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(54) Title: A POWER TROWEL, A TOOL SET CARRIER FOR A POWER TROWEL AND A METHOD FOR INSPECTING, SERVICING, REPLACING AND/OR EXCHANGING TOOLS ON A POWER TROWEL

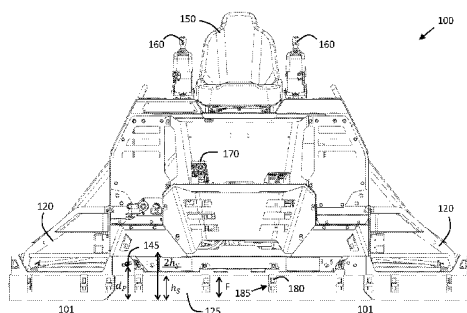


FIG. 1A

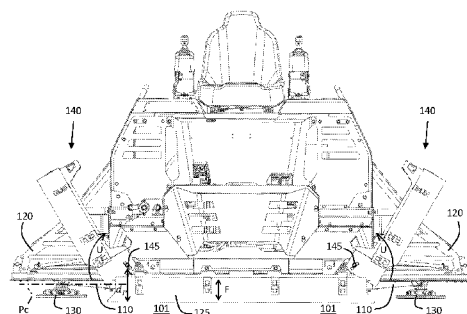


FIG. 1B

(57) Abstract: A power trowel (100, 1200) comprising one or more rotatable tool set carriers (110) arranged to support respective sets of tool holders (130) for processing a surface (101), the power trowel (100, 1200) comprising a protective cover (120) configured to at least partly enclose the one or more rotatable tool set carriers (110), where at least one access section (140) configured in connection to the protective cover (120) is arranged to be moved between a first position where the tool set carriers (110) are covered to a second position where the tool set carriers (110) are uncovered to allow access to at least one of the tool holders (130) from outside of the protective cover (120), where at least one of the tool set carriers (110) comprises a center hub (310) arranged to be attached to a drive shaft, wherein the tool set carrier (110) is arranged to rotate in a drive direction (R1) about a center axis of rotation (A1) in response to a rotation by the drive shaft, where the tool set carrier (110) is arranged to allow manual rotation of the tool set carrier (110), relative to the drive shaft, for at least part of a revolution about the center axis of rotation (A1). The invention further comprises a tool set carrier for a power trowel and a method for inspecting, servicing, replacing and/or exchanging tools on a power trowel.

TITLE

TOOL HOLDERS AND TOOL SET CARRIERS FOR POWER TROWELS

TECHNICAL FIELD

- 5 The present disclosure relates to surface processing equipment for processing hard surfaces such as concrete and stone surfaces, and in particular to power trowel grinders that can be used both for trowelling and for grinding and/or polishing concrete surfaces.

10 BACKGROUND

A power trowel, sometimes also referred to as a power float, is according to a traditional meaning a machine that is used on semi-matured concrete to even out the surface after pouring. A power trowel can however also be used on more matured concrete surfaces to obtain a desired finish if the trowel tools
15 are replaced by grinding tools. Power trowels capable of both trowelling and grinding are sometimes referred to as power trowel grinders.

A power trowel grinder comprises one or more rotatable sets of tool holders which may hold trowel tools or grinding tools. Larger machines with two or more sets of rotatable tool holders are often ride-on versions where the operator sits on top of the trowel, while smaller power trowels with a single set
20 of rotating tool holders are normally manually guided by an operator walking next to the power trowel. An interconnected set of tool holders is carried on a tool set carrier.

Autonomous concrete surface processing machines and remotely controlled
25 concrete surface processing machines are also known, where no driver is present in direct connection to the machine.

A power trowel may, generally, comprise any number of sets of rotatable tool holders, where one or two sets are the most common.

There is a desire to provide improved power trowel grinders and other surface processing tools.

SUMMARY

5 It is an object of the present disclosure to provide improved surface processing tools.

This object is at least in part obtained by a power trowel comprising one or more rotatable tool set carriers arranged to support respective sets of tool holders for processing a surface such as a concrete or stone surface. The power trowel comprises a protective cover or cage structure configured to at least partly enclose the one or more rotatable tool set carriers, and preferably the entire tool set carrier arrangement, at least from above. At least one access section is configured in connection to the protective cover. The access section is arranged to be moved between a first position where the tool set carriers are covered to a second position where the tool set carriers are uncovered to allow access to at least one of the tool holders from outside of the protective cover. The access section offers a convenient way for an operator to access the tools of the power trowel. The design is advantageously combined with manually rotatable tool set carriers, which can be rotated by an operator in at least one direction to expose any given tool holder on the tool set carrier via the access section opening. The access sections simplify both servicing and inspection of the tools of the power trowel.

According to some aspects, a skirt is arranged around an edge of the protective cover, between the protective cover and the surface. This skirt prevents foreign objects from entering in under the protective cover, which is an advantage. The skirt is preferably arranged floating relative to the protective cover and supported by the surface in use. This way sufficient contact between skirt and surface is maintained to ensure that the skirt performs its intended function. The skirt can also follow unevenness in the surface to some degree, which is an advantage. A vertical position of the skirt relative to the surface in

use can, in some embodiments, be adjustable. This allows an operator to adjust the position of the skirt relative to the surface. Some leeway between the surface and the skirt may, for instance, be desired in some cases. A part of this skirt may be integrated with or at least attached to the access section,
5 such that the part of the skirt moves with the access section between the first position and the second position. This way the skirt will not hinder access to the tool holders from outside of the protective cover when the access section is in the second position.

According to some aspects, each access section of the protective cover is
10 arranged to uncover a part of a respective tool set carrier when in the second position. As noted above, the tool set carrier may be arranged so that it can be manually rotated by an operator to expose all the tools on the tool set carrier. The uncovered part of the respective tool set carrier may, e.g., correspond to at least one third of the circumference of the tool set carrier. The size of the
15 access section can be kept within reasonable limits this way, which is an advantage.

At least one access section of the protective cover can be hingedly connected about at least one pivot point to the power trowel to allow pivoting by the access section from the first position into the second position. This is
20 convenient since the access section stays attached to the power trowel at all times. The at least one hingedly connected access section can also be biased towards the first position by a spring loaded hinge arrangement if moved from the first position towards the second position by less than a predetermined angle. This way the access section stays closed to prevent unintended
25 opening of the access section. The at least one hingedly connected access section can also be biased into the second position by the spring loaded hinge arrangement if moved from the first position towards the second position by more than the predetermined angle. The access section then stays in the second position while the operator accesses the tools and performs the work
30 task. The access section also becomes more easily moved from the first

position into the second position, since the spring loaded hinge arrangement provides an assistive rotation force, which is an advantage.

As an alternative or a complement to using a hinged access section, at least one access section of the protective cover can be arranged to be disconnected
5 from the rest of the protective cover and removed from the power trowel. An operator can in this case remove the access section from the power trowel in order to access the tools.

Aspects of the present disclosure also relate to a tool set carrier for a power trowel. The tool set carrier is arranged to support one or more tool holders.
10 The tool set carrier comprises a center hub arranged to be attached to a drive shaft, and the tool set carrier is arranged to rotate in a drive direction about a center axis of rotation in response to a rotation by the drive shaft. The tool set carrier is arranged to allow manual rotation of the tool set carrier, relative to the drive shaft, for at least part of a revolution about the center axis of rotation.
15 This way an operator can access different tools held by the tool set carrier by manually rotating the tool set carrier. The manually rotatable tool set carrier can be used together with a protective cover which allows access to a subset of the tool holders. An operator can then manually rotate the tool set carrier in order to access all the tool holders. According to some aspects, the tool set
20 carrier is arranged to allow manual rotation of the tool set carrier in the drive direction. According to some other aspects, the tool set carrier is arranged to allow manual rotation of the tool set carrier in the drive direction and also in a direction opposite to the drive direction, i.e., both clockwise and counterclockwise. This simplifies accessing the tools on supported on the tool
25 set carrier.

According to some aspects, the center hub of the tool set carrier comprises a first part arranged to be rotationally fixed to the drive shaft, and a second part connected to the tool holders. The second part bears on the first part to allow relative rotation there inbetween about the center axis of rotation. The first part
30 and the second part together implement a rotation limiting mechanism that prevents relative rotation between the first part and the second part beyond an

angular range and/or rotation by the tool set carrier relative to the drive shaft opposite to the drive direction. This allows an operator to access all the tools supported on the tool set carrier by manually rotating the tool set carrier, which is an advantage.

- 5 The rotation stop mechanism optionally comprises cooperating and radially overlapping heels arranged between the first part and the second part to prevent relative rotation between the inner part and the outer part beyond an angular range. This way an operator can rotate the parts to access the tools, and the drive shaft can at any time be engaged to drive to tool set carrier,
10 without any additional locking devices or the like. The heels provide a robust rotation lock when the tool set carrier is driven by the drive shaft.

The rotation stop mechanism may also comprise a ratchet mechanism configured to prevent rotation by the tool set carrier relative to the drive shaft in direction opposite to the drive direction. The ratchet mechanism may for
15 instance comprise cooperating ratchet rings attached to the first part and to the second part, respectively. Alternatively, or as a complement, the ratchet mechanism may comprise a ratchet wheel connected to one of the first part and the second part, and one or more spring loaded pawls connected to the other of the first part and the second part. These type of ratchet mechanisms
20 have been found to work well on this type of tool holder for concrete and stone surface processing machines. The ratchet mechanisms allow unlimited rotation of the tool set carrier in the drive direction, i.e., an operator can rotate the tool set carrier several revolutions, which may be an advantage if testing or inspection is performed by the operator, to see that the tool set carrier
25 rotates freely under the power trowel protective cover.

A method for inspecting, servicing, replacing and/or exchanging tools on a power trowel comprising one or more rotatable tool set carriers arranged to support respective sets of tool holders for processing a surface according to the above discussion is also disclosed herein. The method comprises moving
30 an access section into its second position, accessing the at least one tool

holder from outside of the protective cover, and inspecting, servicing, replacing and/or exchanging a tool supported by the tool holder.

Parts of the disclosure also relate to a tool holder for a power trowel which comprises a center hub arranged to be attached to a tool set carrier and a
5 rotating part comprising a tool holder plate and a cardan arrangement, where the rotating part is arranged to rotate relative to the center hub about a tool holder axis of rotation. The cardan arrangement pivotably connects the center hub to the tool holder plate such that the tool holder plate is allowed to pivot relative to the center hub about at least a first cardan pivot axis. The center
10 hub is fixed to a bearing which bears on the rotating part to allow the relative rotation between the center hub and the rotating part about the tool holder axis of rotation, where the bearing is at least partly enclosed by the rotating part.

Build height is important in tool holders for power trowel grinders. The tool holders disclosed herein have a relatively small build height due in part to the
15 bearing that is embedded in the rotating part of the tool holder. Build height normally refers to the height of the tool holder measured from the bottom of the tool holder plate along its main axis of rotation.

The cardan arrangement is preferably configured to allow pivoting about a first cardan axis and about a second cardan axis extending transversally or even
20 orthogonally with respect to the first cardan pivot axis, although a single pivot axis is sufficient.

Aspects of the tool holders discussed herein comprise a cardan shaft that is divided into two axially aligned parts. A second cardan shaft can then pass transversely inbetween the two axially aligned parts, thereby reducing the build
25 height of the tool holder further.

To further reduce build height of the tool holder, cut-out portions or recesses can be formed in the upper side of the tool holder plate to allow passage by parts of the cardan arrangement as the tool holder plate pivots relative to the center hub.

The disclosure also relates to a tool holder for a power trowel which comprises a center hub and a tool holder plate, where the center hub is arranged to be attached to a tool set carrier of a power trowel. A cardan arrangement pivotably connects the center hub to the tool holder plate such that the tool holder plate
5 is allowed to pivot relative to the center hub about a first cardan pivot axis and about a second cardan pivot axis. The center hub comprises a sealed bearing which bears on the cardan arrangement to allow relative rotation between the center hub and the tool holder plate about a tool holder axis of rotation. The sealed bearing, which may be embedded into a top plate of the tool holder
10 where it is protected and does not add much to the build height of the tool holder, reduces the need for servicing the tool holder, and generally provides a robust design suitable for concrete surface processing.

A labyrinth structure can be configured in connection to the bearing to prevent dust and slurry from passing into connection with the bearing. This labyrinth
15 structure provides additional protection for the bearing. Together with the bearing embedded into the top plate of the tool holder a robust design is achieved suitable for very demanding concrete surface processing operations involving large amounts of dust and slurry. A sealed bearing, if used, also reduces the need for maintenance of the tool holder, which is an advantage.

20 According to some aspects, a resilient seal or gasket, such as a V-ring seal or a radial axle seal, is journaled about the center hub and arranged inbetween the center hub and the rotating part of the tool holder. The resilient seal may be arranged in connection to the labyrinth structure to improve the protection against dust and slurry or be used instead of the labyrinth structure. The seal
25 provides additional protection that prevents dust and slurry from entering into the tool holder where it may otherwise cause problems.

A tool set carrier for a power trowel is also disclosed herein. The tool set carrier extends in a tool set carrier plane and is arranged to rotate in a drive direction about a center axis of rotation in response to a rotation by a drive shaft. The
30 tool set carrier is arranged to rotatably support one or more tool holders at respective radial distances from the center axis of rotation, where each tool

holder is arranged to rotate about a respective tool holder axis of rotation. The tool set carrier comprises one or more biasing elements arranged to exert a force on respective tool holders, in a direction transversal to the tool set carrier plane, at a location that is offset from the tool holder axis of rotation. The

5 biasing element promotes passive rotation by the tool holder about the tool holder axis in use, i.e., as the tool set carrier supporting the tool holder rotates. The induced rotation is a passive rotation that is obtained without any dedicated active drive means, which is an advantage. I.e., the induced rotation about the tool holder rotation axis is generated by the rotation of the tool set

10 carrier. At least one of the biasing elements preferably comprises a spring-loaded wheel with a rolling direction arranged perpendicular to a radial direction of the tool holder. This is a cost-effective and robust way to promote rotation about the tool holder axis. At least one of the biasing elements can be attached to an arm of the tool set carrier, such as between the center axis of

15 rotation of the tool set carrier and the tool holder axis of rotation.

Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the element, apparatus, component, means, step, etc." are to be interpreted openly as referring to at least one instance of

20 the element, apparatus, component, means, step, etc., unless explicitly stated otherwise. The steps of any method disclosed herein do not have to be performed in the exact order disclosed, unless explicitly stated. Further features of, and advantages with, the present invention will become apparent when studying the appended claims and the following description. The skilled

25 person realizes that different features of the present invention may be combined to create embodiments other than those described in the following, without departing from the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

30 The present disclosure will now be described in more detail with reference to the appended drawings, where

Figures 1A-C illustrate an example ride-on power trowel;

Figures 2A-B illustrate an example spring mechanism;

Figures 3, 4A-B, 5A-B, and 6 illustrate example tool set carriers;

Figures 7-9 illustrate example tool holders;

5 Figures 10-11 shows example tool set carriers with biasing elements;

Figures 12A-B illustrates an example walk-beside power trowel;

Figure 13 is a flow chart illustrating a method;

Figure 14 illustrates an example ride-on power trowel; and

Figure 15 shows an example tool set carrier;

10

DETAILED DESCRIPTION

The invention will now be described more fully hereinafter with reference to the accompanying drawings, in which certain aspects of the invention are shown.

15 This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments and aspects set forth herein; rather, these embodiments are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout the description.

20 It is to be understood that the present invention is not limited to the embodiments described herein and illustrated in the drawings; rather, the skilled person will recognize that many changes and modifications may be made within the scope of the appended claims.

25 Figures 1A-C illustrate an example ride-on power trowel 100. This disclosure and the techniques and examples described herein are, however, not limited to any particular form of power trowel. Rather, the teachings herein are applicable to most power trowel designs, including single-trowel set and multi-trowel set machines, manually and autonomously guided machines, as well as

both walk-beside and ride-on machines. An example walk-beside power trowel is shown in Figures 12A-B. The machines may, e.g., be battery powered, gasoline engine powered, or propane engine powered. Figures 12A-B show an example manually guided power trowel 1200 where at least some of the
5 teachings herein can be applied with advantage.

The example power trowel 100 in Figures 1A-C comprises an operator seat 150 and control means in the form of two joysticks 160 and a foot pedal 170 which the operator sitting in the seat 150 can use to control various operations of the ride-on power trowel 100. The power trowel 100 comprises two tool set
10 carriers 110, arranged side-by-side, which gives the machine 100 an elongated footprint on the surface 101, as seen from a top view T of the machine 100.

Each tool set carrier 110 rotatably supports a plurality of tool holders 130 on arms that extend radially out from a center of the tool set carrier. It is noted
15 that the arms are not strictly necessary. The tool holders may also be supported on a large disc or the like. Figure 3 shows an example tool set carrier 110, with arms 320 that extend radially out from a center hub 310. Each arm 320 has an attachment point 330 for a tool holder on its distal end, as exemplified in Figure 3.

20 The tool holders 130 support respective trowel tools or grinding tools, depending on the task at hand, which engage the concrete or stone surface to be processed. Thus, it is appreciated that the phrase power “trowel” is used broadly herein and encompasses machines capable of concrete surface trowelling, grinding, and/or polishing. The power trowels discussed herein may
25 also be referred to as concrete surface processing equipment or concrete surface processing machines. Some power trowels may not even be capable of holding trowel tools, only grinding tools such as rigid abrasive tools or soft pads comprising polishing compound or abrasive particulate matter.

Each tool holder 130 on a tool set carrier 110 can be fitted with a trowel tool to
30 smoothen a nearly matured concrete surface, or a grinding tool which grinds or polishes the concrete surface by abrasive action. The grinding tool may

comprise rigid abrasive segments, or soft pads with or without some form of polishing compound or abrasive particles. The grit level of the grinding tools determine the end finish of the concrete surface. An increasing grit size means finer grit, and a grit size of about 800 or more gives a glossy finish. Soft
5 polishing tools are also conceivable, such as pads with polishing paste.

The tool holders 130 are arranged in sets on one or more tool set carriers 110 which will be exemplified and discussed in more detail below in connection to, e.g., Figure 3. Each tool set carrier rotates around a respective central axis of rotation due to a drive torque provided by a drive shaft. The tool holders 130
10 may also rotate around respective tool holder axes during operation, where the rotation by a tool holders about its tool holder axis is normally a passive rotation induced by the rotation of the tool set carrier about the tool set carrier central axis of rotation. Thus, there are normally two types of rotation involved during processing of a concrete surface. One active main rotation about the
15 center of the tool set carrier and one passive local rotation about the rotation centers of the tool holders. These different rotation axes will be discussed in more detail below in connection to Figure 3. The central axes of rotation of the tool set carriers on the power trowel are normally pivotable, which allows maneuvering by the power trowel on the concrete surface 101. By tilting the
20 tool set carriers, both steering and forward motion can be generated in a known manner.

A protective cover 120 is arranged to enclose the rotatable tool set carriers 110, to protect the tool set carriers from external objects at the work site, and also to protect personnel from the rotating tools on the tool set carrier or
25 carriers. The protective cover 120 may be formed as a cage structure from metal bars or pipes as in Figures 1A-C and Figures 12A-B. Sections of plastic or metal sheet may also form part of the protective cover 120. The protective cover 120 preferably extends over the entire footprint of the rotatable tools of the power trowel, at least when viewed from above, which is an advantage.
30 Thus, when viewed from the top T as indicated in Figure 1C, the protective cage covers the entire swept area of the rotatable tools of the machine.

In some cases, the protective cover 120 defines an enclosed or sealed-off volume that comprises the tool holders. This enclosed volume can be sealed relative to the surface by a floating skirt 125 as exemplified in Figures 1A-C. An advantage of using an enclosed volume is that dust generated during surface processing operations can be trapped in the volume and extracted from the volume in a controlled manner by using a dust extractor.

A ride-on power trowel 100 is a relatively heavy piece of equipment which is difficult to lift off the ground, e.g., by tilting it. It is therefore difficult to access the tool holders underneath the machine 100. To simplify access to the tool holders, e.g., so that a new set of grinding tools can be mounted, or so that inspection of the tool holders and tool set carriers can be made more efficiently, the power trowels in Figures 1A-C and in Figures 12A-B comprises one or more access sections 140 which can be moved from a first position where the access section covers the tools to a second position where access to at least some of the tools are allowed in a convenient manner. Figure 1A shows an example with two access sections, where both access sections are in their respective first positions, i.e., in the position used during operation of the power trowel 100. Figure 1B shows the two access sections 140 in their respective second positions, where access to the tool holders is allowed. The technique of using access sections in the protective cover of a power trowel can be used also with other types of power trowels, such as with the machine 1200 shown in Figures 12A-B.

In the example of Figures 1A-C, the access sections are formed in a manner similar to a visor on a helmet, where the pivotable section of the skirt is the visor and the protective cover is the helmet that stays in place as the access section is opened to reveal part of the tool set carriers. The access sections 140 pivot on the outside of the protective cage from the first position to the second position similar to a face protecting visor on a helmet. According to some aspects of the teachings herein, the access section or sections 140 are separate from the protective structure 120, meaning that the protective structure stays in place as the access sections are moved from the first to the

second position. This is an advantage since the protection from the protective cover 120 is maintained regardless of the position of the access section 140. It also means that the protective cover does not need any hinges and can be rigidly formed as one structure, which allows for a more stable protective cover.

5 To summarize, there is disclosed herein a power trowel 100, 1200 comprising one or more rotatable tool set carriers 110 arranged to support respective sets of tool holders 130 for processing a surface 101 such as a concrete or stone surface. The power trowel 100, 1200 comprises a protective cover 120 configured to at least partly enclose the one or more rotatable tool set carriers
10 110, and preferably to cover an entirety of the rotatable tool set carriers. The protective cover may be a cage structure as illustrated in Figures 1A-C and in Figures 12A-B, or some other cover structure such as a cover made of sheet metal, a plastic casing, or the like. A combination of steel bars and sheet material can also be used. At least one access section 140 is arranged in
15 connection to the protective cover 120, and preferably formed separately from the protective cover. This access section is arranged to be moved between a first position where the tool set carriers 110 are covered, i.e., protected from the ambient environment to a second position where the tool set carriers 110 are at least partly uncovered to allow access to at least one of the tool holders
20 130 from outside of the protective cover 120.

An operator or service technician can operate the access section to gain access to the tools under the power trowel, which is an advantage since access to the tools underneath the machine is greatly simplified in this manner. In the examples of Figures 1A-C, access to the tool holders is allowed from a
25 horizontal direction parallel to the surface 101, and not from above. This is an advantage since the tool holders are protected from, e.g., falling objects even if the access sections are in their second position.

The access section of the protective cover 120 is advantageously combined with a special type of tool set carrier 110 that is arranged to allow manual
30 rotation of the tool set carrier 110, relative to the drive shaft, for at least part of a revolution about the center axis of rotation of the tool set carrier. This type of

tool set carrier will be discussed below and some examples will be given of how it can be realized in practice. An operator can, by the techniques disclosed herein, move the access section 140 into the second position (as exemplified in Figure 1B and Figure 1C), and then access all the tool holders on the tool set carrier by manually rotating the tool set carrier to expose the tool holders one after the other. Note however that the tool holders are still covered by the protective cover 120.

Each access section 140 of the protective cover 120 is arranged to uncover at least a part of a respective tool set carrier 110 when in the second position.

The uncovered part of the respective tool set carrier 110 corresponds to at least one third of the circumference of the tool set carrier 110.

A skirt 125 is preferably arranged around an edge of the protective cover 120, between the protective cover 120 and the surface 101, as exemplified in Figures 1A-C. This skirt reduces the amount of dust and slurry which is ejected into the ambient environment during surface processing which is an advantage. The skirt also prevents foreign objects from entering in under the power trowel, where they may cause damage to the tools or the tool holders. The skirt 125 can be arranged floating relative to the protective cover 120 and supported by the surface 101 in use. To be arranged floating means that the skirt is only loosely connected to the rest of the power trowel, in the example of Figures 1A-C vertical displacement relative to the power trowel chassis is allowed. The vertical displacement in Figures 1A-C is realized by the cooperating vertically extending slots 180 and the sliders 185 that traverse up and down the slot 180.

As an alternative to having a freely floating skirt, a vertical position or height of the skirt 125 relative to the surface 101 in use can be adjustable. This way an operator can configure a height of the skirt 125 above the surface to be processed. An operator can then adjust a gap between the surface 101 and the lower edge of the skirt to a preferred magnitude. In this case the sliders 185 may be formed as excentre locks or other friction generating devices.

In this and other examples, the skirt is formed from a plurality of segments, i.e., not as one continuous piece bent around the protective cover 120. The example in Figures 1A-C has a skirt formed out of four sections. Two sections are arranged on or at least in connection to respective access sections 140, while two other sections are arranged on the sides between the access sections 140.

In the example in Figures 1A-C, the access sections 140 are hingedly connected to the power trowel chassis about an axis P, indicated in Figure 1C, to simplify operating the access section. Generally, at least one access section 140 of the protective cover 120 is hingedly connected to the power trowel 100 about at least one pivot point 145, 1200 to allow pivoting U by the access section 140 from the first position into the second position. The pivot axis P in Figure 1C intersects two pivot points 145. It is, however, noted that only pivot point is necessary, and that there can be two or more points on the trowel about which the access section pivots.

To simplify moving the access section 140 between the first and second positions, the at least one hingedly connected access section 140 can be biased towards the first position by a spring loaded hinge arrangement 200 if moved from the first position towards the second position by less than a predetermined angle, and also biased into the second position by the spring loaded hinge arrangement 200 if moved from the first position towards the second position by more than the predetermined angle. The predetermined angle is a balancing point of the spring loaded hinge arrangement. Figures 2A-B illustrate an example spring loaded hinge arrangement 200 having this function. Figure 2A shows an access section 140 in the first position where the tool holders are covered, i.e., not accessible from outside of the protective cover 120. The access section is hingedly connected about pivot point 145. The spring arrangement 200 in this example comprises a spring 210 connected to the power trowel 100 at a bracket 220 and at a pivotable element 230. The access section can be attached to the pivotable element 230 at the bolt holes 240. In Figure 2A, the spring force from the spring 210 urges the

pivotable element to rotate counterclockwise such that the access section 140 is held in the first position. As the access section 140 is pivoted in the clockwise direction (in the view of Figures 2A-B) about the pivot point 145 it passes a balance point, similar to an excentre arrangement, whereupon it instead becomes biased in the clockwise direction. When this happens the access section 140 instead becomes biased towards the second position, where it is held so that an operator or service technician can access one or more tool holders 130 and also a part of the tool set carrier 110. This state of the spring arrangement 200 is illustrated in Figure 2B.

10 A gas spring or the like may be used instead of a conventional spring 210.

A sensor arrangement 250, 255 may be arranged in connection to one or more access sections, to detect which position the access section is in, i.e., whether the access section is opened to allow access to the tools or closed to prevent access. In Figure 2B, a Hall effect sensor 250 or the like can be configured to detect when a magnet or metallic object 255 is in vicinity of the sensor, to detect in which position out of the first and second position the access section is in.

According to some aspects, a control unit of the power trowel can be configured to prevent operation in case one or more access sections are in their respective second positions, i.e., if one or more access sections have been opened to allow access to the tools underneath the power trowel. This improves safety for an operator since the machine cannot be started during servicing when an operator or service technician may be located in vicinity of the tools underneath the power trowel.

25 It is appreciated that the access section does not have to be hingedly connected to the rest of the power trowel. According to other aspects, at least one access section 140 of the protective cover 120 is arranged to be disconnected entirely from the rest of the protective cover and removed from the power trowel 100, 1200. An operator wishing to access the tool holders can, e.g., lift one or more access section off from the power trowel in order to gain access to the tools.

It may be desired to manually rotate the tool set carrier 110, e.g., in order to access a particular tool holder or to inspect the entire tool set carrier. This is particularly true in case the access portion only exposes a part of the tool set carrier, as in the example of Figures 1A-C.

5 With reference to, e.g., Figure 1C, it is noted that the access section 140 of the protective cover 120 is hingedly connected to the power trowel 100 to allow pivoting U by the access section 140 from the first position into the second position about a pivot axis P that intersects first and second pivot points 145. The first and second pivot points 145 and thus also the pivot axis P are all
10 located at a distance d_p from the surface 101. This distance is, in the illustrated examples, less than three times the height h_s of the skirt 125 of the power trowel 100, and preferably less than two times the height h_s of the skirt 125 of the power trowel 100. Thus, the pivot axis P is located relatively close to the surface 101. The location close to the surface allows for a relatively large
15 separation between the pivot points 145, which makes the access section pivoting motion stable. It is worthwhile noticing that the access sections pivot about a pivot axis P close to the surface 101, and that the access sections are formed as elements that are separate from the protective cover 120. The protective cover 120 can be seen as a helmet of sorts which protects the
20 rotating tools of the power trowel, while the access sections 140 can be seen as visors that can be lifted to gain access to the tools, without removing the protective cover. A key feature of a preferred embodiment of the teachings herein is that the protective cover is separate from the access sections, such that the protective cover can stay in place as the access section, or sections
25 are operated in order to gain access to the tools.

According to some aspects, a distance D1 between the first and second pivot points 145 is at least 0,75 times a diameter D2 of the rotatable tool set carriers 110, and preferably at least as large as the diameter D2 of the rotatable tool set carriers 110. Figure 1C illustrates the distances D1 and D2. By making the
30 distance D1 larger than the distance D2, the pivotable access section 140 can pivot all the way down to the surface 101, similar to a visor on a helmet. This

improves the protection by the access section in the first position. At least one access section 140 optionally comprises a section of a floating skirt 125 of the power trowel 100, as illustrated in Figures 1A-C.

It is also an advantage if the protective cover 120 in the first position, seen
5 from a top view T of the power trowel 100 as indicated in Figure 1C, covers at least 90% of the one or more rotatable tool set carriers 110, and preferably all of the one or more rotatable tool set carriers. This means that the protective cover maintains its protective function regardless of the position of the access section. In other words, an operator or other person in vicinity of the power
10 trowel is protected by the protective cover even if the access section is moved into its second position.

The access section 140, which can be moved between a first and a second position, extends on an outside of the protective cover 120. This simplifies the pivoting and/or removal of the access section since it will not interfere with the
15 protective cover as it is moved between its first and second position. The access section 140 advantageously also comprises a part of the floating skirt 125 of the power trowel which is separated from a protective cage 120 of the power trowel 100.

To summarize, advantages are obtained by configuring the access section 140
20 or access sections on the power trowel as visor-like elements which can be pivoted into an open second position where access to the tool holders is allowed, from a first position where the tool holders are covered.

Figures 3, 4A-B, 5A-B, and 6 show example tool set carriers 110, 400, 500, 600 suitable for use with a power trowel 100, 1200. As before, the tool set
25 carriers are arranged to support one or more tool holders 130. The tool set carriers 110 all comprise a center hub 310 arranged to be attached to a drive shaft, and they are all arranged to rotate in a drive direction R1 about a center axis of rotation A1 in response to a rotation by the drive shaft. Arms 320 extend radially outwards from the center hub 310 to attachment points 330 where tools
30 can be attached. There are five arms on the example tool set carrier 110 in Figure 3. However, two, three, four, or more than five arms are also possible.

The tool set carriers 110, 400, 500, 600 are arranged to allow manual rotation of the tool set carrier relative to the drive shaft, for at least part of a revolution about the center axis of rotation A1. In these examples the tool set carrier 110 extends in a carrier plane Pc, and the drive shaft extends in a direction normal to the carrier plane Pc.

Figures 4A-B, 5A-B, and 6 show different examples of how this manual rotation feature can be realized. In all these examples, the center hub 310 comprises a first part 410, 510, 610 and a second part 420, 520, 620. The first part 410, 510, 610 is arranged to be rotationally fixed to the drive shaft, e.g., by a keyway 440, while the second part 420, 520, 620 is at least indirectly connected to the tool holders 130. The second part 420, 520, 620 bears on the first part 410, 510, 610 to allow relative rotation there inbetween about the center axis of rotation A1.

The first part 410, 510, 610 and the second part 420, 520, 620 together implement a rotation limiting mechanism 430, 530, 540 that prevents relative rotation between the first part 410, 510, 610 and the second part 420, 520, 620 beyond an angular range and/or rotation by the tool set carrier 110, 400 relative to the drive shaft in the drive direction R1, such that the tool set carrier will rotate in the drive direction R1 in response to a rotation by the drive shaft. In some examples the tool set carrier 110 is arranged to allow manual rotation of the tool set carrier 110 in a direction R1' opposite to the drive direction R1, and in some examples the tool set carrier 110 is arranged to allow manual rotation of the tool set carrier 110 only in the drive direction R1. The second part 420, 520, 620 is, in the examples, arranged radially outwards from the first part 410, 510, 610. This means that an operator can rotate the tool set carrier to access different tools, and the drive shaft can also drive the tool set carriers during operation, which any locking mechanism or the like which the operator needs to operate in order to, e.g., allow manual rotation or drive mode.

Figure 4A illustrates a perspective view and Figure 4B illustrates a cross-section view of an example where the rotation stop mechanism 430 comprises cooperating and radially overlapping heels 431, 432 arranged between the first

part 410 and the second part 420 to prevent relative rotation between the inner part 410 and the outer part 420 beyond an angular range. As long as the radially overlapping heels are not in abutment with each other, rotation in any direction R1, R1' about the center axis A1 is allowed. As the drive shaft is
5 rotated the heels will eventually abut each other, so that the drive torque from the drive shaft is transferred to the tool set carrier.

A keyway 440 is formed in the first part 410 to provide rotational lock of the drive shaft.

In Figures 5A-B and 6 the rotation stop mechanism 530, 630 comprises a
10 ratchet mechanism configured to prevent rotation by the tool set carrier 110, 500, 600 relative to the drive shaft in direction R1' opposite to the drive direction R1. The ratchet mechanism 530 may for instance comprise cooperating ratchet rings 531, 532 attached to the first part 510 and to the second part 520, respectively, as exemplified in Figures 5A-B. The ratchet
15 mechanism 630 may also comprise a ratchet wheel 631 connected to one of the first part 610 and the second part 620, and one or more spring loaded pawls 632 connected to the other of the first part 610 and the second part 620, as exemplified in Figure 6. Note the optional springs 640 in Figure 6 which biases the pawls 632 towards the ratchet wheel 631. Torsion springs or the like
20 can of course also be used with similar effect, i.e., to bias the pawls 632 towards the ratchet wheel 631.

Figure 15 shows yet another example of a tool set carrier 1500 that is arranged to allow manual rotation of the tool set carrier relative to the drive shaft, for at least part of a revolution about the center axis of rotation A1. In this case the
25 center hub of the tool set carrier 1500 comprises a rotation lock mechanism 1510 arranged to mesh in rotationally locking engagement with a corresponding part fixed to the drive shaft.

The tool set carrier 1500 is arranged slidably along the center axis of rotation A1. As the power trowel 100 is lifted up from the surface 101, e.g., as shown
30 in Figure 15, the tool set carrier moves along the axis of rotation A1 away from the chassis of the power trowel 100, which movement disengages the rotation

lock mechanism to allow manual rotation of the tool set carrier relative to the drive shaft.

In the example 1500, the rotation lock mechanism 1510 comprises a set of teeth 1520 arranged to enter into rotationally locking engagement with matching recesses formed on fixed relation to the drive shaft. Thus, if the tool set carrier is pressed up against the chassis of the power trowel 100 then the rotation lock mechanism 1510 engages to allow the drive shaft to drive the tool set carrier. If the tool set carrier is axially removed from the chassis, then the rotation lock mechanism 1510 disengages to allow manual rotation of the tool set carrier in both directions $R1$, $R1'$.

Power trowel grinder machines are often used in harsh environments where dust and slurry may accumulate and hamper performance. To obtain a good end result after surface grinding, it is preferred that the tool holders are rotatably connected to the tool set carrier, i.e., so that they may rotate freely about the tool holder axis of rotation $A2$. By having a tool holder that rotates about its central axis $A2$ in use, a more even grinding result is obtained. The tool set carrier 110 is then driven by drive torque from the power trowel drive shaft, and the tool holders rotate passively about respective tool holder axes of rotation $A2$. This passive rotation may be hampered by dust and slurry which has accumulated in vicinity of the tool holder axis of rotation.

To be able to process surfaces which are not perfectly planar, it is preferred to have tool holders which can adapt to unevenness in the surface to be processed. For this reason, it is desired to provide tool holders that are able to pivot relative to the tool holder axis of rotation. It may also be advantageous if the pivoting relative to the tool holder axis of rotation is biased towards a horizontal position of the tool holder, where the tool holder axis of rotation $A2$ is normal to the tool holder plane Ph , indicated in Figure 8 and in Figure 9 which are discussed in more detail below. This bias towards a horizontal position can be obtained, e.g., by resilient bushings as will be discussed in more detail below.

An improvement in the surface processing result compared to when using fixed, non-pivoting, tool holders is obtained even if the tool holder is only able to pivot about a single pivot axis. Such a single pivot axis cardan arrangement can be obtained in a straightforward manner by replacing one of the cardan shafts in the examples with a fixed non-pivotable support. For instance, to obtain a single pivot axis cardan arrangement starting from the example in Figure 10, it is sufficient to replace the part of the cardan arrangement comprising the second cardan shaft 770 with a fixed attachment to the tool holder plate 720. This will result in a tool holder comprising a tool holder plate that is only able to pivot about the first cardan pivot axis C1.

However, it is preferred that the tool holder is able to pivot about first and second pivot axes extending transversally or even orthogonally with respect to each other. The present disclosure is not limited to tool holders that are arranged to pivot about two different pivot axes, but also encompasses tool holders with a single pivot axis.

Figures 7-9 illustrate an example tool holder 130, 700 for a power trowel 100, 1200. The tool holder 130, 700 comprises a center hub 710 and a tool holder plate 720. The center hub 710 is arranged to be attached to a tool set carrier 110, so that it can be used to process a surface 101 such as a concrete or stone surface. A cardan arrangement 730, 740 pivotably connects the center hub 710 to the tool holder plate 720 such that the tool holder plate 720 is allowed to pivot relative to the center hub 710 about a first cardan pivot axis C1 and a second cardan pivot axis C2. Note however, that the second cardan pivot axis is an optional pivot axis, since only one pivot axis is required in order to use the tool holder successfully. The first and second cardan pivot axes C1, C2 are orthogonal in the illustrated examples, although this is not strictly necessary. This way the tool holder is able to absorb unevenness in the surface that is being processed, which leads to better end results.

The center hub 710 also comprises a bearing 910 which bears on the cardan arrangement 730, 740 to allow relative rotation R2 between the center hub 710 and the tool holder plate 720 about a tool holder axis of rotation A2.

A radial inner part of the bearing 910 in the example shown in Figure 9 is fixed to the center hub 710 while a radial outer part of the bearing 910 is fixed to the rotating part of the tool holder. A rotation axis of the bearing 910 is in alignment with the tool holder axis of rotation A2. This means that the radial inner part of the bearing does not rotate in relation to the tool set carrier, and that the radial outer part of the bearing rotates together with the rotating part of the tool holder.

The bearing 910 may be a sealed bearing. That the bearing is sealed means that there is an enclosure which contains the balls or the rollers of the bearing, such that dust and slurry cannot penetrate into the bearing to cause problems therein. A sealed bearing also does not need to be lubricated or maintained regularly, which is an advantage. A sealed bearing is a bearing that comprises some form of seal arranged between the balls or rollers of the bearing and the ambient environment.

According to some aspects, a labyrinth structure 810 configured to prevent dust and slurry from passing through it is arranged in connection to the bearing 910, i.e., radially outwards from the bearing. A lid 920 may also be arranged to enclose a volume comprising the bearing. The lid 920 is attached from below the tool holder and is preferably kept in place by interference fit or snap lock. The lid covers the bearing from below and thus prevents dust and slurry from entering into contact with the bearing from below. In the example in Figure 9, the lid engages the rotating part, and therefore rotates together with the rotating part and together with the radial outer part of the bearing 910.

To improve the protection of the tool holder internal structures, it is possible to arrange a resilient seal or gasket, such as a V-ring seal or an axle seal, radially outwards of the bearing 910, preferably in connection to the labyrinth structure 810. The seal will then be journaled about the center hub 310 to seal the same passage as the labyrinth structure 810. Note that the labyrinth structure is not inextricably linked to the seal, i.e., the two can be used independently of each other or in combination.

Figures 7-9 illustrate an example tool holder 130, 700 for a power trowel 100, 1200. The tool holder 130, 700 comprises a center hub 710 and a rotating part arranged to rotate R2 relative to the center hub 710 about a tool holder axis of rotation A2. The center hub 710 is arranged to be attached to a tool set carrier
5 110. The rotating part comprises a cardan arrangement 730, 740 and a tool holder plate 720. The cardan arrangement 730, 740 pivotably connects the center hub 710 to the tool holder plate 720 such that the tool holder plate 720 is allowed to pivot relative to the center hub 710 about at least a first cardan pivot axis C1, where the center hub 710 is fixed to a bearing 910 which bears
10 on the rotating part to allow the relative rotation R2 between the center hub 710 and the rotating part about the tool holder axis of rotation A2. The bearing 910 is at least partly enclosed by the rotating part, as shown in the example in Figure 9.

The tool holder 700 comprises an upper support member 750 which is
15 pivotable in relation to the tool holder plate 720, such that relative rotation between the upper support member 750 and the tool holder plate 720 about the first cardan pivot axis C1 is allowed. The upper support member 750 may be an upper plate of the cardan arrangement, i.e., a planar support member having an extension essentially parallel to the tool holder plate in a nominal
20 (non-pivoted) position of the tool holder. The upper support member 750, however, does not have to be a planar component.

The upper support member 750 is pivotably connected by first aligned cardan shafts 760 to a second cardan shaft 770 that runs transversal to the first cardan shafts 760. In other words, the first cardan shaft is divided into two axially
25 aligned parts with a gap inbetween to allow the second cardan shaft to pass transversely in the same plane or at least vertically close to the first cardan shaft. It is an advantage that the cardan arrangement 730, 740 comprises a first cardan shaft 760 that is divided into two axially aligned parts intersected by the second cardan shaft 770 that runs transversal to the first cardan shaft
30 760, since this reduces the build height of the tool holder. The second cardan shaft 770 can of course also be divided into two axially aligned parts.

According to some aspects, the cardan arrangement comprises first and second cardan shafts 760, 770, where at least one of the cardan shafts extends radially across the bearing 910 from one end of the cardan arrangement to the other end of the cardan arrangement. Thus, one of the
5 cardan shafts is an unbroken shaft. The other of the cardan shafts may be divided into two axially aligned parts with a gap inbetween, as discussed above, in order to limit the total build height of the tool holder.

The second cardan shaft 770 is pivotably connected to the tool holder plate 720, such that relative rotation between the upper support member 750 and
10 the tool holder plate 720 about the second cardan pivot axis C2 is allowed. Relative rotations about two transversal axes is thus allowed, which improves the efficiency of the tool holder in processing concrete surfaces, in particular uneven concrete surfaces.

The upper support member 750 may be of an elongated shape that extends in
15 direction of the first cardan pivot axis C1.

The center hub 710 of the tool holder 700 is rotatably attached to the upper support member 750, which means that the entire tool holder 700 can rotate freely about the tool holder axis of rotation A2.

The upper support member 750 of the example cardan arrangement shown in
20 the drawings extends in direction of the first cardan pivot axis C1 between opposite ends of the cardan arrangement, i.e., between distal end points of the first cardan shaft. The bearing 910 is at least partly embedded into the upper support member 750. This decreases the overall build height of the tool holder 700 measured along the axis of rotation A2, and also protects the bearing from
25 impact by objects during operation

The center hub 710 preferably extends over the entire bearing and forms the labyrinth structure 810 radially outwards of the bearing 910.

Resilient bushings 930, such as rubber bushings, may be arranged to support the first and second cardan shafts. The cardan shaft are then supported by
30 bushings that are pressed together and rotationally fixed. Any rotation by the

tool holder plate 720 about the axes C1 and C2 will result in tension in the bushing and an urge to revert back to a nominal position, which is preferably configured such that the axis A2 is normal to the tool holder plate 730. To summarize, the cardan arrangement may comprise first and second cardan shafts 760, 770, where each cardan shaft is supported at its end points by a rotatably fixed resilient bushing 930. Coil springs and the like can be used with similar effect.

The cardan arrangement 700 has an upper part that comprises the upper support member 750. The upper support member supports the center hub 710. The cardan arrangement also has a lower part which is attached to the tool holder plate 720. The center hub 710 is where the tool holder rotatably attaches to the tool set carrier such that it can rotate about axis A2. This attachment between the tool holder and the tool set carrier allows for rotation of the tool holder in a plane Ph as indicated in Figure 8 and in Figure 9.

The upper part is pivotably attached to the lower part, such that it can pivot about axis C1. This pivotable attachment is realized by means of the first cardan shaft 760 that bear on the lower part, along the axis C1. The upper part is not in direct contact with the tool holder plate 720, as can be seen in Figure 10.

The lower part pivotably supports the upper part and is directly attached to the tool holder plate 720, at the end supports 771, 772 against which the second cardan shaft 770 bears.

Looking at Figures 7-10, some interesting geometrical relationships are noted. For example, the example bearing 910 shown in Figure 9 rotationally connects the center hub 710 and an upper support member 750 of the cardan arrangement 730, 740. The bearing 910 is at least partly embedded into the upper support member 750, in order to limit the total build height Bh of the tool holder.

A plane Pb that is orthogonal to the tool holder axis of rotation A2 and intersecting an axial center of the bearing 910 intersects the upper support

member 750 or separates the upper support member 750 and the tool holder plate 720. This means that the bearing is embedded relatively deeply into the cardan arrangement, in this case into the upper support member of the cardan arrangement.

- 5 The balls or the rollers of the bearing 910 lie below an upper surface of the upper support member 750 in the example in Figure 9.

A total build height B_h of the tool holder, measured along the tool holder axis of rotation A_2 as indicated in Figure 9 is less than 20 times the build height B_p of the tool holder plate 720, and preferably less than 15 times the build height
10 B_p of the tool holder plate 720.

With reference to Figure 10, when the tool holder plate 720 pivots relative to the tool set carrier arm 320 about axis C_2 , then there is relative movement between the bearing surfaces at the end supports 771, 772 and the second cardan shaft 770. When the tool holder plate 720 pivots relative to the tool set
15 carrier arm 320 about axis C_1 , then there is relative movement between the bearing surfaces at the center of the lower part and the first cardan shafts 760. When the tool holder plate 720 rotates about axis A_2 , then there is relative movement between the bearing surface in the center hub 710 and the axis extending up to the attachment point 330 of the tool carrier arm 320.

- 20 The tool holder plate 720 preferably comprises cut-out portions or recesses 725 arranged to accommodate a part of the cardan arrangement 730, to allow rotation about axes C_1 and C_2 . These cut-out portions reduce build height of the tool holder, which is an advantage.

In some cases, the passive rotation R_2 by the tool holders 130 about the tool
25 holder axis of rotation A_2 on known power trowels may fail, or may only occur intermittently, which may be detrimental to the end result. To improve the passive rotation R_2 by the tool holders about the tool holder axis of rotation A_2 , a biasing element 1010 may be arranged as exemplified in Figure 10. The biasing element generates an increased normal force F at a location offset by

a distance O from the tool holder axis of rotation A2. This asymmetry in normal force over the tool holder stimulates the passive rotation by the tool holder 130.

In other words, with reference also to Figure 11, there is disclosed a tool set carrier 110, 1000 for a power trowel 100, 1200, where the tool set carrier 110, 1000 extends in a tool set carrier plane Pc and is arranged to rotate in a drive direction R1 about a center axis of rotation A1 in response to a rotation by a drive shaft. The tool set carrier 110, 1000 is arranged to rotatably support one or more tool holders 130 at respective radial distances D1 from the center axis of rotation A1, where each tool holder 130 is arranged to rotate R2 about a respective tool holder axis of rotation A2. The tool set carrier 110, 1000 comprises one or more biasing elements 1010 arranged to exert a force F on a respective tool holder 130, in a direction transversal to the tool set carrier plane Pc, at a location offset O from the tool holder axis of rotation A2.

At least one of the biasing elements 1010 may comprise a spring-loaded wheel 1020, as exemplified in Figure 10, with a rolling direction arranged perpendicular to a radial direction of the tool holder 130. This wheel can roll unhindered in a circle around the tool holder plate 720.

According to some aspects, at least one of the biasing elements 1010 comprises a force adjustment mechanism configured to adjust the force F exerted by the biasing element 1010 by a configurable amount. This force adjustment mechanism may, for instance, comprise a variable pre-tensioning of the spring-loaded wheel. The biasing element may be configurable in two or more pre-determined positions of increasing force that are selectable by an operator of the trowel 100.

It is appreciated that the biasing element 1010 may be attached to the center part of the tool holder 130, 700 instead of to the tool carrier arm 320, since the center part of the tool holder does not rotate relative to the arm 320, as illustrated by the right-most biasing element 1100 in Figure 11.

It is appreciated that the biasing element 1010 is not dependent on the attachment between tool holder and tool set carrier arm 320. In other words,

the cardan arrangement discussed above in connection to Figures 7-9 is not inextricably linked to the biasing arrangement 1010.

Figure 13 is a flow chart that illustrates a method for inspecting, servicing, replacing and/or exchanging tools on a power trowel 100, 1200 according to the different teachings herein. The power trowel comprises one or more rotatable tool set carriers 110 arranged to support respective sets of tool holders 130 for processing a surface 101. The power trowel comprises a protective cover 120 configured to at least partly enclose the one or more rotatable tool set carriers 110, where at least one access section 140 configured in connection to the protective cover 120 is arranged to be moved between a first position where the tool set carriers 110 are covered to a second position where the tool set carriers 110 are uncovered to allow access to at least one of the tool holders 130 from outside of the protective cover 120. The method comprises

moving S1 an access section 140 from its first position into its second position, accessing S2 the at least one tool holder 130 from outside of the protective cover 120, and

inspecting, servicing, replacing and/or exchanging S3 a tool supported by the tool holder 130.

Inspecting a tool may comprise, e.g., a visual inspection or a measurement of tool wear using some type of measurement device, such as calipers.

Replacing and exchanging a tool may refer to replacement of a worn tool by a new fresh tool of the same type, or exchanging of the tool for a tool of a different grit or type.

Figure 14 illustrates an example of servicing a tools supported by a tool holder 130. The ride-on power trowel 100 has here been lifted from the surface 101 by a service cart 1400. By raising the trowel 100 from the ground it becomes easier to access the tools, and also to rotate the tool set carrier 110 as discussed above.

The service cart 1400 may comprise an elongated handle portion 1410 that can be used by an operator to guide the cart. In the example shown in Figure 14, the handle portion also functions as a lever which can be used to pivot the cart about the support wheel 1420, as illustrated in Figure 14. The service cart
5 has an engagement point 1430 which is arranged to engage the power trowel 100 in order to lift 1440 the trowel 100 from the surface 101.

A support block 1450 may be inserted under the trowel 100 in order to keep it in a raised position.

The service cart 1400 may comprise a jack, a spindle, or some other
10 mechanism which allows the heavy machine 100 to be raised from the surface 100 manually by an operator.

It is appreciated that the mechanisms that allow manual rotation of the tool set carrier that were discussed, e.g., in connection to Figures 4A-B, 5A-B and 6 are useful when inspecting, servicing, replacing and/or exchanging S3 a tool,
15 since the different tools on the tool set carrier can be accessed one after the other by manually rotating the tool set carrier.

To allow manual rotation, it may be necessary to release the normal force on the tool set carrier, i.e., the weight of the power trowel on the tool set carrier. This can be achieved by lifting the power trowel from the ground a bit, e.g., by
20 a lever arrangement, or a jack tool such as a pallet jack. Some power trowels also comprise tool set carriers and drive shafts which can be lifted up in a vertical direction to release the pressure on the tools.

CLAIMS

1. A power trowel (100, 1200) comprising one or more rotatable tool set carriers (110) arranged to support respective sets of tool holders (130) for processing a surface (101),
- 5 the power trowel (100, 1200) comprising a protective cover (120) configured to at least partly enclose the one or more rotatable tool set carriers (110),
where at least one access section (140) configured in connection to the protective cover (120) is arranged to be moved between a first position where the tool set carriers (110) are covered to a second position where the tool set
10 carriers (110) are uncovered to allow access to at least one of the tool holders (130) from outside of the protective cover (120),
where at least one of the tool set carriers (110) comprises a center hub (310) arranged to be attached to a drive shaft, wherein the tool set carrier (110) is arranged to rotate in a drive direction (R1) about a center axis of rotation (A1)
15 in response to a rotation by the drive shaft, where the tool set carrier (110) is arranged to allow manual rotation of the tool set carrier (110), relative to the drive shaft, for at least part of a revolution about the center axis of rotation (A1).
2. The power trowel (100, 1200) according to claim 1, where a skirt (125) is
20 arranged around an edge of the protective cover (120), between the protective cover (120) and the surface (101).
3. The power trowel (100, 1200) according to claim 2, where the skirt (125) is arranged floating (F) relative to the protective cover (120) and supported by the surface (101) in use.
- 25 4. The power trowel (100, 1200) according to claim 2 or 3, where a vertical position of the skirt (125) relative to the surface (101) in use is adjustable.
5. The power trowel (100, 1200) according to any previous claim, where each access section (140) of the protective cover (120) is arranged to uncover a part of a respective tool set carrier (110) when in the second position, where

the uncovered part of the respective tool set carrier (110) corresponds to at least one third of the circumference of the tool set carrier (110).

6. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) of the protective cover (120) is hingedly
5 connected about at least one pivot point (145) to the power trowel (100, 1200) to allow pivoting (U) by the access section (140) from the first position into the second position.

7. The power trowel (100, 1200) according to claim 6, where the at least one hingedly connected access section (140) is biased towards the first
10 position by a spring loaded hinge arrangement (200) if moved from the first position towards the second position by less than a predetermined angle.

8. The power trowel (100, 1200) according to any previous claim, where the at least one hingedly connected access section (140) is biased into the second
15 position by the spring loaded hinge arrangement (200) if moved from the first position towards the second position by more than the predetermined angle.

9. The power trowel (100, 1200) according to any of claims 1-5, where at least one access section (140) of the protective cover (120) is arranged to be disconnected from the rest of the protective cover and removed from the power
trowel (100, 1200).

20 10. The power trowel (100) according to any previous claim, where the power trowel is a ride-on power trowel with two rotatable tool set carriers (110), where two sections of the protective cover (120) are arranged to be moved between respective first and second positions.

11. The power trowel (1200) according to any of claims 1-9, where the power
25 trowel is a walk-beside power trowel (1200) with one rotatable tool set carrier (110), where one section of the protective cover (120) is arranged to be moved (U) between respective first and second positions.

12. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) of the protective cover (120) is hingedly
30 connected to the power trowel (100, 1200) to allow pivoting (U) by the access

section (140) from the first position into the second position about a pivot axis (P) that intersects first and second pivot points (145) on the power trowel (100, 1200), where the pivot axis (P) is located at a distance (d_p) from the surface (101) that is less than three times the height (h_s) of a skirt (125) of the power
5 trowel (100), and preferably less than two time the height (h_s) of the skirt (125) of the power trowel (100).

13. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) of the protective cover (120) is hingedly connected to the power trowel (100, 1200) to allow pivoting (U) by the access
10 section (140) from the first position into the second position about a pivot axis (P) that intersects first and second pivot points (145), where a distance (D1) between the first and second pivot points (145) is at least 0,75 times a diameter (D2) of the rotatable tool set carriers (110), and preferably at least as large as the diameter (D2) of the rotatable tool set carriers (110), and more preferably
15 larger than the diameter (D2) of the rotatable tool set carriers (110).

14. The power trowel (100, 1200) according to any previous claim, where the protective cover (120) in the first position, seen from a top view (T) of the power trowel (100), covers at least 90% of the one or more rotatable tool set carriers (110), and preferably all of the one or more rotatable tool set carriers.

20 15. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) comprises a section of a floating skirt (125) of the power trowel (100).

16. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) extends outside of the protective cover (120)
25 relative to the one or more rotatable tool set carriers.

17. The power trowel (100, 1200) according to any previous claim, where at least one access section (140) comprises a part of a floating skirt (125) of the power trowel which is separated from a protective cage (120) of the power trowel (100).

30 18. A tool set carrier (110) for a power trowel (100, 1200),

where the tool set carrier (110) is arranged to support one or more tool holders (130),

the tool set carrier (110) comprising a center hub (310) arranged to be attached to a drive shaft, wherein the tool set carrier (110) is arranged to rotate in a drive
5 direction (R1) about a center axis of rotation (A1) in response to a rotation by the drive shaft,

where the tool set carrier (110) is arranged to allow manual rotation of the tool set carrier (110), relative to the drive shaft, for at least part of a revolution about the center axis of rotation (A1).

10 19. The tool set carrier (110) according to claim 18, where the tool set carrier (110) is arranged to allow manual rotation of the tool set carrier (110) in the drive direction (R1).

20. The tool set carrier (110) according to claim 18 or 19, where the tool set carrier (110) extends in a carrier plane (Pc), and where the drive shaft extends
15 in a direction normal to the carrier plane (Pc).

21. The tool set carrier (110) according to any of claims 18-20, arranged to support a plurality of tool holders (130) on respective arms (310) extending radially outwards from the center axis of rotation (A1).

22. The tool set carrier (110, 400) according to any of claims 18-21,
20 where the center hub (310) comprises a first part (410, 510, 610) arranged to be rotationally fixed to the drive shaft, and a second part (420, 520, 620) connected to the tool holders (130),

where the second part (420, 520, 620) bears on the first part (410, 510, 610) to allow relative rotation there inbetween about the center axis of rotation (A1),

25 where the first part (410, 510, 610) and the second part (420, 520, 620) together implement a rotation limiting mechanism (430, 530, 540) that prevents relative rotation between the first part (410, 510, 610) and the second part (420, 520, 620) beyond an angular range and/or rotation by the tool set carrier

(110, 400) relative to the drive shaft in a direction opposite to the drive direction (R1).

23. The tool set carrier (110, 400) according to claim 22, where the second part (420, 520, 620) is arranged radially outwards from the first part (410, 510, 610).

24. The tool set carrier (110, 400) according to claim 22 or 23, where the rotation stop mechanism (430) comprises cooperating and radially overlapping heels (431, 432) arranged between the first part (410) and the second part (420) to prevent relative rotation between the inner part (410) and the outer part (420) beyond an angular range.

25. The tool set carrier (110, 500, 600) according to any of claims 22-24, where the rotation stop mechanism (530, 630) comprises a ratchet mechanism configured to prevent rotation by the tool set carrier (110, 500, 600) relative to the drive shaft in direction (R1') opposite to the drive direction (R1).

26. The tool set carrier (110, 500, 600) according to claim 25, where the ratchet mechanism (530) comprises cooperating ratchet rings (531, 532) attached to the first part (510) and to the second part (520), respectively.

27. The tool set carrier (110, 500, 600) according to claim 25, where the ratchet mechanism (630) comprises a ratchet wheel (631) connected to one of the first part (610) and the second part (620), and one or more spring loaded pawls (632) connected to the other of the first part (610) and the second part (620).

28. A method for inspecting, servicing, replacing and/or exchanging tools on a power trowel (100, 1200) comprising one or more rotatable tool set carriers (110) arranged to support respective sets of tool holders (130) for processing a surface (101),

the power trowel (100, 1200) comprising a protective cover (120) configured to at least partly enclose the one or more rotatable tool set carriers (110),

where at least one access section (140) configured in connection to the protective cover (120) is arranged to be moved between a first position where the tool set carriers (110) are covered to a second position where the tool set carriers (110) are uncovered to allow access to at least one of the tool holders (130) from outside of the protective cover (120),

the method comprising

moving (S1) an access section (140) into its second position,

accessing (S2) the at least one tool holder (130) from outside of the protective cover (120), and

inspecting, servicing, replacing and/or exchanging (S3) a tool supported by the tool holder (130).

29. A tool holder (130, 700) for a power trowel (100, 1200),

the tool holder (130, 700) comprising a center hub (710) and a rotating part arranged to rotate (R2) relative to the center hub (710) about a tool holder axis of rotation (A2), where the center hub (710) is arranged to be attached to a tool set carrier (110) and where the rotating part comprises a cardan arrangement (730, 740) and a tool holder plate (720),

where the cardan arrangement (730, 740) pivotably connects the center hub (710) to the tool holder plate (720) such that the tool holder plate (720) is allowed to pivot relative to the center hub (710) about at least a first cardan pivot axis (C1),

where the center hub (710) is fixed to a bearing (910) which bears on the rotating part to allow the relative rotation (R2) between the center hub (710) and the rotating part about the tool holder axis of rotation (A2),

where the bearing (910) is at least partly enclosed by the rotating part.

30. The tool holder (130, 700) according to claim 29, where the bearing (910) is a sealed bearing.

31. The tool holder (130, 700) according to claim 29 or 30, where a radial inner part of the bearing (910) is fixed to the center hub (710) and a radial outer part of the bearing (910) is fixed to the rotating part of the tool holder.

5 32. The tool holder (130, 700) according to any of claims 29-31, where an upper support member (750) of the cardan arrangement extends in direction of the first cardan pivot axis (C1) between opposite sides of the cardan arrangement and above at least the first cardan pivot axis (C1), where the bearing (910) is at least partly embedded into the upper support member (750).

10 33. The tool holder (130, 700) according to claim 32, where a plane (Pb) orthogonal to the tool holder axis of rotation (A2) and intersecting an axial center of the bearing (910) intersects the upper support member (750) or separates the upper support member (750) from the tool holder plate (720).

15 34. The tool holder (130, 700) according to claim 32 or 33, where an axial center of the balls or the rollers of the bearing (910) lie below an upper surface of the upper support member (750).

35. The tool holder (130, 700) according to any of claims 29-34, where a labyrinth structure (810) configured to prevent dust and slurry from passing is arranged in connection to the bearing (910).

20 36. The tool holder (130, 700) according to any of claims 29-35, where a seal, such as a V-ring seal or a radial axle seal, is journalled about the center hub (710) and arranged inbetween the center hub (710) and the rotating part.

37. The tool holder (130, 700) according to any of claims 29-36, where a lid (920) is arranged to enclose a volume comprising the bearing (910).

25 38. The tool holder (130, 700) according to any of claims 29-37, where the cardan arrangement comprises first and second cardan shafts (760, 770) associated with respective first and second cardan pivot axes (C1, C2), where each cardan shaft is supported at its end points by a rotationally fixed resilient bushing (930).

39. The tool holder (130, 700) according to any of claims 29-38, where the cardan arrangement (730, 740) comprises at least a first cardan shaft (760) divided into two axially aligned parts intersected by a second cardan shaft (770) that runs transversal to the first cardan shaft (760).
- 5 40. The tool holder (130, 700) according to any of claims 29-39, where the tool holder plate (720) comprises cut-out portions (725) arranged to accommodate a part of the cardan arrangement (730).
41. The tool holder (130, 700) according to any of claims 29-40, comprising a biasing element (1010) attached to the center hub (710), where the biasing
10 element (1010) is arranged to exert a force (F) on the tool holder plate (720) transversal to the tool holder plate (720), at a location offset (O) from the tool holder axis of rotation (A2).
42. The tool holder (130, 700) according to any of claims 29-41, where the cardan arrangement comprises first and second cardan shafts (760, 770)
15 associated with respective first and second cardan pivot axes (C1, C2), where at least one of the cardan shafts extends radially across the bearing (910) from one end of the cardan arrangement to the other end of the cardan arrangement.
43. The tool holder (130, 700) according to any of claims 29-42, where a total
20 build height (Bh) of the tool holder, measured along the tool holder axis of rotation (A2) is less than 20 times the build height (Bp) of the tool holder plate (720), and preferably less than 15 times the build height (Bp) of the tool holder plate (720).
44. A power trowel (100) comprising one or more tool holders (130, 700)
25 according to any of claims 29-43.
45. A tool holder (130, 700) for a power trowel (100, 1200),
the tool holder (130, 700) comprising a center hub (710) and a tool holder plate (720),

where the center hub (710) is arranged to be attached to a tool set carrier (110),

where a cardan arrangement (730, 740) pivotably connects the center hub (710) to the tool holder plate (720) such that the tool holder plate (720) is
5 allowed to pivot relative to the center hub (710) about a first cardan pivot axis (C1) and about a second cardan pivot axis (C2),

where the center hub (710) comprises a sealed bearing (910) which bears on the cardan arrangement (730, 740) to allow relative rotation (R2) between the center hub (710) and the tool holder plate (720) about a tool holder axis of
10 rotation (A2).

46. The tool holder (130, 700) according to claim 45, where a labyrinth structure (810) configured to prevent dust and slurry from passing is arranged in connection to the sealed bearing (910).

47. The tool holder (130, 700) according to claim 45 or 46, where a lid (920)
15 is arranged to enclose a volume comprising the sealed bearing.

48. The tool holder (130, 700) according to any of claims 45-47, where the sealed bearing is at least partly enclosed by the tool holder (700).

49. A tool set carrier (110, 1000) for a power trowel (100, 1200),
where the tool set carrier (110, 1000) extends in a tool set carrier plane (Pc)
20 and is arranged to rotate in a drive direction (R1) about a center axis of rotation (A1) in response to a rotation by a drive shaft,

where the tool set carrier (110, 1000) is arranged to rotatably support one or more tool holders (130) at respective radial distances (D1) from the center axis of rotation (A1), where each tool holder (130) is arranged to rotate (R2) about
25 a respective tool holder axis of rotation (A2),

where the tool set carrier (110, 1000) comprises one or more biasing elements (1010) arranged to exert a force (F) on a respective tool holder (130), in a direction transversal to the tool set carrier plane (Pc), at a location offset (O) from the tool holder axis of rotation (A2).

50. The tool set carrier (110, 1000) according to claim 49, where at least one of the biasing elements (1010) comprises a spring-loaded wheel (1020) with a rolling direction arranged perpendicular to a radial direction of the tool holder (130).

5 51. The tool set carrier (110, 1000) according to any of claims 49-50, where at least one of the biasing elements (1010) is attached to an arm of the tool set carrier.

10 52. The tool set carrier (110, 1000) according to any of claims 49-51, where at least one of the biasing elements (1010) is arranged between the center axis of rotation (A1) of the tool set carrier and the tool holder axis of rotation (A2).

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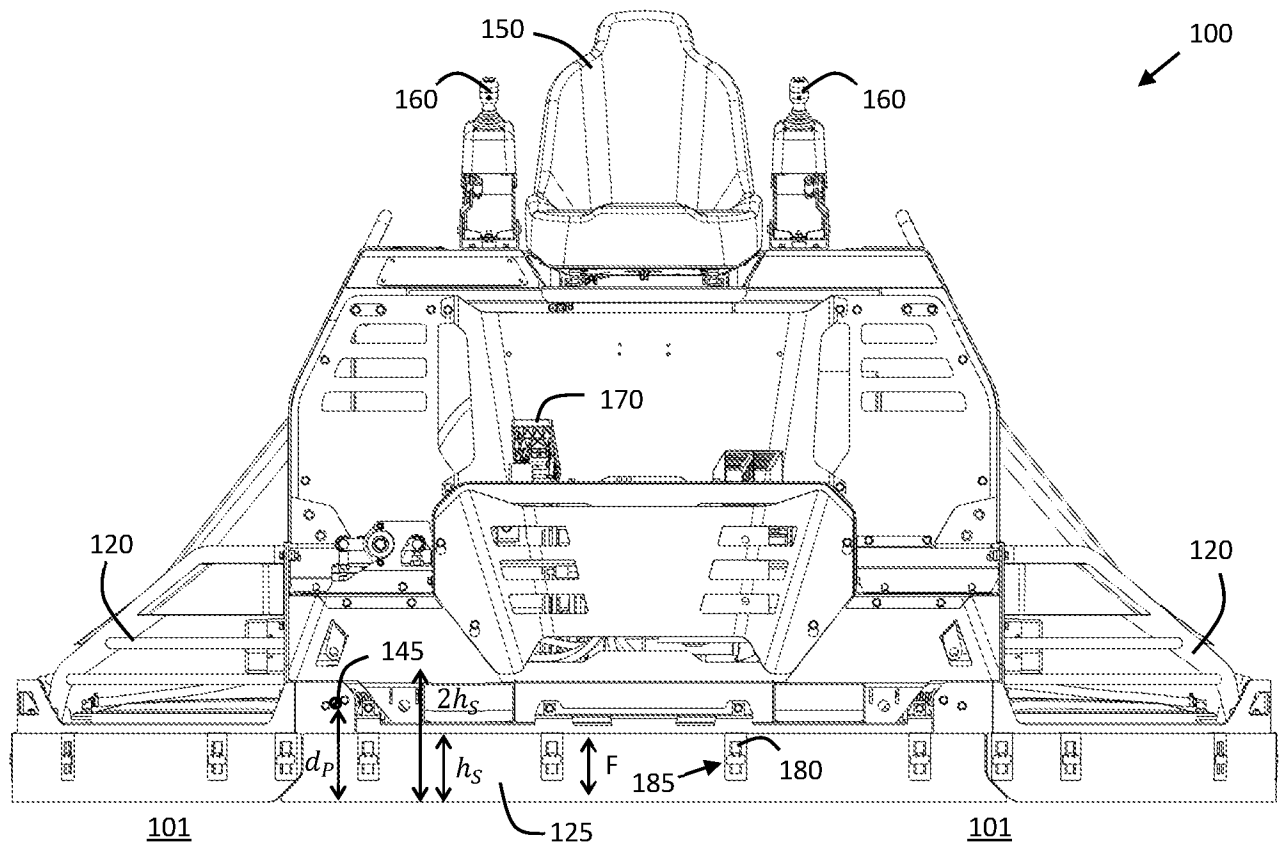


FIG. 1A

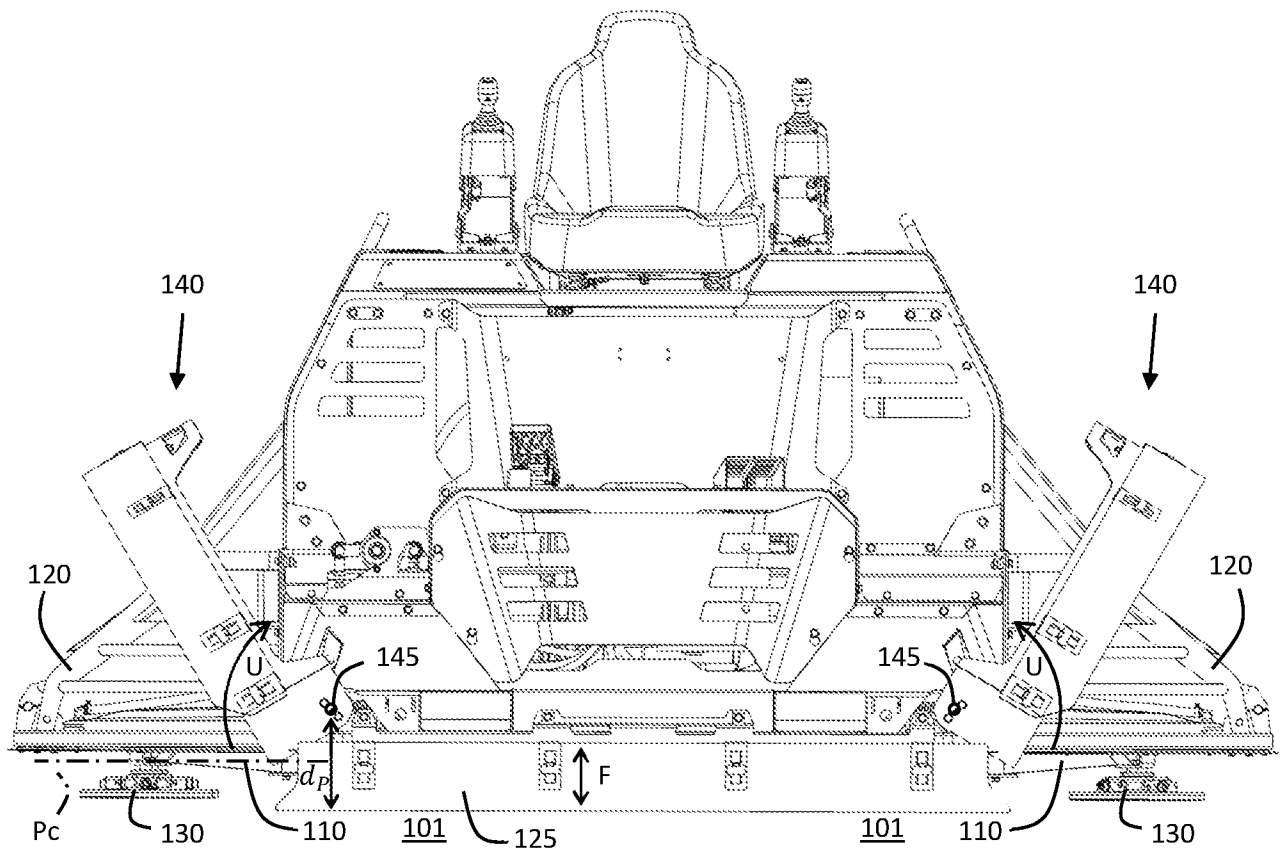


FIG. 1B

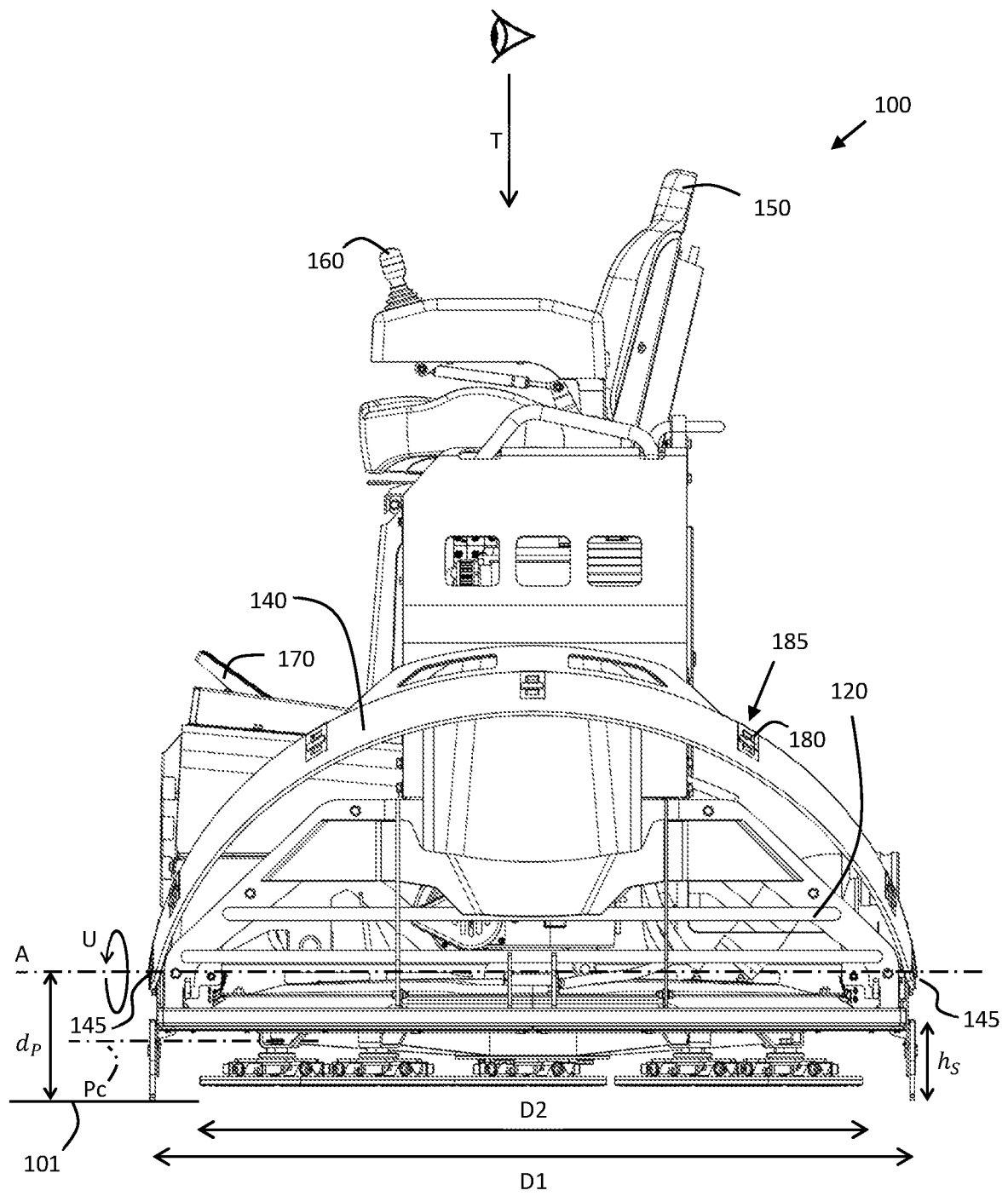


FIG. 1C

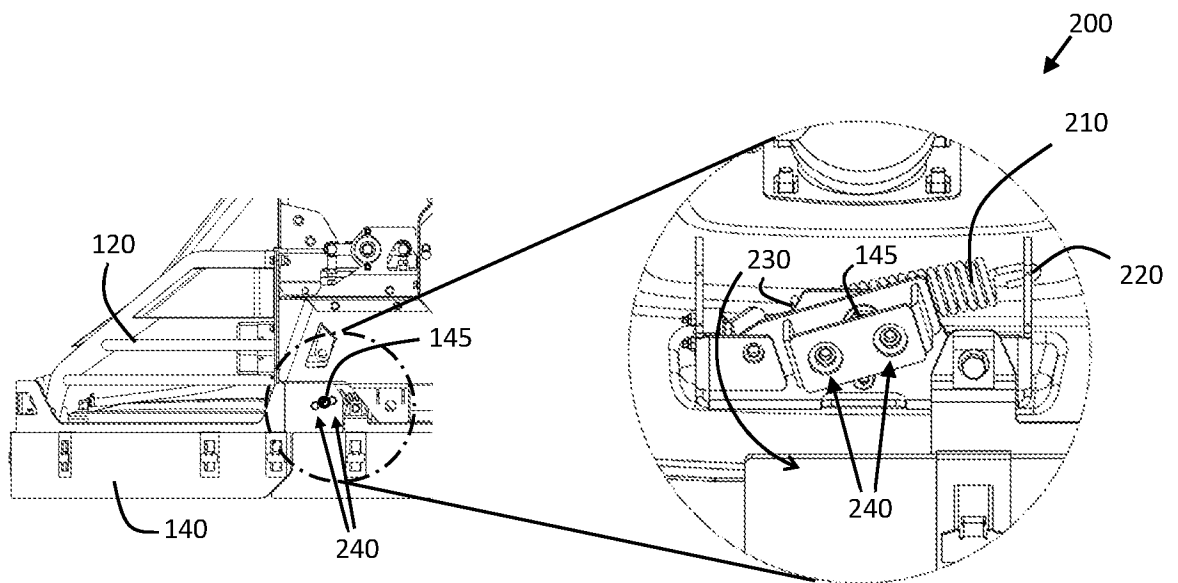


FIG. 2A

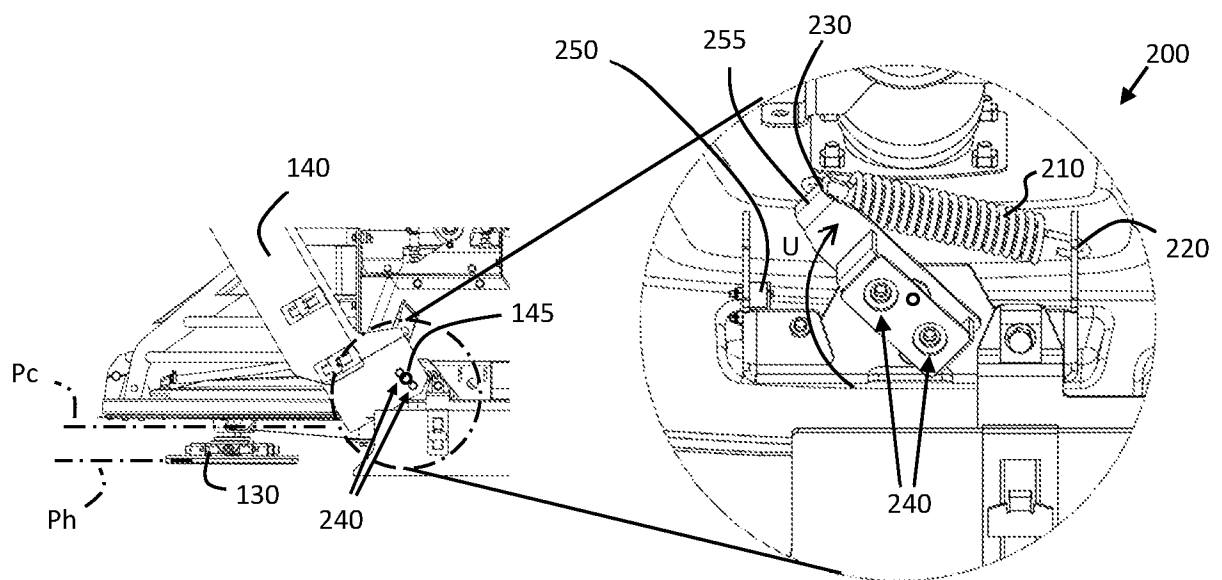


FIG. 2B

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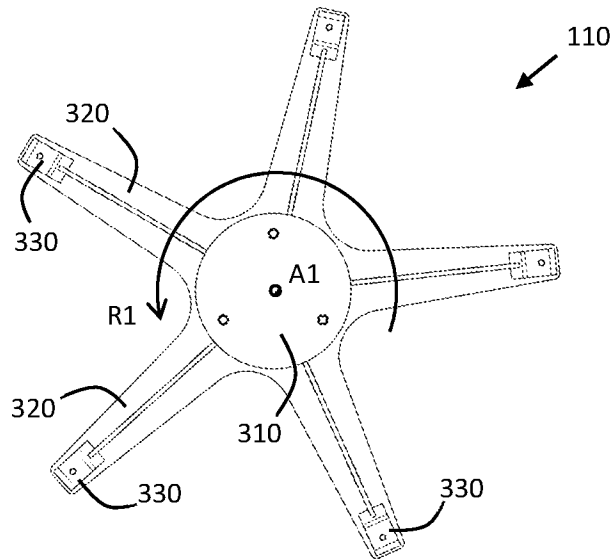


FIG. 3

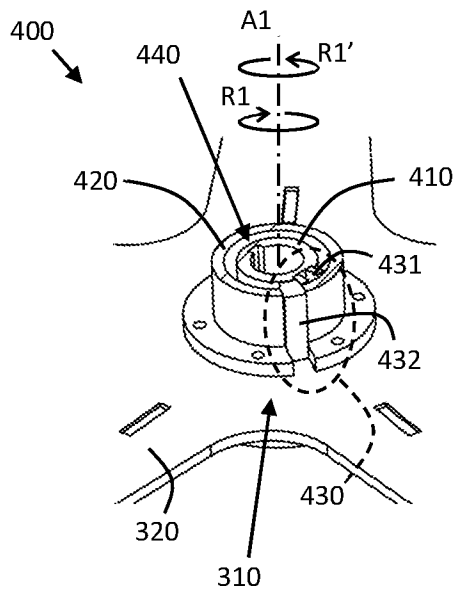


FIG. 4A

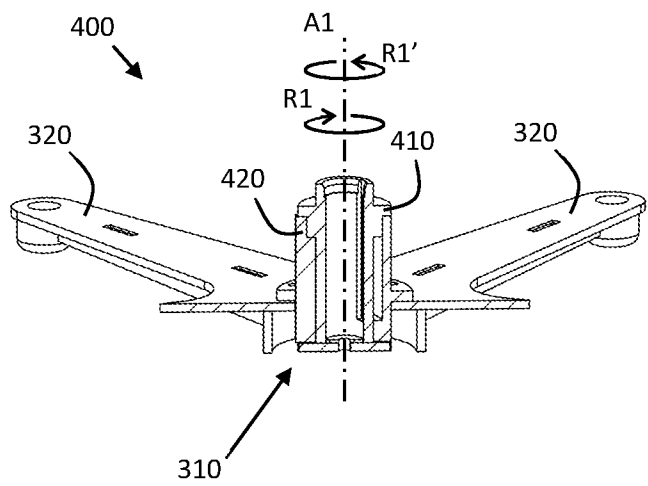


FIG. 4B

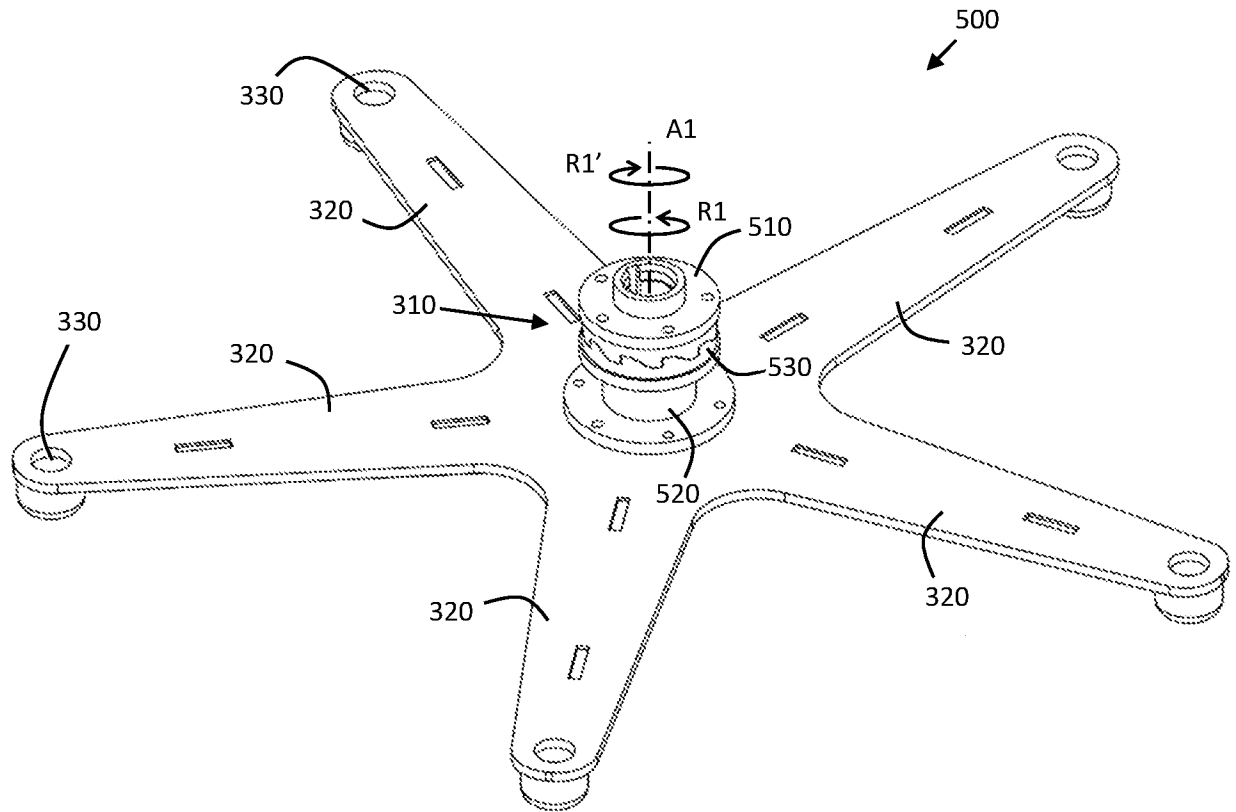


FIG. 5A

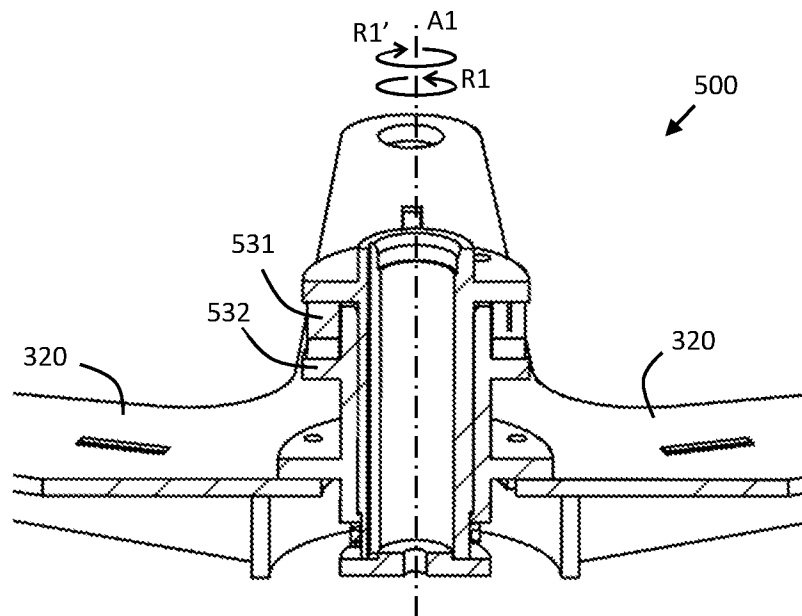


FIG. 5B

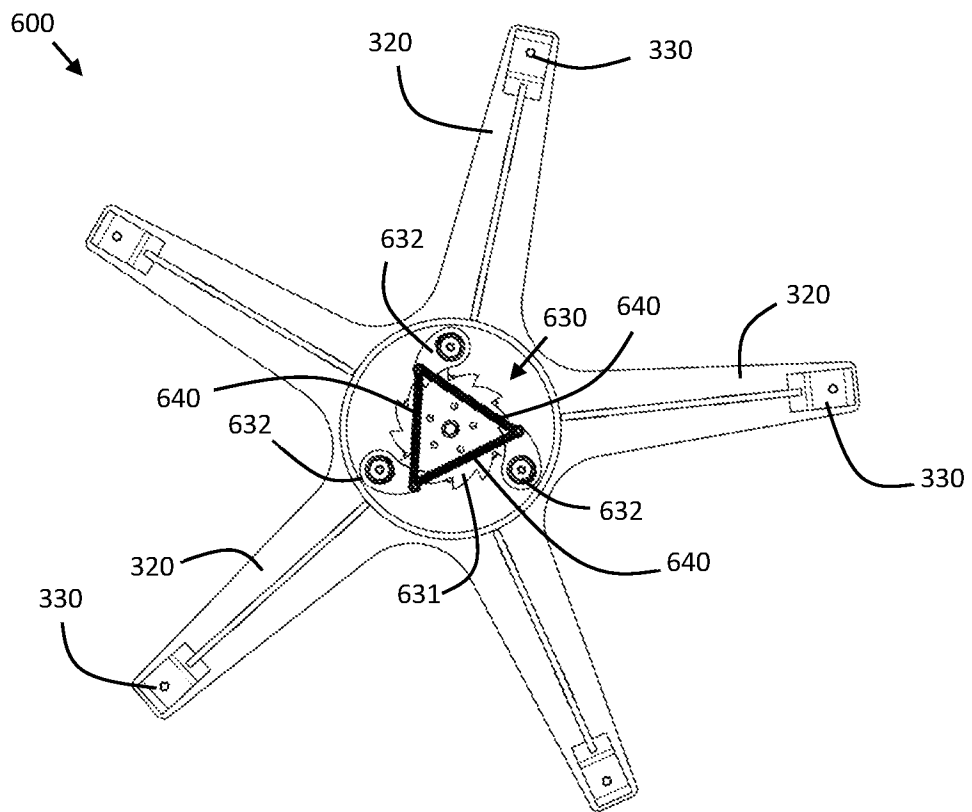


FIG. 6

7/10

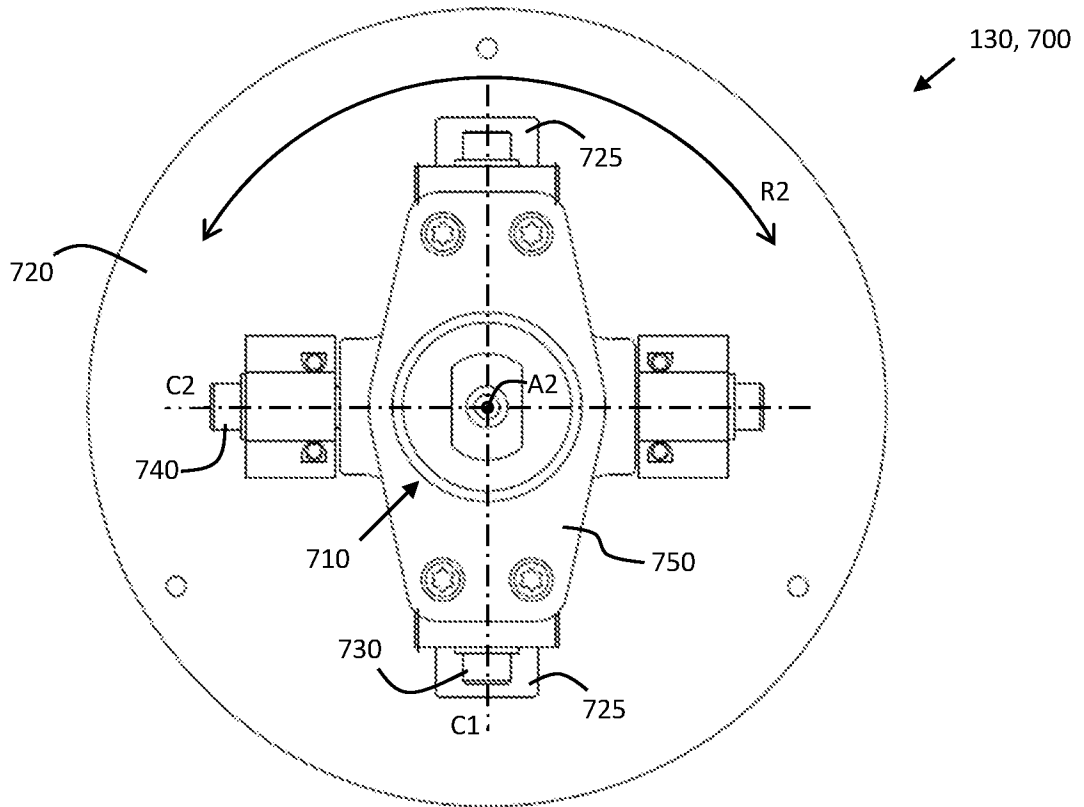


FIG. 7

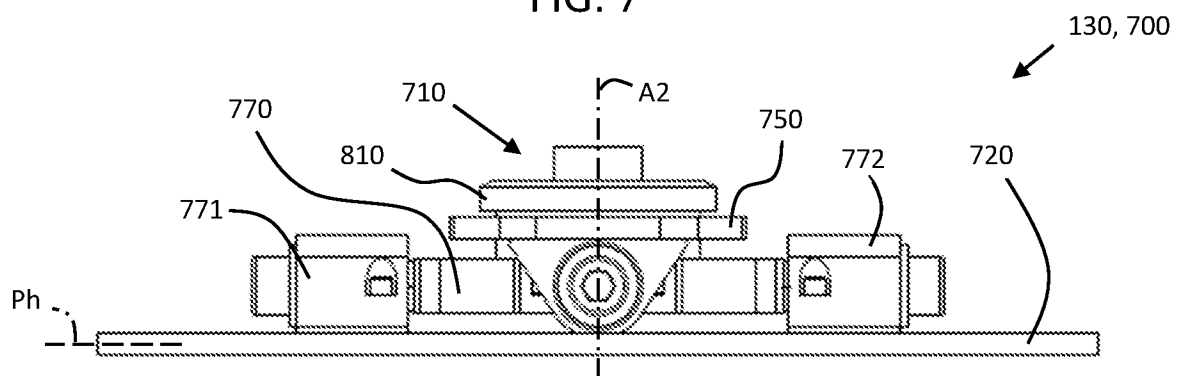


FIG. 8

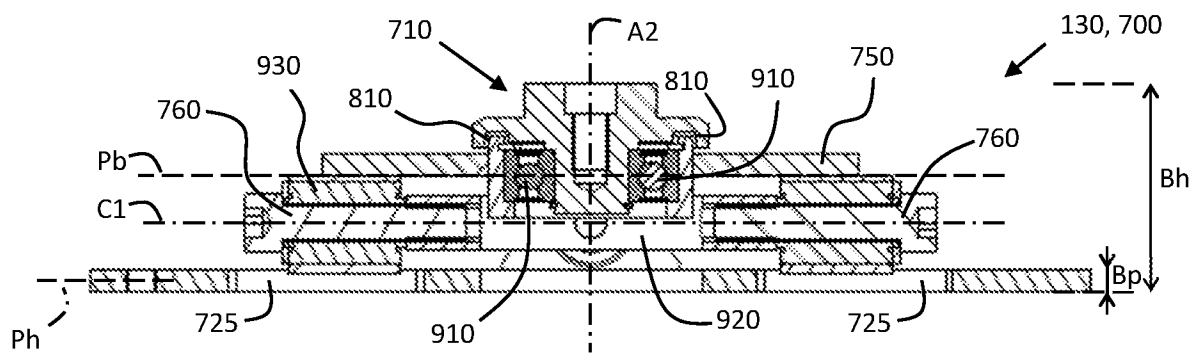


FIG. 9

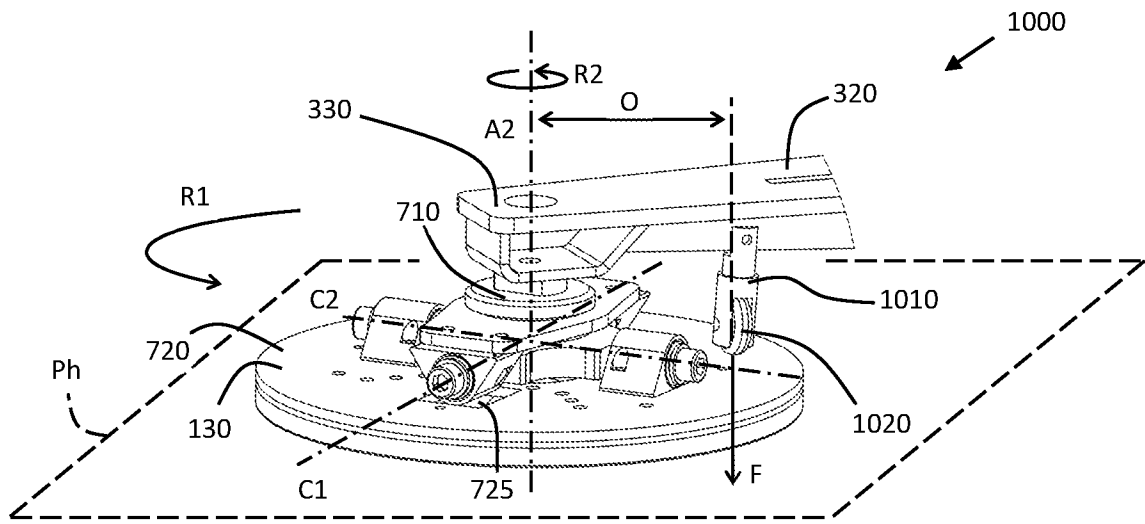


FIG. 10

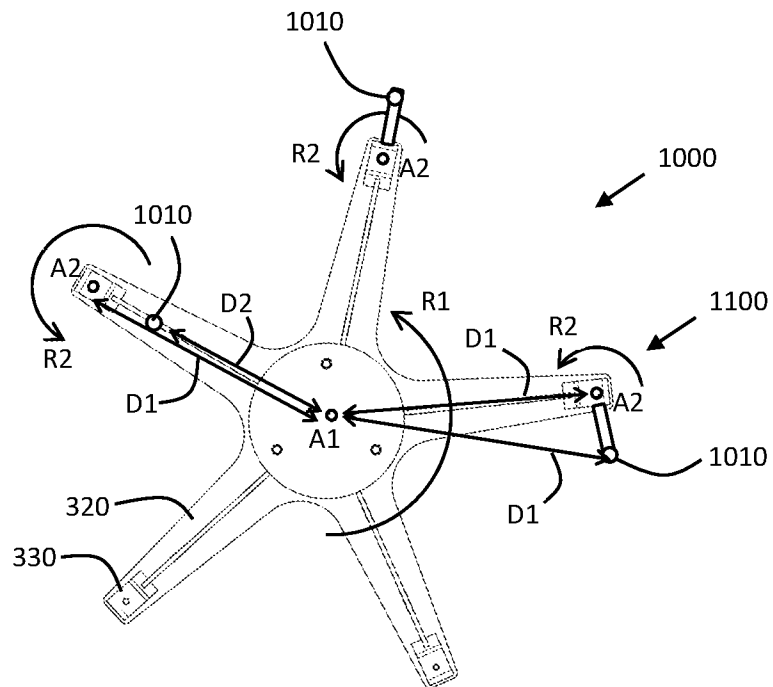


FIG. 11

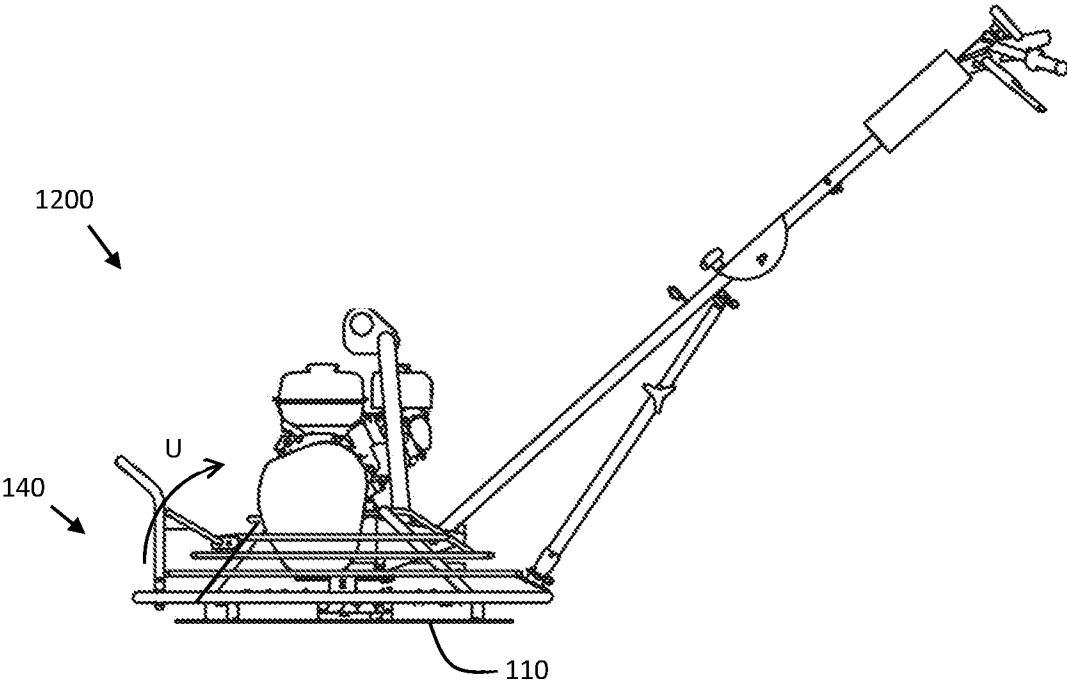


FIG. 12A

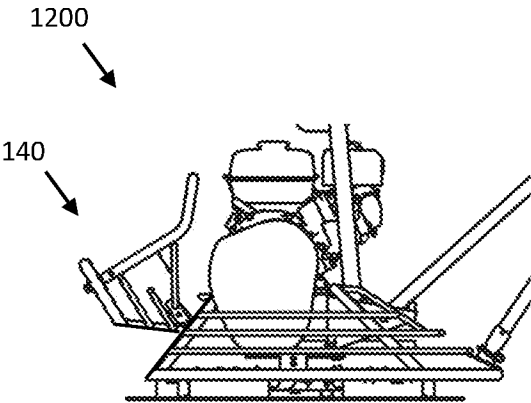


FIG. 12B

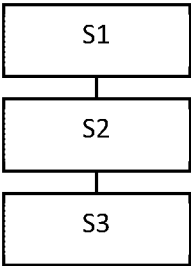


FIG. 13

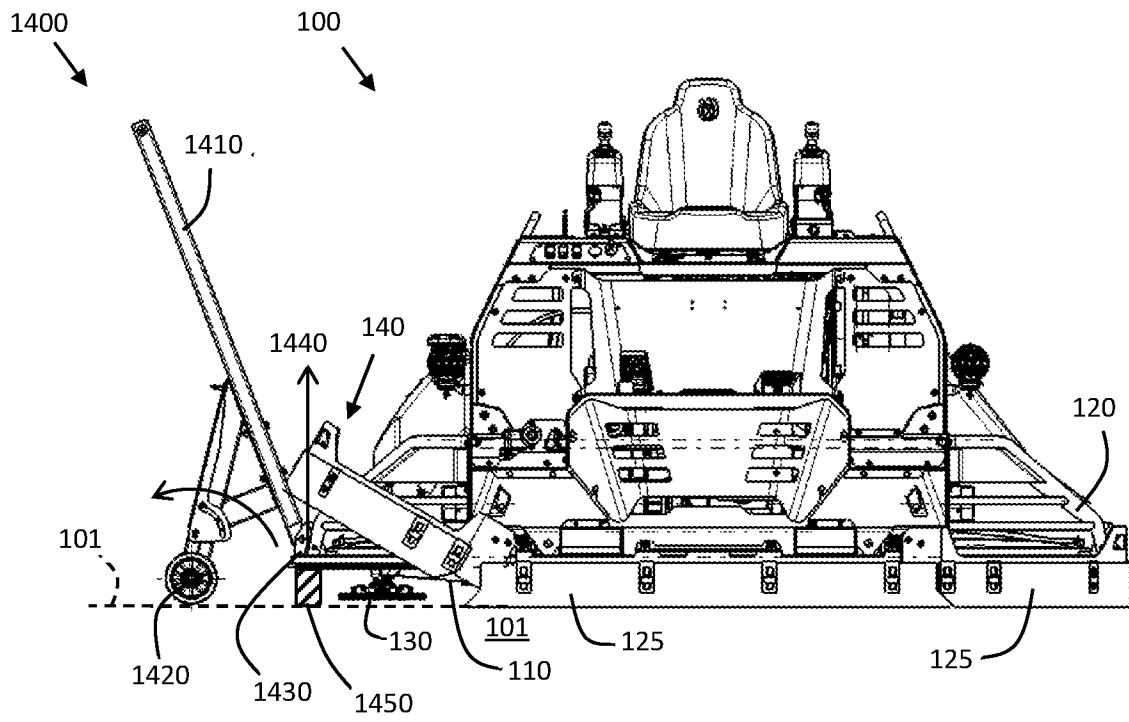


FIG. 14

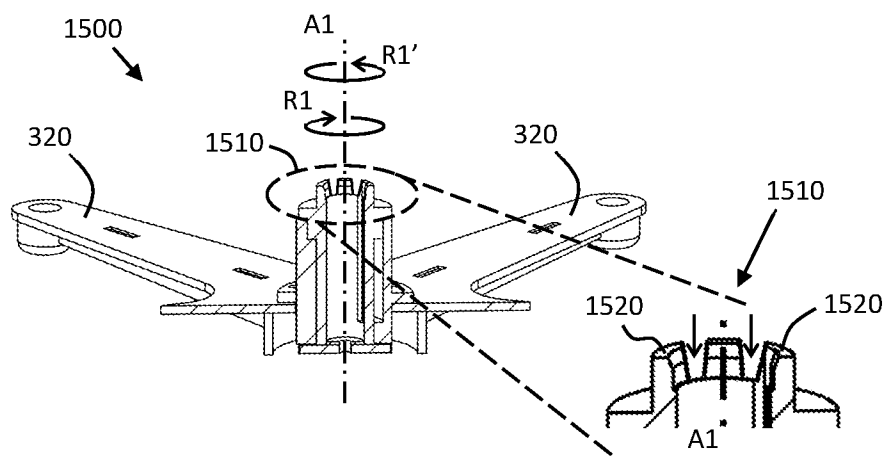


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2024/051121

A. CLASSIFICATION OF SUBJECT MATTER		
IPC: see extra sheet		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC: B23Q, B24B, E04F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE, DK, FI, NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPO-Internal, PAJ, KIME		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5480257 A (ALLEN J DEWAYNE), 2 January 1996 (1996-01-02); abstract; column 1, line 16 - line 20; column 1, line 30 - line 42; column 2, line 23 - line 25; column 5, line 7 - column 7, line 53; all figures --	1-21, 28
A	US 11618121 B2 (KLACKING RYAN), 4 April 2023 (2023-04-04); abstract; column 1, line 14 - line 31; column 1, line 57 - column 2, line 5; column 4, line 14 - line 25; column 8, line 61 - column 9, line 8; figures 1-2,21-22; claims 1,3,8,13,16,20 --	1-21, 28
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
"D" document cited by the applicant in the international application	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"E" earlier application or patent but published on or after the international filing date		
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
04-03-2025	04-03-2025	
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Barbara Silén Telephone No. + 46 8 782 28 00	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2024/051121

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5238323 A (ALLEN J DEWAYNE ET AL), 24 August 1993 (1993-08-24); abstract; column 1, line 14 - line 45; column 2, line 51 - column 3, line 50; column 4, line 35 - line 38; column 5, line 27 - column 6, line 30; column 8, line 12 - line 23; figures 1-3,5 --	1-21, 28
A	CN 112921758 A (JIAXING TAOYUAN MACHINERY TECH CO LTD), 8 June 2021 (2021-06-08); abstract; figure 1; machine translation of the whole document --	1-21, 28
A	US 5988938 A (ALLEN J DEWAYNE), 23 November 1999 (1999-11-23); abstract; column 2, line 23 - line 36; all figures --	1-21, 28
A	US 20130084782 A1 (MCCUTCHEN TRAVIS ET AL), 4 April 2013 (2013-04-04); abstract; all figures --	1-21, 28
A	US 5890833 A (ALLEN J DEWAYNE ET AL), 6 April 1999 (1999-04-06); abstract; all figures --	1-21, 28
A	US 5658089 A (ALLEN J DEWAYNE), 19 August 1997 (1997-08-19); abstract; all figures -- -----	1-21, 28

Continuation of: second sheet

International Patent Classification (IPC)

E04F 21/24 (2006.01)

B23Q 11/08 (2006.01)

B24B 7/18 (2006.01)

B24B 7/22 (2006.01)

B24B 41/02 (2006.01)

B24B 55/04 (2006.01)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2024/051121**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The following separate inventions were identified:

1. Claims 1-28 related to a power trowel comprising at least one access section configure in connection to the protective cover and at least one tool set carrier comprises a center hub. The tool set carrier is arranged to allow manual rotation of the tool set carrier relative to the drive shaft for at least part of a revolution about the center axis of rotation.

.../...

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: **1-21,28**

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Continuation of: Box No. III

2. Claims 29-48 related to a tool holder for a power trowel comprising a center hub, a cardan arrangement and a sealed bearing, as well as a power trowel comprising such a tool holder.

3. Claims 49-52 related to a tool set carrier for a power trowel comprising one or more biasing elements.

1a. Claims 1-21, 28 related to a power trowel comprising a skirt arranged around an edge of the protective cover between the protective cover and the surface.

4. Claims 22-27 related to a tool set carrier, where the center hub comprises a first part arranged to be rotationally fixed to the drive shaft, and a second part connected to the tool holders, where the second part bears on the first part to allow relative rotation there inbetween about the center axis of rotation, where the first part and the second part together implement a rotation limiting mechanism that prevents relative rotation between the first part and the second part beyond an angular range and/or rotation by the tool set carrier relative to the drive shaft in a direction opposite to the drive direction.

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

A power trowel (100, 1200) comprising one or more rotatable tool set carriers (110) arranged to support respective sets of tool holders (130) for processing a surface (101), the power trowel (100, 1200) comprising a protective cover (120) configured to at least partly enclose the one or more rotatable tool set carriers (110), where at least one access section (140) configured in connection to the protective cover (120) is arranged to be moved between a first position where the tool set carriers (110) are covered to a second position where the tool set carriers (110) are uncovered to allow access to at least one of the tool holders (130) from outside of the protective cover (120), where at least one of the tool set carriers (110) comprises a center hub (310) arranged to be attached to a drive shaft, wherein the tool set carrier (110) is arranged to rotate in a drive direction (R1) about a center axis of rotation (A1) in response to a rotation by the drive shaft, where the tool set carrier (110) is arranged to allow manual rotation of the tool set carrier (110), relative to the drive shaft, for at least part of a revolution about the center axis of rotation (A1). The invention further comprises a tool set carrier for a power trowel and a method for inspecting, servicing, replacing and/or exchanging tools on a power trowel.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2024/051121

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