a first portion (in the example the jacket, not visible) mounted onto the support itself, and a second portion 12 (in the example the piston) intended to be stiffly coupled, typically on a respective end 13 thereof, with the second jaw 8 for rotating the latter with respect to the support and/or to the first jaw. Typically, the cylinder 11 is turnably mounted onto a pin 14, mounted in its turn onto the support and arranged transversally to the direction of actuation of the cylinder 11.

[0040] The device 1 advantageously comprises a coupling system 15 for stiffly and removably mounting the fixed jaw 7 onto the support 2, the system 15 comprising a first portion 17 belonging to the support 2, in correspondence of a second end 16 thereof opposite the first one 4, and a second portion 18 belonging to the movable jaw 8, in correspondence of an end thereof opposite the operating portion 9 thereof. The first portion 17 of the coupling system 15 comprises four anchoring points 19 (all of them visible in Figure 1 and 3, whereas Figure 2 shows two only) two by two opposed with respect to the support itself, intended to engage four corresponding anchoring points 20 (all of them visible in Figure 3, whereas Figure 1 shows two only) included in the second portion 18 of the coupling system 15, so as to establish a stiff (e.g. without degrees of freedom) and removable coupling between the first jaw 7 and the support 2. Preferably, the four anchoring points are two by two symmetrically opposed with respect to the support itself, e.g. they are two by two aligned along a respective line orthogonal to the plane of main development of the support. However, the present invention also encompasses the case in which the four anchoring points are in "offset" positions though remaining two by two opposed, in order to establish a stiff connection of the tool on the support.

[0041] Advantageously, each of the four anchoring

points 19 of the first portion 17 comprises a pin 21 and an actuator 22 associated thereto for shifting the latter from a first position (not shown) in which it does not get out of the overall size of the support 2 (considered without the pin), to a second position (shown in the figures) in which it gets out of the overall size of the support for engaging the corresponding anchoring points 20 of the first jaw 7. Preferably, each one of the corresponding anchoring points 20 of the first jaw 7 comprises a hollow or housing 23 countershaped to the corresponding pin (or at least with the free end of the corresponding pin) for partially housing the aforesaid pin when it is in the aforesaid second position. Preferably, when the pin is in the second position, it is basically without clearance with respect to, or in contact with, the inner surface of the hollow 23 for its whole peripheral development. Preferably, each hollow 23 consists of a through opening obtained on a respective wall 29 of the fixed jaw, preferably consisting of a substantially (i.e. for a main part of its circumferential development) circular hole (as shown by way of example). Preferably, the wall 25 in which the sliding guide 24 of the pin is obtained and the respective wall 29 of the fixed jaw in which the through opening 23 is obtained are mutually near or in contact when the tool is mounted on the support (Fig. 3). Preferably, for each pair of symmetrically opposed anchoring points the two respective walls 29 of the fixed jaw lie on opposite sides of the two respective walls 25 of the support.

[0042] Preferably, the actuators 22 are configured for moving all the respective pins 21 along four respective trajectories of movement (indicated by the arrows D in Figure 2) parallel to each other and preferably two by two aligned on the same straight line. Advantageously, this trajectory of movement D can be orthogonal to a plane of main development of the support 2. Preferably, the trajectories of movement D for each pair of opposed pins 21 have opposite direction, in the movement of the respective pin from the first to the second position. Preferably, as shown by way of example in the figure, this direction of movement of the respective pin from the first to the second position points away from the support 2, so that during this movement the free ends of the pins get out of the support (e.g. out of the respective guides 24, see below) projecting outside the support 2. For instance, the two opposed pins move away from each other, in the movement from the first to the second position. In the movement from the second to the first position the direction of movement of the pin is typically inverted.

[0043] Alternatively (not shown), one or more of the four pins can have a direction of movement of the respective pin from the first to the second position approaching the support 2, e.g. so that the two opposed pins approach each other.

[0044] Preferably, each of the four anchoring points 19 of the first portion 17 comprise a sliding guide 24, stiffly connected to the support, developing parallel to the aforesaid trajectory D, within which the pin can slide in its movement from the first to the second position and

vice versa, and intended to partially house the respective pin at least in the second position (typically also in the first position). Preferably, the guide 24 consists of a through opening obtained in a respective wall 25 of the support (in the example shown this wall 25 is shaped as a wing integral with the main body of the support 2, e.g. fastened by welding or forming one only body). Typically, each pin 21 is housed inside the respective sliding guide 24 and/or inside the hollow 23 substantially without clearance, or in contact with the inner lateral surface of the guide and/or of the hollow, respectively, for a main part of its peripheral development, considered on a cross section of the pin on the guide 24 and/or the hollow 23, respectively,

[0045] Preferably, as shown in the figures, each pin is basically cylindrical in shape, with a substantially circular section. Preferably, each through opening which the guide 24 of the pin consists of has a circular section.

[0046] Preferably, each actuator 22 is either hydraulic or pneumatic. Preferably, each actuator comprises a cylinder 30, e.g. of known type, comprising a jacket 31 (or hollow body) with a sealed chamber and a piston 32 movable with respect to the chamber, an end of the piston hermetically dividing the chamber into two compartments. Figure 2 shows by way of example on the jacket 31 the connections for the flow of hydraulic (or pneumatic) fluid getting in and out of the two compartments.

[0047] Preferably, as shown in the example, there is one actuator 22 for each pair of symmetrically opposed pins 21. In this case, advantageously, the jacket 31 is mechanically constrained to one of the two pins and the piston 32 to the other one of the two pins, and moreover the cylinder 30 preferably has no other connection points (e.g. to the main body of the support), so as to simultaneously push both pins with identical and opposite forces. Preferably, the piston 32 and/or the jacket 31 are constrained to the respective pin 21 in a radially central position of the pin or coaxial to the pin, e.g. being housed on a respective end thereof in a countershaped seat 33 (if necessary, also shaped to house the aforesaid connections for the fluid) obtained in the pins and coaxial therewith. It is thus advantageously possible to size the pins whatever the size of the cylinder, differently from an alternative solution, not shown though being part of the present invention, in which one jacket houses two opposed pistons (and therefore in this case the inner chamber is divided into three compartments) whose free ends directly act as pins and get out of the opposite ends of the jacket. It should be pointed out that the solution shown by way of example and described above is advantageous because it has a particularly simple hydraulic and/or actuating system for the cylinder 30, since it carries out the desired movements of the pins with two compartments only of the inner chamber of the cylinder.

[0048] Preferably, each of the four anchoring points 19 comprises a projection 35, stiffly connected to the respective pin 21 (e.g. to the outer lateral surface thereof) and extending transversally (e.g. radially) to the pin,

which slidably engages (e.g. on a respective end thereof) a further guide 36 developing parallel to the trajectory of movement D of the respective pin. The further guide 36 is advantageously integral with the support 2 (e.g. fastened to the walls or wings 25 as shown by way of example). Preferably, each one of the further guides 36 has a end stop for the respective projection on both ends of its main development. For each pair of symmetrically opposed anchoring points, as shown in Figure 2, the two most adjacent end stops 37 of the two further guides 36 determine the minimum distance between the two pins (corresponding to the first position for both pins). The two most distal end stops 38 (in the example abutting against the walls 25) of the two more distal further guides advantageously determine the maximum distance between the two pins without the tool (on the contrary, when the tool is present, in the second position the end stop of the pins is determined by the abutment between the inclined surfaces 40 and 41 of the pins, see below, and the hollows 23). Advantageously, the end stops (37 and also the surfaces 40 and 41) act so that when one of the opposed pins has reached the first or second position, the cylinder moves the other pin only until reaching the respective corresponding position.

[0049] Preferably, the free end of each pin has a portion 40 of the outer lateral surface which is flat (typically obtained by milling of a cylinder) and arranged for forming an angle e.g. of about 12° with respect to the longitudinal axis of the pin (or to its trajectory of movement D). Preferably, this flat portion 40 extends, along the longitudinal axis of the pin, for less than half the axial length of the pin, preferably for about or less than one third.

[0050] Preferably, also the hollow 23 has a portion 41 of the respective inner lateral surface (the portion 41 typically having a peripheral development which is smaller than one fourth of the total peripheral development of the hollow 23) which is flat and inclined with respect to the axis of the hollow or opening 23 correspondingly to the inclination of the corresponding flat portion 40 of the respective pin 21 of the support 2.

[0051] In the example shown in Figure 3, the pins on the left of the figure can have a diameter of 140 mm and a length of 180 mm, whereas the pins on the right have a diameter of 120 mm and a length of 180 mm. Preferably, the device 1 comprises an alignment system 50 having a first portion 51 belonging to the support 2 and intended to match with, and countershaped to, a second portion 52 belonging to the fixed jaw 7. Preferably, the first portion 51 of the alignment system 50 comprises a pair of recesses 53 symmetrically opposed with respect to the support and/or a pair of abutment surfaces 54 parallel to each other and opposed with respect to the support. Preferably, the second portion 52 of the coupling system comprises a pair of projections 55 opposed to each other with respect to the fixed jaw and arranged correspondingly to the recesses 53. Preferably, the second portion 52 comprises a pair of abutment surfaces 56 parallel to each other and opposed with respect to the fixed jaw, coun-

tershaped with the aforesaid abutment surfaces 54.

[0052] In an alternative embodiment, not shown in the figure, at least one or maximum two of the aforesaid anchoring points 19 of the support, opposed to each other with respect to the support, may not comprise the aforesaid actuator and the movable pin. For instance, they may comprise a fixed hook or alternatively a fixed pin, for engaging a fixed pin or a fixed hook, respectively, belonging to the corresponding anchoring points 20 of the tool.

[0053] During use, the tool 3 is mounted onto the support 2 according to the following exemplary steps: the support 2, mounted onto the arm of the operating machine, is moved near the tool 3 arranged on a rest plane with the fixed jaw 7 placed under the movable jaw 8; with the pins 21 in the first position, the anchoring points 19 of the support are matched with the anchoring points 20 of the tool (if necessary using the alignment system 50 by pivoting on the projections 55 with the recesses 53); the pins 21 are moved from the first to the second position. Typically, the actuating cylinder 11 of the movable jaw 8 is anchored to the latter.

Claims

1. A support (2) for a tool (3) for material treatment, the tool comprising a first jaw (7) intended to be stiffly mounted onto the support and a second jaw (8) matching with the first jaw, provided with at least one rotational degree of freedom with respect to the first jaw, the support being intended to be firmly mechanically coupled with the movable arm of an operating machine and comprising a first portion (17) of a coupling system (15) for removable mounting of the tool onto the support, the first portion of the coupling system comprising four anchoring points (19), opposed two by two with respect to the support and intended to engage four corresponding anchoring points (20) of a second portion (18) of the coupling system belonging to the first jaw of said tool, so as to establish a stiff coupling between the first jaw and the support, wherein at least two of the four anchoring points of the first portion, opposed to one another with respect to the support, include each a pin (21) and an actuator (22) associated thereto for shifting the latter from a first position in which it is not apt to engage a respective hollow (23) of the first jaw of the tool, to a second position in which it is apt to engage said respective hollow (23) of the first jaw, wherein said two actuators are configured for moving the two respective pins along two respective trajectories of movement (D) having opposite sense, in the movement from the first to the second position.
2. The support according to claim 1, wherein said at least two of the four anchoring points include each a sliding guide (24), stiffly connected to the support,

within which the pin can slide in its movement from the first to the second position and for partially housing the respective pin at least in the second position, said guide consisting in a through opening obtained in a respective wall (25) of the support.

3. The support according to claim 1 or 2, wherein each actuator (22) includes a pneumatic or hydraulic cylinder (30) comprising a jacket (31) with a sealed chamber and a piston (32) movable with respect to the chamber, an end of the piston hermetically dividing the chamber into two compartments, wherein one between the jacket and the piston is mechanically coupled with the respective pin. 5
4. The support according to any one of the preceding claims, wherein the four anchoring points are two by two symmetrically opposed with respect to the support and wherein said at least two of the four anchoring points are symmetrically opposed with respect to the support, wherein the actuator of one of the two pins and the actuator of the other one of said two pins coincide in a single actuator, comprising a cylinder (30) including a jacket (31) mechanically constrained to one of the two pins, and a piston (32) mechanically constrained to the other of the two pins. 10 20 25
5. The support according to any one of the preceding claims, wherein said at least two of the four anchoring points include each a projection (35) stiffly connected to the corresponding pin and extending transversally to the pin, which slidably engages a further guide (26) developing parallel to the trajectory of movement (D) of the pin, said further guide of the projections being integral with the support, and wherein each of the aforesaid further guides has a respective end stop for the corresponding projection on both ends of its main development, so that the two most adjacent end stops (37) of the two further guides determine the minimum distance between the two pins, corresponding to the first position for both pins. 30 35 40
6. The support according to any one of the preceding claims, wherein each pin is substantially cylinder-shaped and the free end of each pin (21) has a portion (40) of the outer lateral surface which is flat and arranged so as to form an angle of about 5° to about 20° with respect to the longitudinal axis of the pin. 45
7. The support according to any one of the preceding claims, wherein all of the aforesaid four anchoring points (19) have one or more of the features claimed in the preceding claims, the remaining two of the four anchoring points having one or more of the features claimed in the preceding claims for said at least two of the four anchoring points. 50 55
8. A device for material treatment, comprising the sup-

port according to any one of the preceding claims and said tool, wherein at least two of said four corresponding anchoring points (20) of the second portion (18) of the coupling system, corresponding to said at least two of the four anchoring points (19) of the first portion, include each a respective hollow (23) for housing at least one free end of the respective pin, when the latter is in the second position, each of said respective hollows consisting of a through opening obtained on a corresponding wall (29) of the fixed jaw.

9. The device according to the preceding claim, wherein all of the four corresponding anchoring points (20) of the second portion (18) of the coupling system comprise the features as claimed in the preceding claim.
10. Machine for material treatment, in particular for the demolition of residential or industrial structures and/or buildings, comprising a machine body movable on the operating ground, including a maneuver cabin for an operator and appropriate means for handle and control, and a movable boom, hinged in one or more points, on whose free end a device for material treatment according to claim 8 or 9 is mounted.

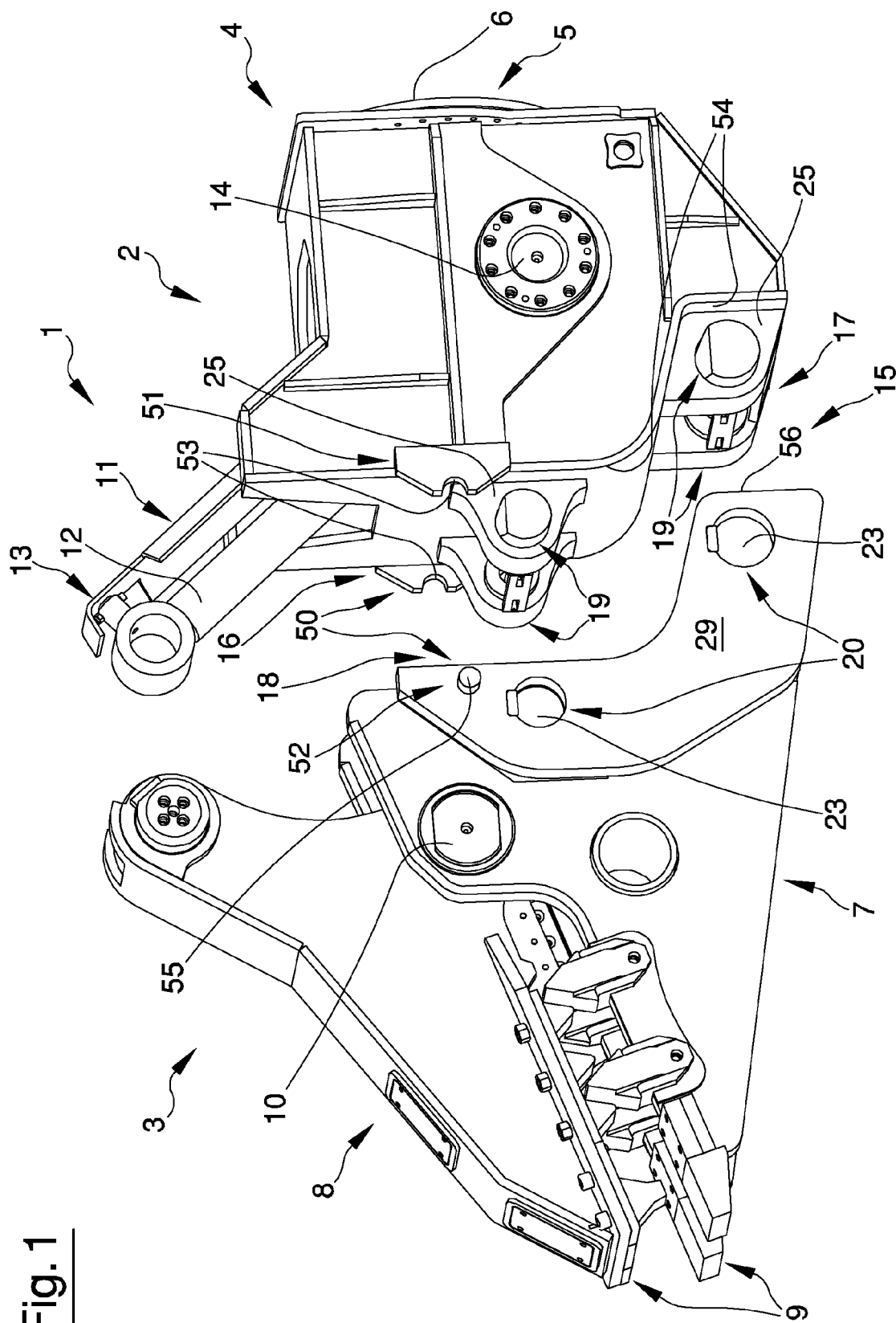


Fig. 1

Fig. 2

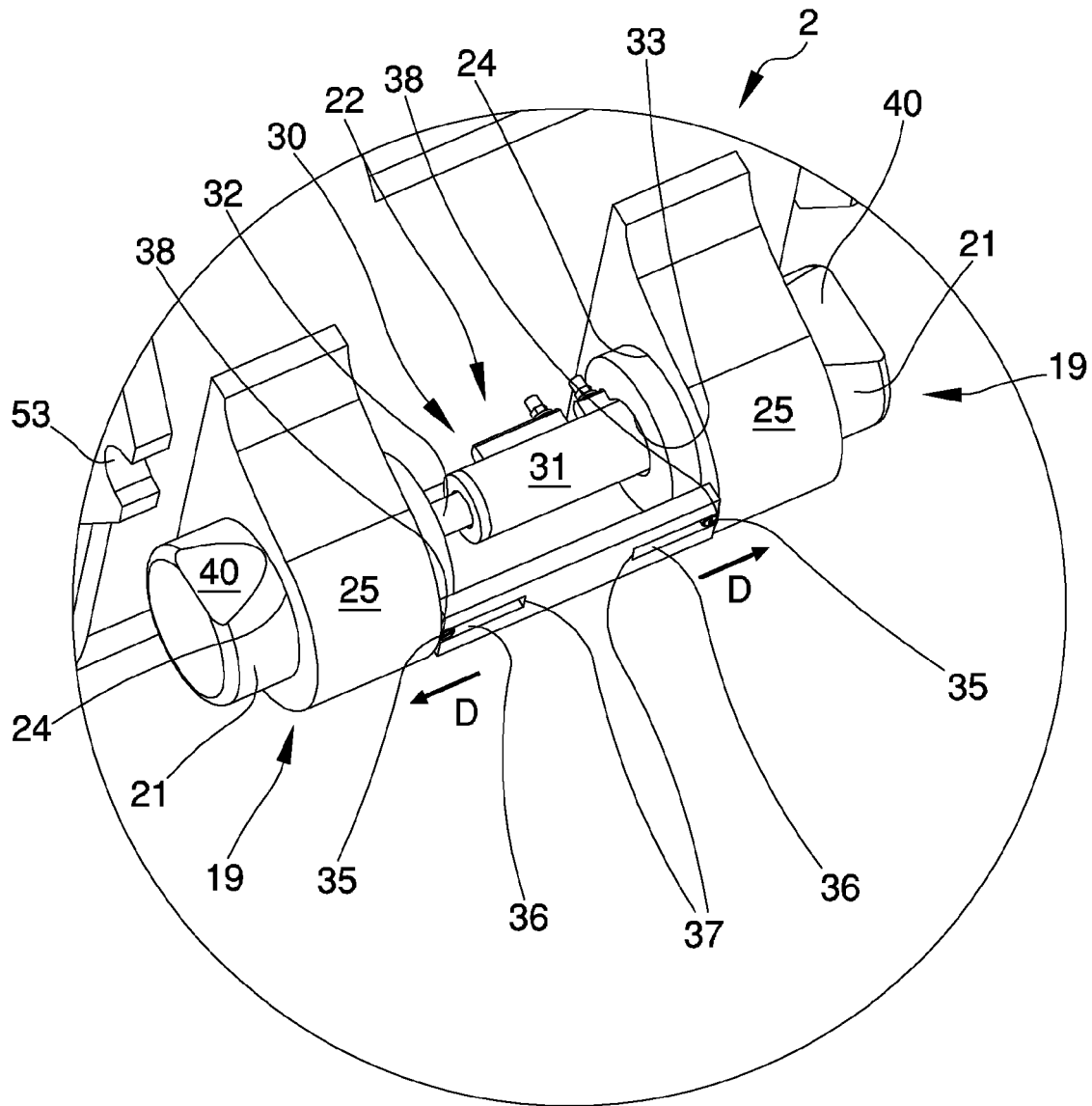
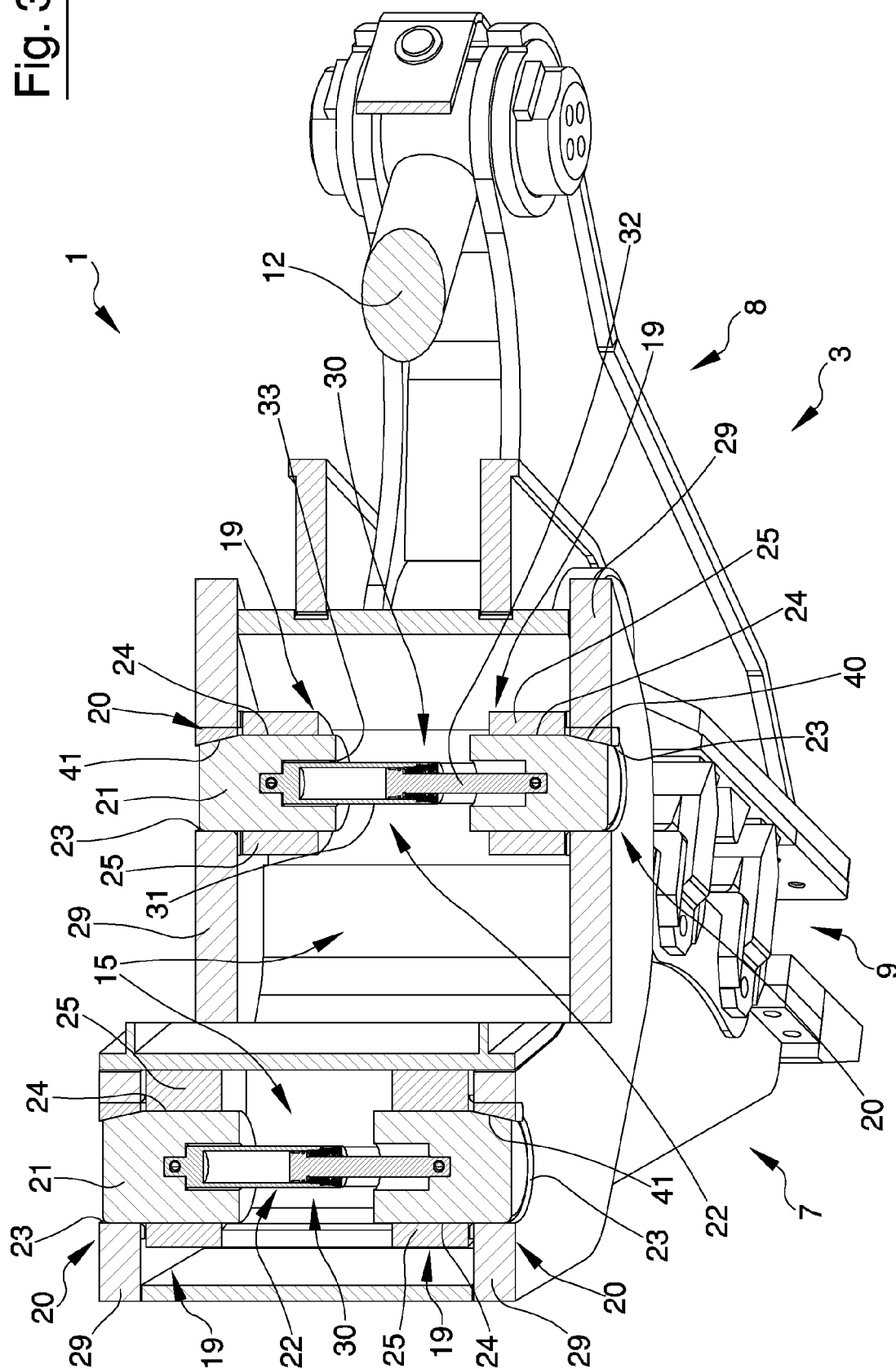


Fig. 3





EUROPEAN SEARCH REPORT

Application Number
EP 10 16 6162

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