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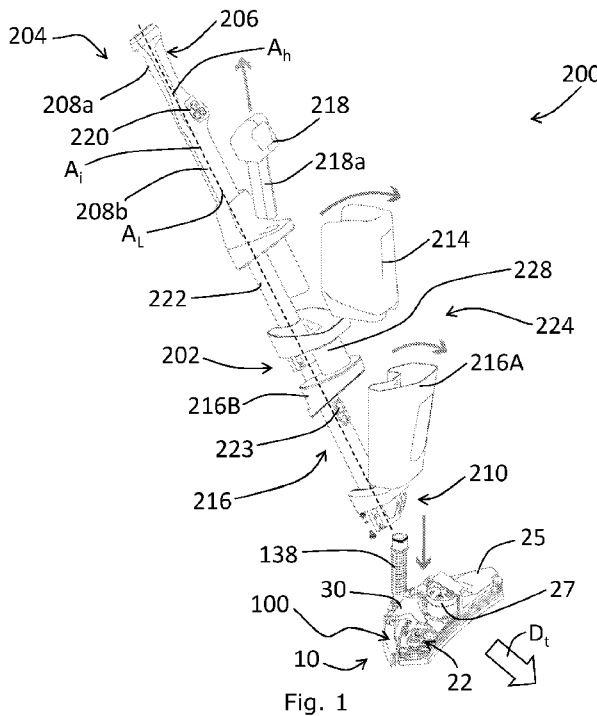
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(54) Title: SURFACE TREATMENT TOOL



(57) Abstract: A surface treatment tool (200) comprising an elongate body (202). The elongate body (202) comprises a first end (204) having a handle (206) with a first handgrip portion (208a) and a second end (210) distal the first end (204) configured to be coupled a surface treatment head (10). The surface treatment tool (200) also comprises a fluid outlet (212) configured to apply fluid to a surface S to be treated, and a surface treatment head (10) configured to engage a surface S to be treated and comprising a suction region (106) configured to suck fluid from a surface S to be treated. The elongate body (202) comprises: a fluid tank (214) in fluid (10) communication with the fluid outlet (212); a waste tank (216A) in fluid communication with the suction region (106) and configured to collect fluid removed from a surface S to be treated via the suction region (106); and a power source (218) configured to supply power to the surface treatment tool (200).



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Surface Treatment Tool

FIELD

The present disclosure relates to a surface treatment tool for treating a surface, for example, the surface treatment tool may comprise a scrubber dryer machine.

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BACKGROUND

Known surface treatment tools, such as scrubber dryer machines, are typically in the form of a walk behind machine or a ride on machine. Such machines are suitable for cleaning large open areas, for example in an airport or other large space. However, such machines are not well suited to treating smaller, difficult to access areas, such as stairs, floor edges adjacent walls, washrooms, or surfaces beneath furniture or around other obstacles. Therefore a user must use additional equipment, for example a mop or other machine, to clean these areas. This increases the time required to complete the required cleaning and the associated cost.

Further, known surface treatment tools are typically large and heavy, which makes them bulky to operate and difficult to transport from one area to be treated to another.

The present disclosure seeks to overcome, or at least mitigate, one or more problems of the prior art.

SUMMARY

According to a first aspect of the disclosure, a surface treatment tool is provided, the surface treatment tool comprising: an elongate body comprising a first end having a handle with a handgrip portion and a second end distal the first end configured to be coupled a surface treatment head; a fluid outlet configured to apply fluid to a surface to be treated; and a surface treatment head configured to engage a surface to be treated and comprising a suction region configured to suck fluid from a surface to be treated. Optionally wherein the elongate body comprises: a fluid tank in fluid communication with the fluid outlet; a waste tank in fluid communication with the suction region and configured to collect fluid removed from a surface to be treated via the suction region; and/or a power source configured to supply power to the surface treatment tool.

Optionally, the elongate body comprises a suction source for sucking fluid and/or debris from the suction region to the waste tank.

In this way, a surface treatment tool is provided which is configured both to apply a fluid to a surface to be treated and also to remove waste fluid from the surface. The fluid tank, waste tank and power source required to achieve this function are provided on the

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surface treatment tool itself, therefore, no additional equipment is required in order to provide these components. Accordingly, a more compact, easy to use surface treatment tool is provided.

5 For example, since the elongate body of the surface treatment tool comprises a power source, e.g. a battery, no power cable or separate power supply is required. Accordingly, this increases the range of surfaces that can be treated. Similarly, since the elongate body of the surface treatment tool comprises a waste fluid tank and a fluid tank, no separate component comprising a waste fluid tank and/or a separate fluid supply is needed.

10 Furthermore, in the surface treatment tool disclosed herein, each of the fluid tank, waste tank and power source components are provided by the elongate body. In this way, the number of components located on the surface treatment head is kept to a minimum. Accordingly, a surface treatment head which is more compact, has a reduced height dimension, has a reduced length dimension and/or has a reduced width dimension can be
15 used. This facilitates use of the surface treatment tool in small, hard to reach areas, and areas around furniture or other obstacles.

Since the surface treatment tool disclosed herein comprises an elongate body, it will be appreciated that it can be operated when a user is standing. This facilitates use of the machine, without putting unnecessary strain on the user (e.g. the user does not need
20 to bend to use the surface treatment tool on a given surface).

Since the suction source is provided on the surface treatment tool itself, no additional equipment is required in order to provide this component. Accordingly, a more compact, easy to use surface treatment tool is provided.

25 Furthermore, since the suction source is provided by the elongate body, the number of components located on the surface treatment head is kept to a minimum. Accordingly, a surface treatment head which is more compact, has a reduced height dimension, has a reduced length dimension and/or has a reduced width dimension can be used. This facilitates use of the surface treatment tool in small, hard to reach areas, and areas around furniture or other obstacles.

30 In exemplary embodiments, the surface treatment tool is a scrubber dryer, which is configured to apply cleaning fluid to a surface to be treated, and to remove waste fluid from the surface. In such embodiments, the fluid tank is a cleaning fluid tank and the fluid outlet is a cleaning fluid outlet.

35 Optionally, the elongate body comprises a spine defining a longitudinal axis extending between the first end and the second end of the elongate body.

Optionally, the fluid tank and/or the waste tank and/or the power source is coupled to the spine.

Optionally, the fluid tank and/or the waste tank and/or the power source is removably coupled to the spine.

5 In this way, the fluid tank and/or the waste tank may be removed and easily replenished or emptied as needed. The power source may be removed for recharging as required. In some embodiments, the power source is not removable.

10 Furthermore, the fluid tank and/or the waste tank and/or the power source may be removed and replaced with an alternative. For example in the case of damage, in the case where a fluid tank and/or waste tank and/or power source with different features or attributes is required, to replace a depleted fluid tank with a full fluid tank, to replace a full waste tank with an empty waste tank, and/or to replace a depleted power source with a fully charged power source.

This facilitates ease of use and flexibility of use of the surface treatment tool.

15 Optionally, the fluid tank is shaped to wrap around at least a portion of the spine, and/or wherein the waste tank is shaped to wrap around at least a portion of the spine.

In this way, the weight of the fluid tank and/or the waste tank is located closer to the longitudinal axis of the spine. This provides a more compact surface treatment tool and facilitates manoeuvrability

20 Optionally, the power source is located proximal the spine; optionally wherein the fluid tank is shaped to wrap around at least a portion of the power source and/or wherein the waste tank is shaped to wrap around at least a portion of the power source.

25 In this way, the weight of the power source is located closer to the longitudinal axis of the spine. This provides a more compact surface treatment tool and facilitates manoeuvrability.

The fluid tank and/or waste tank may also act to protect the power source from damage.

30 Optionally, at least two of the fluid tank, the waste tank and the power source are coupled to the spine such that the bulk of said two components is located at a first side of the spine, optionally wherein the first side corresponds to a treatment direction when the surface treatment tool is in normal use.

In other words, a centre of mass of the respective component is located at a first side of the spine. In such embodiments, the centre of mass of the fluid tank and/or the waste tank is located at a first side of the spine in all fill conditions, in other words,

irrespective of a fill level of the respective tank. This facilitates manoeuvrability of the surface treatment tool.

Placing the bulk of two or more of the fluid tank, the waste tank and the power source at a first side of the spine corresponding to a treatment direction has been found to facilitate better control of the surface treatment tool. In particular, facilitating turning the direction of treatment in use. For example, when the elongate body is in use and inclined at an angle to a surface being treated such that the two or more components face away from the surface, rotating the elongate body about the longitudinal axis in order to change the direction of the surface treatment tool is facilitated by this weight distribution

Optionally, the handgrip portion is an elongate handle comprising a longitudinal axis which is substantially parallel to the longitudinal body of the elongate body, optionally wherein the longitudinal axis of the elongate handle is coaxial with the longitudinal axis of the elongate body.

This facilitates the manoeuvrability of the surface treatment tool. For example, when the elongate body is positioned such that the longitudinal axis extends substantially upright with respect to the surface to be treated, the surface treatment tool can be used in a similar manner to a standard mop, thereby facilitating ease of use of the surface treatment tool.

Optionally, the spine comprises an interior profile configured to carry: a fluid supply path arranged to couple the fluid outlet with the fluid tank, and/or a waste removal path arranged to couple the suction region to the waste tank, and/or a power supply line arranged to carry power from the power source to the surface treatment head.

By providing the fluid supply path and/or the waste removal path and/or the power supply line in an interior profile of the spine, the respective path/line is protected from damage and kept out of the way so as not to interfere with use of the surface treatment tool. This provides a neater tool arrangement which is both aesthetically pleasing, easier to use and less susceptible to damage.

In some embodiments, the spine and/or the handle comprises an interior profile configured to receive the power source, such that the power source may be located at least partially within the spine and/or handle. In some embodiments, the power source may be removably located at least partially within the spine and/or handle.

In some embodiments, the power source comprises an elongate portion. In some embodiments, the elongate portion of the power source is parallel to or coaxial with the longitudinal axis of the spine and/or the longitudinal axis of the handle. In some embodiments, the elongate portion of the power source is coaxial with the longitudinal

axis of the spine and/or the longitudinal axis of the handle when the power source is located, at least partially, within the spine.

Optionally, the spine comprises an interior profile defining a volume forming to at least part of the fluid supply path, and/or wherein the spine comprises a profile defining a volume forming to at least part of the waste removal path.

In this way a compact structure is provided in which the fluid supply path and/or the waste removal path is protected.

This arrangement also reduces the number of parts required to manufacture the surface treatment tool, making more efficient use of the spine of the elongate body, hence reducing manufacturing costs and materials used.

In some embodiments, the suction source comprises a suction unit.

In some embodiments the suction unit comprises a motor, optionally, a digital motor.

In some embodiments, the surface treatment tool comprises a waste tank module comprising the waste tank. In some embodiments, the waste tank module also comprises a waste tank receiving structure configured to couple the waste tank to the spine of the elongate body.

The waste tank module may define a volume. In some embodiments, the suction source is coupled directly to the waste tank module such that it is in fluid communication with the volume defined by the waste tank module. For example, the suction source maybe coupled to the waste tank module such that a seal is formed between the suction source and the waste tank module. In some embodiments, the suction source comprises a seal.

In some embodiments, the suction source is coupled to the waste tank module via a hose.

Optionally, the elongate body is coupled to the surface treatment head via coupling, wherein the coupling comprises a joint arrangement comprising a first axis and a second axis perpendicular to the first rotational axis; optionally, wherein the first rotational axis intersects the second rotational axis.

Such a joint arrangement allows the elongate body to move in a plurality directions with respect to the surface treatment head, and to transmit torque, about a third axis perpendicular to the first and second axes, from the elongate body to the surface treatment head. This allows the surface treatment head to be easily manoeuvred by a user via movement or rotation of the elongate body.

Optionally, the elongate body is coupled to the surface treatment head via a coupling, wherein the coupling is a resilient coupling such as a spring or rubber cylinder.

Such a coupling allows the elongate body to move in all directions with respect to the surface treatment head. This allows the surface treatment head to be easily manoeuvred by a user via pivoting movement or rotation of the elongate body.

Optionally, the coupling is offset from the longitudinal axis of the elongate body.

In other words the elongate body is coupled to the surface treatment head via a bent or angled portion which is out of alignment with the elongate body. In this way, manoeuvrability of the surface treatment tool is enhanced.

Optionally, the surface treatment head comprises rear edge with respect to a treatment direction of the surface treatment tool, wherein the rear edge comprises a first end, a second end and a middle portion located between the first and second ends, wherein the middle portion of the rear edge projects rearward of first and second ends with respect to a treatment direction of the cleaner head.

Having a middle portion of the rear edge project rearwards of the first and second ends of the rear edge with respect to the treatment direction increases the area of the movable surface treatment element whilst maintaining a desired geometry at the sides/front edge of the surface treatment head. This increase in area of the movable surface treatment element results in a greater treatment area when it engages a surface, which leads to more efficient treatment (e.g. cleaning) of the surface.

For example, in the case where the surface treatment head forms part of a scrubber dryer and comprises a suction region for removing waste water which is typically curved/angled rearwards, having the middle portion of the rear edge project rearwards of the first and second ends of the rear edge ensures that the movable surface treatment element is shaped to fill, at least partially, a void created by a curved/angled front edge of the suction region, which reduces wasted space on the surface treatment head.

Optionally, the suction region comprises a first end, a second end and a middle portion located between the first and second ends, wherein the first and second ends of the suction region project forward of the middle portion of the suction region in the treatment direction of the surface treatment head.

In some embodiments, the surface treatment head comprises first and second ends which project forward of the middle portion in a treatment direction means that dirt and/or waste fluid is directed towards the middle portion as the surface treatment head is moved, facilitating collection of dirt and/or waste fluid.

Directing waste fluid towards the middle portion may facilitate uptake of waste fluid by the suction region and provide an improved drying performance.

This shape of surface treatment head also facilitates treatment of hard-to-reach areas and partial surrounding of objects such as table legs or other obstacles, thereby providing effecting treatment of an entire floor area.

5 Furthermore, in combination with the joint arrangement comprising a first axis and a second axis perpendicular to the first rotational axis, this shape of surface treatment head results in an easy to use and effective surface treatment tool.

Optionally, the surface treatment head comprises at least a portion comprising a curved shaped profile in plan view; and/or wherein the surface treatment head comprises at least a portion comprising a substantially V-shaped profile in plan view.

10 Such a profile shape has been found to provide good treatment performance, good manoeuvrability of the surface treatment head, and relatively compact head size for treating confined areas and compact storage.

Optionally, the surface treatment head comprises a front edge with respect to the treatment direction and a rear edge with respect to the treatment direction, and wherein 15 at least one of the front edge and the rear edge are at least partially curved or V-shaped.

In some embodiments, the surface treatment head comprises any suitably shaped profile when viewed in plan view. For example, circular, rectangular, triangular, trapezoidal or any profile comprising a plurality of vertices in plan view.

In some embodiments the surface treatment head comprises an elongate profile.

20 In some embodiments, a front edge of the surface treatment head comprises a straight edge.

Optionally, the surface treatment head comprises the fluid outlet configured to apply fluid from the fluid tank to a surface to be treated.

25 In this way fluid (e.g. cleaning fluid or detergent) can be directly applied to where it is needed, thereby facilitating treatment of the surface.

Optionally, the surface treatment head comprises a moveable surface treatment element configured to engage a surface to be treated and a driving means comprising a motor configured to drive the movable surface treatment element.

In some embodiments the motor of the driving means is a digital motor.

30 Having a movable surface treatment element facilitates improved treatment of a surface (e.g. via agitating dirt/debris which makes it easier to remove from the surface).

In some embodiments, the fluid outlet is configured to apply fluid to a region of the surface to be treated forward of the moveable surface treatment element with respect to a treatment direction. This ensures that the fluid is applied to an area of the surface which

is likely to be acted on by the moveable surface treatment element, so that the moveable surface treatment element will pass over a surface after fluid has been introduced. This increases the treatment performance of the surface treatment tool and ease of use.

5 Optionally, the driving means comprises an eccentric drive mechanism, wherein the motor is coupled to the moveable surface treatment element via the eccentric drive mechanism so that the moveable surface treatment element engages a surface to be treated in a cyclical motion such that a portion of the moveable surface treatment element faces in the same direction throughout the cyclical motion.

10 For example, such that a front edge of the moveable surface treatment element faces forwards with respect to the treatment direction throughout the cyclical motion.

Typically, moveable surface treatment elements of cleaning tools are configured to engage a surface to be treated in a rotating motion, which results in a circular treatment area. Such cleaning tools are therefore unable to clean in corners of floors/other surfaces or other hard to reach areas such as regions around table/chair legs to be treated.

15 Having a driving means configured to drive the movable surface treatment element in a cyclical motion (e.g. a repeating or back-and-forth motion) allows the moveable surface treatment element to define treatment areas of other shapes, which can enable easier cleaning of corners. This also allows the surface treatment head and moveable surface treatment element to be shaped for maximum manoeuvrability and to be
20 appropriately sized for optimal cleaning and storage purposes.

In some embodiments, the eccentric drive mechanism is configured to drive the moveable surface treatment element so that each point on the moveable surface treatment element moves along a circular path, wherein the circular paths each have a unique centre point but a common radius dimension.

25 Optionally, the suction region is provided proximal the movable surface treatment element; optionally, wherein the suction region is provided to a rear of the movable surface treatment element with respect to a treatment direction of the surface treatment tool.

30 Providing the suction region proximal the movable surface treatment element has been found to facilitate improved uptake of waste through the suction region, since dirt/debris or fluid agitated by the movable surface treatment element is in close proximity to the suction region and is thus easily removed from said surface.

Optionally, the suction region is defined by one or more resilient guide members; optionally, wherein the profile of the or each resilient guide member(s) is complementary to the profile of the or a movable surface treatment element.

Optionally, the resilient guide members comprise a first resilient guide member provided proximal the or a movable surface treatment element, optionally wherein the first resilient guide member is shaped to form openings when in use to permit fluid to enter said suction region when the surface treatment tool is moved in a treatment direction.

Such a suction region has been found to be particularly effective for uptake of fluid from a surface to be treated.

Optionally, the suction region is defined, at least in part, by first and second resilient guide members.

According to a further aspect of the disclosure, a surface treatment tool is provided, the surface treatment tool comprising: an elongate body comprising a first end having a handle with a handgrip portion and a second end distal the first end configured to be coupled a surface treatment head; a fluid outlet configured to apply fluid to a surface to be treated; and a surface treatment head comprising a chassis configured to be coupled to a treatment portion arranged to engage a surface to be treated when in use, the surface treatment head comprising a suction region configured to suck fluid from a surface to be treated. Optionally wherein the elongate body comprises: a fluid tank in fluid communication with the fluid outlet; a waste tank in fluid communication with the suction region and configured to collect fluid removed from a surface to be treated via the suction region; and/or a power source configured to supply power to the surface treatment tool.

According to a further aspect of the disclosure, a surface treatment tool is provided comprising: an elongate body comprising a first end having a handle with a first handgrip portion and a second end distal the first end configured to be coupled a surface treatment head; and a surface treatment head comprising a chassis configured to be coupled to a treatment portion arranged to engage a surface to be treated when in use; wherein the elongate body comprises a second handgrip portion spaced apart from the first handgrip portion.

By providing spaced apart handgrip portions in this way, the user can use two hands to control and manoeuvre the surface treatment tool. For example the user can control the surface treatment tool such that the treatment head is moved side-to-side as the user walks forwards or backwards. In some embodiments, surface treatment head is manoeuvred such that a front edge of the treatment head always faces a forward direction with respect to a direction of motion of the treatment head, i.e. such that the direction of motion is along the treatment direction. In this way, the user can use a traditional mopping motion, e.g. whilst walking backwards to avoid walking on the treated surface.

Optionally, the surface treatment head comprising a suction region configured to suck fluid from a surface to be treated. Optionally the surface treatment tool comprises a fluid outlet configured to apply fluid to a surface to be treated.

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Optionally, the handle comprises both the first and second handgrip portions. Optionally the handle comprises a first handle comprising the first handgrip portion, and the elongate body comprises a second handle comprising the second handgrip portion.

10 Optionally, the first and second handgrip portions are spaced apart by 70cm or less, for example between 10 and 50cm, for example between 20 and 30 cm, e.g. 25cm.

Optionally, the elongate body is shaped such that at least a portion of the elongate body comprises a curved profile. In some embodiments, the first and/or second handle is located at the curved profile. In this way, use of the surface treatment tool by simply pushing the
15 tool in a forward direction with respect to a user (i.e. a user walking behind the tool in use) can be facilitated.

Optionally, the first handgrip portion and the second handgrip portion are substantially
20 parallel to each other, e.g. co-axial.

In some embodiments, the first handgrip portion and the second handgrip portion are angled in relation to each other, e.g. at an acute angle to each other, e.g. at an angle of 45° or less to each other. In this way, use of the surface treatment tool by simply pushing
25 the tool in a forward direction with respect to a user (i.e. a user walking behind the tool in use) can be facilitated.

According to a further aspect of the disclosure a surface treatment head for a surface treatment tool is provided, the surface treatment head comprising: a first
30 treatment component having a first surface treatment element configured to engage a surface to be treated; a second treatment component having a second surface treatment element configured to engage said surface to be treated; and a bracket arrangement configured to couple the first and second treatment components together; and wherein the bracket arrangement is configured such that when a load is applied to the bracket
35 arrangement, the load is distributed between the first and second treatment components and applied to said surface to be treated.

It will be understood that a load applied to the first and second treatment components will improve contact between each of the first and second treatment elements

and the surface to be treated, which facilitates effective treatment of the surface by the surface treatment elements.

Therefore, the bracket arrangement being configured to distribute a load applied thereto between the first and second treatment components facilitates effective treatment
5 by the first and second surface treatment elements. By distributing the load in this way, the first and second surface treatment elements do not become overloaded, and so performance of the first and second surface treatment elements is optimised, without the need for additional support structures on the surface treatment head (e.g. wheels).

Optionally, the first treatment component comprises a body and the first treatment
10 element is a movable surface treatment element configured for movement with respect to the body, optionally wherein the first treatment component comprises a driving means configured to drive the movable surface treatment element to effect treatment of said surface to be treated.

Such a movable surface treatment element facilitates effective treatment (e.g.
15 cleaning) of the surface, since it increases the amount of movement relative to the surface (e.g. over that provided by movement of the surface treatment head alone). For example, the movable surface treatment element may be a rotatable pad, brush, and/or sponge. In some embodiments, the surface treatment element is a pad, brush, and/or sponge which is driven by an eccentric drive mechanism so that it engages a surface to be treated in a
20 cyclical motion, optionally wherein the surface treatment element comprises a portion (e.g. a front portion, a surface or an edge) which faces in substantially the same direction (e.g. forwards with respect to a treatment direction) throughout the entire cyclical motion.

It will be understood that a load applied to the first treatment component will facilitate effective treatment (e.g. cleaning) by the movable surface treatment element,
25 since the load will cause an increase in frictional forces between the movable surface treatment element and the surface to be treated as the movable surface treatment element is driven by the driving means.

Optionally, the second treatment element comprises a suction region configured to suck fluid from said surface to be treated; optionally, wherein the suction region is defined
30 by one or more resilient members, the one or more resilient members comprising front and rear elongate squeegee blades.

It will be understood that a load applied to the second treatment component will facilitate effective sealing between the suction region and the surface to be treated, since the contact between the suction region and the surface to be treated (e.g. between one
35 or more squeegees defining the suction region and the surface) is improved by said load.

When resting on the surface to be treated, such squeegee blades will flex when a load is applied through bracket arrangement to the second treatment component. This improves contact between the squeegee blades and the surface to be treated which improves sealing of the suction region.

5 In exemplary embodiments, the first treatment component may comprise: a body and a moveable surface treatment element configured for movement with respect to the body; a body and a static surface treatment element configured to move in unison with the body; and/or a suction region configured to suck debris (e.g. fluid) from a surface.

10 In exemplary embodiments, the second treatment component may comprise: a body and a moveable surface treatment element configured for movement with respect to the body; a body and a static surface treatment element configured to move in unison with the body; and/or a suction region configured to suck debris (e.g. fluid) from a surface.

The moveable and/or static surface treatment element may comprise pad, brush and/or sponge, or any other suitable element.

15 Optionally, the bracket arrangement is configured such that when a load is applied to the bracket arrangement a first predetermined amount of said load is applied to the first treatment component and a second predetermined amount of said load is applied to the second treatment component; wherein the first predetermined amount is in the range of 30 to 70%, optionally 40 to 60%, optionally 45% to 55%, of the total load applied to the bracket arrangement; and/or wherein the second predetermined amount is in the range of 30 to 70%, optionally 40 to 60%, optionally 45% to 55% of the total load applied to the bracket arrangement.

25 Such ranges of the first and second predetermined amounts provides sufficient load to the first and second treatment components to facilitate effective treatment by the first and second surface treatment elements.

In some embodiments, 50% of the load applied to the bracket arrangement is transferred to the first treatment component and 50% of the load applied to the bracket arrangement is transferred to the second treatment component.

30 Optionally, the entire load applied to the bracket arrangement is transferred to the first and second treatment elements.

In other words the entire load applied to the bracket arrangement is distributed between the first and second treatment elements, for application to said surface.

35 In other words, the first predetermined amount is transferred to the first treatment element, the second predetermined amount is transferred to the second treatment element, and the sum of the first and second predetermined amounts is 100% of the load

applied to the bracket arrangement (in contrast to systems in which a portion of the load applied to the surface treatment head is transferred to separate wheels or other guiding members). This improves contact between each of the first and second treatment elements and the surface to be treated, which improves performance of the surface treatment head.

5 Such a configuration is particularly beneficial for lightweight (e.g. hand-guided) tools, since it transfers all load applied to the surface treatment head to the functional areas (i.e. first and second treatment elements, e.g. for cleaning or suction). In this way, a higher pressure per unit area can be achieved for a given load.

10 Optionally, the bracket arrangement is configured to couple the first and second treatment components together such that relative movement therebetween is permitted.

15 The first and second treatment components being coupled such that relative movement therebetween is permitted facilitates engagement of each respective surface treatment element with a surface to be treated, even when the surface is irregular (i.e. not flat). In other words, this facilitates surface tracking as the surface treatment head moves over uneven surfaces. Put another way, the first and second surface treatment elements remain in close contact with the surface, even when the surface is irregular, thereby facilitating treatment of the surface.

20 Optionally, the bracket arrangement is configured to couple the first and second treatment components together such that relative movement therebetween is permitted in a direction perpendicular to the surface to be treated.

25 The first and second treatment components being coupled such that relative movement therebetween is permitted in a direction perpendicular to the surface facilitates engagement of each component with a surface having varying heights (i.e. a stepped or otherwise uneven/undulating surface). In some embodiments, where the surface is substantially horizontal, relative vertical movement between the first and second treatment components is permitted.

30 In other words, as the surface treatment head moves over an uneven/undulating surface the first and second treatment components can rise or fall with respect to each other as they pass over undulations in the surface (i.e. this facilitates maintaining close contact between the surface treatment head and the surface as the surface treatment head moves over uneven surfaces).

 Optionally, the first treatment component is pivotally coupled to the bracket arrangement and/or wherein the second treatment component is pivotally coupled to the bracket arrangement.

The first and/or second treatment components being pivotally coupled to the bracket arrangement facilitates engagement of the first and/or second treatment components with angled portions of an uneven surface.

5 Optionally, the bracket arrangement is configured to be pivotally coupled to an elongate body, and both of the first and second treatment components are pivotally coupled to the bracket arrangement such that relative linear movement between the first and second treatment components is permitted.

10 In other words, by simultaneous pivoting of the first and second treatment components in the same direction relative to the bracket arrangement, and pivoting of the bracket arrangement relative to an elongate body, linear movement between the first and second treatment components is achieved.

This provides a simple and stable arrangement for facilitating relative movement between the first and second treatment components in a direction perpendicular to a surface to be treated.

15 Optionally, the surface treatment head comprises a limiting mechanism configured to limit relative movement between the first and second treatment components; optionally, wherein the limiting mechanism is adjustable.

20 Limiting the relative movement between the first and second treatment components (i.e. only permitting relative movement within a range of angles and/or distances) improves the stability of the surface treatment head whilst still permitting a certain degree of movement for good engagement with uneven surfaces.

25 The limiting mechanism being adjustable (i.e. the extent to which it limits relative movement between the first and second treatment components being adjustable) provides flexibility between increasing stability of the surface treatment head (by limiting relative movement to a greater extent) and increasing the ability for the first and second treatment components to track an uneven surface (by limiting relative movement to a lesser extent).

30 Optionally, the bracket arrangement comprises a first connection structure pivotally coupled to the first treatment component, wherein the first connection structure and first treatment component are configured to interact to define a permitted range of movement therebetween, and/or a second connection structure pivotally coupled to the second treatment component, wherein the second connection structure and second treatment component are configured to interact to define a permitted range of movement therebetween.

35 Optionally, the first treatment component comprises one or more abutment surfaces configured to abut the first connection arrangement to limit relative movement

between the first treatment component and the bracket arrangement, optionally, wherein the one or more abutment surfaces of the first treatment component comprise two abutment surfaces configured to abut opposing sides of the first connection structure to define a maximum and minimum of the permitted range of movement.

5 Optionally, the second treatment component comprises one or more abutment surfaces configured to abut the second connection arrangement to limit relative movement between the second treatment component and the bracket arrangement, optionally, wherein the one or more abutment surfaces of the second treatment component comprise two abutment surfaces configured to abut opposing sides of the second connection
10 structure to define a maximum and minimum of the permitted range of movement.

Such an arrangement provides an effective mechanism for limiting relative pivoting between the respective treatment component and the bracket arrangement.

Having two abutment surfaces on opposing sides of the respective connection structure allows pivoting to be limited in both directions.

15 Optionally, each abutment surface is angled relative to a surface contact plane defined by the respective surface treatment element.

Having an angled abutment surface increases the contact area between the respective connection structure and the abutment surface. For example, the respective connection structure and angled surface may be parallel when in abutment with each
20 other.

Optionally, at least one abutment surface is movable to adjust the extent to which the respective treatment component is free to pivot with respect to the bracket arrangement; optionally, wherein a distance between said abutment surface and the respective connection structure is adjustable; and/or optionally, wherein an angle of said
25 abutment surface relative to a surface contact plane defined by the respective surface treatment element is adjustable.

At least one abutment surface being movable to adjust the extent to which relative pivoting between the respective surface treatment component and the respective connection structure provides flexibility between increasing stability of the surface
30 treatment head (by limiting relative pivoting to a greater extent) and increasing the ability for the respective surface treatment component to track (i.e. remain in close contact with) an uneven surface (by limiting relative pivoting to a lesser extent).

In some embodiments, the or each abutment surface is coupled to the respective treatment component via an attachment mechanism (e.g. comprising complementary
35 threads), wherein the distance between said abutment surface and the respective

connection structure is adjustable by adjustment of the attachment mechanism (e.g. by relative rotation between the complementary threads).

For example, the or each abutment surface may comprise a bolt, screw or other threaded fastener coupled to a complementary threaded bore in the respective treatment component, or vice versa.

Optionally, the surface treatment head is configured to restrict pivoting of the first and second treatment components relative to each other to a pre-determined range of movement.

As the surface treatment head is moved along a surface in a treatment direction, friction between the respective surface treatment element and the surface may urge the rearmost surface treatment component (with respect to a treatment direction) to pivot to such an extent that the rearmost surface treatment element lifts or disengages from the surface to some extent. For example, when the rearmost surface treatment element comprises a suction region, this may cause a seal between a rear of the suction region and the surface to be broken.

The surface treatment head being configured to restrict pivoting of the first and second surface treatment components relative to each other inhibits such an undesirable pivoting of the rearmost surface treatment component when in use, which improves performance of the second surface treatment element. For example, when the rear surface treatment element comprises a suction region, this may improve suction performance.

Optionally, the first and/or second treatment component comprises one or more structures configured to co-operate with the second and/or first treatment component to limit relative movement therebetween; optionally, wherein the one or more structures are configured to limit pivoting of the first and second treatment components relative to each other beyond a predetermined amount; and/or optionally, wherein the one or more structures are provided proximal first and second ends of the surface treatment head; and/or optionally, wherein the one or more structures are configured to co-operate with one or more complementary structures of the second and/or first treatment component to limit pivoting of the first and second treatment components relative to each other beyond a predetermined amount.

In exemplary embodiments, the or each structure comprises a projection. In some embodiments, the one or more projections are configured to co-operate with a surface (e.g. upper, lower or side surface) of the second and/or first treatment component to limit pivoting of the first and second treatment components relative to each other beyond a predetermined amount.

In exemplary embodiments, the one or more structures and/or complementary structures comprises a surface (e.g. upper, lower or side surface) of the first and/or second treatment component; optionally, wherein the surface(s) of the first treatment component is configured to abut the complementary surface(s) of the second treatment component.

5 In exemplary embodiments, the or each projection comprises a bar and the or each complementary structure comprises a cylindrical structure such as a bush configured to permit vertical movement of the bar, but limit pivotal movement.

10 It will be appreciated that any structure and complementary structure that are configured to cooperate to permit vertical movement of the bar, but limit pivotal movement may be used.

Such an arrangement of one or more structures (e.g. projections and/or tabs) provides an effective mechanism for restricting pivoting of the first and second surface treatment components relative to each other.

15 The one or more structures being configured to cooperate with (e.g. engage and disengage) a surface of the second and/or first surface treatment component to permit a limited range of relative pivotal movement between the first and second surface treatment components facilitates close contact of the surface treatment elements with uneven floors.

20 First and second ends of surface treatment head may have a greater frictional force applied as they move over a surface to be treated (particularly when the first and second ends project forwards of a middle portion of the second treatment component in a treatment direction of the surface treatment head). Therefore, the one or more structures being provided proximal the first and second ends improves their effectiveness for restricting relative pivoting.

25 Optionally, the bracket arrangement comprises one or more arms coupled to the first treatment component and/or wherein the bracket arrangement comprises one or more arms coupled to the second treatment component.

30 Optionally, the bracket arrangement comprises a plurality of arms coupled to the respective treatment component such that the arms are arranged on either side of a central axis of the respective treatment component extending along a treatment direction, optionally, such that the arms are symmetrically positioned with respect to the central axis.

35 Optionally, the bracket arrangement comprises a plurality of arms each coupled to the respective treatment component along a transverse axis extending perpendicular to a treatment direction, optionally, wherein the transverse axis defines a midpoint between frontmost and rearmost portion of the respective treatment component.

This spreads out the application of load from the bracket arrangement across the respective first and second treatment components. In this way, smooth movement of the surface treatment head across the surface is facilitated.

5 Optionally, the first treatment component comprises a driving means and the transverse axis is aligned with a midpoint of the driving means (e.g. wherein the midpoint corresponds to a centre of gravity of the driving means). In some embodiments, the transverse axis is proximal a midpoint of the driving means, optionally extending behind a midpoint of the driving means (i.e. towards a rear of the first treatment component).

10 In this way it has been found that forward motion of the surface treatment head is facilitated.

In some embodiments, the first transverse axis extends within a centre third of the first treatment component, between a frontmost and rearmost point of the first treatment component.

15 In some embodiments, the first and/or second treatment component comprises an upper surface and one or more of said arms is coupled to the respective upper surface.

Coupling arms to the upper surface provides a simple connection arrangement.

20 In some embodiments, the first and/or second treatment component comprises an upper surface and the surface treatment head is configured such that one or more of said arms is coupled to the respective component at a connection point. In some embodiments, one or more connection point is provided at the respective upper surface. In some embodiments, one or more connection point is provided below the respective upper surface, when the surface treatment head is in an upright position on a horizontal surface, such that each arm is partly located below the respective upper surface.

25 In some embodiments, the first and/or second treatment component comprises an upper surface and one or more arm recesses provided in the upper surface, wherein said at least one arm is coupled to the respective treatment component within a respective arm recess such that each arm is partly located below the respective upper surface.

30 Such an arrangement has been found to provide good distribution of load from the bracket arrangement to the first and/or second treatment component, since it is applied closer to a centre of mass of the respective treatment component. In addition, by partly locating each arm below the respective upper surface, an overall height of the surface treatment head 10 can be reduced.

35 Optionally, the surface treatment head comprises a fluid outlet configured to introduce cleaning liquid to said surface to be treated; optionally, wherein the frontmost treatment component comprises the fluid outlet; optionally, wherein the fluid outlet is

provided on a front region of the first and/or treatment component with respect to a treatment direction of the surface treatment head.

Such a fluid outlet facilitates improved cleaning of a surface (e.g. when detergents or the like are applied via the fluid outlet to the surface to be treated).

5 The fluid outlet being located on the frontmost treatment component and/or on a front region of the first and/or second treatment component with respect to a treatment direction of the surface treatment head ensures that cleaning liquid is applied to an area of the surface to be treated before the respective surface treatment element passes over it, which improves cleaning performance.

10 In exemplary embodiments, the first and/or second surface treatment element comprises a treatment portion releasably coupled to the respective treatment component; optionally, wherein the treatment portion comprises a releasable cleaning pad, brush and/or sponge.

15 In exemplary embodiments, the first and/or second surface treatment element comprises a drivable portion coupled to the or a driving means of the respective treatment component and the treatment portion is releasably coupled to the drivable portion.

20 In some embodiments, the first and/or second treatment element comprises an intermediate component (e.g. a support plate) configured such that the treatment portion is coupled to the drivable portion via the intermediate component; optionally, wherein the intermediate component is coupled (e.g. releasably) to the treatment portion and/or coupled (e.g. releasably) to the drivable portion (e.g. via a magnetic coupling, snap-fit coupling, threaded coupling such as a thumb screw, interference fit coupling, resilient/elasticated coupling and/or hook-and-eye coupling). In some embodiments, the treatment portion is configured to be coupled (e.g. releasably) directly to the drivable
25 portion.

In some embodiments, the treatment portion is releasable coupled to the drivable portion via a magnetic coupling, snap-fit coupling, threaded coupling such as a thumb screw(s), interference fit coupling, resilient/elasticated coupling, hook-and-eye coupling and/or any suitable coupling means.

30 In exemplary embodiments, the first and/or second surface treatment element comprises one or more squeegee blades releasably coupled to the respective treatment component.

35 According to a further aspect of the disclosure a surface treatment head for a surface treatment tool is provided, the surface treatment head comprising: a first treatment component configured for coupling to a first surface treatment element

configured to engage a surface to be treated; a second treatment component configured for coupling to a second surface treatment element configured to engage said surface to be treated; and a bracket arrangement configured to couple the first and second treatment components together; and wherein the bracket arrangement is configured such that when
5 first and second treatment elements are coupled to the respective treatment components in use and a load is applied to the bracket arrangement, the load is distributed between the first and second treatment components and applied to said surface to be treated.

It will be understood that a load applied to the first and second treatment components will improve contact between each of the first and second treatment elements
10 (when coupled to the respective treatment components in use) and the surface to be treated, which facilitates effective treatment of the surface by said surface treatment elements.

Therefore, the bracket arrangement being configured to distribute a load applied thereto between the first and second treatment components facilitates effective treatment
15 by said first and second surface treatment elements (when coupled to the respective treatment components in use).

According to a further aspect of the disclosure a surface treatment tool is provided, the surface treatment tool comprising a surface treatment head as disclosed herein and an elongate body configured to be coupled to the bracket arrangement.

Such a surface treatment tool allows the surface treatment head to be guided on a
20 surface to be treated by the elongate body and/or a handle coupled thereto.

Optionally, the second treatment element comprises a suction region configured to suck fluid and/or debris from said surface to be treated; optionally wherein the surface treatment tool comprises a waste tank in fluid communication with the suction region;
25 optionally wherein the surface treatment tool comprises a suction source for sucking fluid from the suction region to the waste tank; and/or optionally, wherein the surface treatment tool comprises a fluid tank and the surface treatment head comprises a fluid outlet configured to apply cleaning liquid from the fluid tank to said surface to be treated.

Such a suction source and waste tank allows fluid and/or debris sucked from the
30 surface to be stored before being disposed of.

Such a fluid tank and fluid outlet facilitate improved cleaning of a surface by the first surface treatment element of the first treatment component (e.g. when detergents or the like are applied from the fluid tank via the fluid outlet to the surface to be treated).

Optionally, the elongate body is coupled to the bracket arrangement by a joint
35 arrangement; optionally, wherein the joint arrangement is configured to permit pivoting

of the elongate body with respect to the surface treatment head about a first axis and about a second axis, wherein the second axis is perpendicular to the first axis; optionally, wherein the second axis intersects the first axis.

5 Such a joint arrangement allows the surface treatment head to be effectively guided over a surface to be treated in variety of directions. In combination with the bracket arrangement being configured to distribute load between the first and second treatment components, this facilitates effective treatment of said surface to be treated.

10 According to a further aspect of the disclosure a squeegee assembly for use with a surface treatment device is provided, the squeegee assembly comprising an elongated squeegee blade and a mounting arrangement for supporting the squeegee blade, wherein the elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use;

15 wherein the squeegee assembly comprises a support formation configured to cooperate with the squeegee blade, optionally to control deflection of the squeegee blade, optionally such that at least a portion of the flexible wiper is arranged to extend in a generally rearward direction, optionally such that deflection of at least said portion of the flexible wiper in a generally forward direction is inhibited.

20 It will be understood that, as a squeegee blade moves in a generally forward direction over a surface to be treated the squeegee blade will move more freely when the flexible wiper extends in a generally rearward direction (e.g. is angled or curved towards the rearward direction). In other words, the squeegee blade can move more smoothly over the surface.

25 Furthermore, the flexible wiper extending towards the generally rearward direction (e.g. being angled or curved towards the rearward direction) improves performance of the flexible wiper because a sharp corner of the squeegee blade contacts the surface to be treated rather than the entire bottom edge of the squeegee. This results in a decreased contact area and thus a greater load-to-contact area ratio, which helps the flexible wiper
30 to seal against the surface to be treated more effectively and therefore facilitates improved guiding of fluid on the surface by the flexible wiper.

In typical surface treatment tools (e.g. scrubber dryer machines), the squeegee blade(s) are flexible and a weight acting on the squeegee blade(s), and/or friction between the flexible wiper(s) and the surface to be treated, facilitates angling/curving of the flexible
35 wiper(s) relative to the surface to be treated in use. However, this can be unreliable,

particularly with lighter tools or those which frequently change direction, such as smaller hand-guided machines.

In addition, when a typical squeegee blade changes direction quickly on a surface to be treated (e.g. pivoting about a central portion of the squeegee blade) one side of the flexible wiper is urged in a first direction while the other side of the flexible wiper is urged in a second direction. This can result in different sides of the flexible wiper being angled in different directions, which breaks a constant line of contact between the flexible wiper and the surface to be treated, leading to reduced performance of the squeegee blade (e.g. reduced removal or control of fluid on the surface).

Therefore, having a support formation configured to cooperate with the squeegee blade (e.g. to direct at least a portion of the squeegee blade) such that at least a portion of the flexible wiper is arranged to extend in a generally rearward direction, and optionally such that deflection of at least said portion of the flexible wiper in a generally forward direction is inhibited, facilitates an optimal orientation of the flexible wiper regardless of the forces or movements applied to the squeegee assembly when in use.

Furthermore, since the position of the squeegee blade is controlled, at least to some degree, the weight which can be applied directly to the squeegee blade without causing unwanted deflection of the squeegee blade is greater. Accordingly, in some embodiments, it is possible to dispense with wheels or other guides that are often present on surface treatment devices. Such wheels reduce the amount of load that can be applied to the squeegee, reducing the amount of pressure applied by the squeegee to the surface. Therefore, a simple and more streamlined device can be provided.

Optionally, the squeegee blade comprises a first end and a second end and a length extending therebetween, such that the fixed portion and the flexible wiper extend between the first and second ends, and wherein the support formation is configured to cooperate with the squeegee blade such that at least a portion of the flexible wiper proximal the first end and/or at least a portion of the flexible wiper proximal the second end is arranged to extend in a generally rearward direction, optionally such that deflection of at least the respective portion of the flexible wiper in a generally forward direction is inhibited.

It will be understood that portions of a flexible wiper proximal the first and second ends are most vulnerable to flexing in unwanted directions when the squeegee blade is moved on a surface. Therefore, the support formation being configured to cooperate with the squeegee blade such that at least a portion of the flexible wiper proximal the first and/or second end extends rearwards, and optionally is inhibited from flexing forwards, facilitates an optimal orientation of the first and/or second ends of the flexible wiper (which are most vulnerable to flexing in use).

Optionally, the support formation is configured to cooperate with the squeegee blade such that the flexible wiper is arranged to extend in a generally rearward direction along the entire length of the squeegee blade, optionally such that deflection of the flexible wiper in a generally forward direction is inhibited along the entire length of the squeegee blade.

The support formation being configured to cooperate with the squeegee blade such that the flexible wiper extends rearwards, and optionally is inhibited from flexing forwards, across the entire length of the squeegee blade facilitates optimal orientation of the flexible wiper along its entire length.

Optionally, the squeegee blade comprises a front surface facing in a generally forward direction, and a rear surface, facing in a generally rearward direction.

Optionally, in use, the front surface of the squeegee blade forms a contact angle with a surface to be treated, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is an acute angle, and such that deflection of the flexible wiper such that the contact angle is greater than 90° is inhibited; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is in the range of 35° to 55° ; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is substantially 45° . Optionally wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle varies along a length of the squeegee blade. Optionally the contact angle increases proximal the first and/or second ends of the squeegee blade. In this way, control of the orientation of the squeegee blade is facilitated.

Such an acute contact angle has been found to facilitate effective movement of the flexible wiper over a surface to be treated, and to provide good contact between the flexible wiper and the surface to be treated (e.g. for directing fluid on a surface and/or creating a seal with the surface).

Optionally, the support formation is configured to cooperate with at least a portion of the front surface and/or rear surface of the squeegee blade.

The support formation cooperating with the front and/or rear surface provides a simple means for suitably arranging and inhibiting flexing of the flexible wiper.

Optionally, the support formation comprises a front support structure configured to contact the front surface of the squeegee blade and/or a rear support structure configured to contact the rear surface of the squeegee blade.

Such a front and/or rear support structure provides a simple means for suitably arranging and inhibiting flexing of the flexible wiper.

Having a rear support structure configured to contact the rear surface of the squeegee blade inhibits the squeegee blade from flexing too far in the rearward direction. In this way, a greater load can be applied to the squeegee blade without over-flexing than could be applied if no rear support structure was present. Allowing a greater application
5 of load results in a better contact between the flexible wiper and the surface to be treated, and thus a better performance of the squeegee blade (e.g. improved guiding of fluid on said surface to be treated).

Optionally the front support structure is not provided.

10 Optionally, the rear support structure may comprise a rigid structure. Optionally, the rear support structure may comprise another squeegee.

Optionally, the respective support structure is configured to contact the respective surface along a continuous line of contact, and/or is configured to contact the respective surface at one or more discrete points (e.g. a series of discrete points).

15 The support structure(s) contacting the respective surface along a continuous line of contact ensures that the flexible wiper is supported by the support structure(s) along the entire continuous line of contact.

The support structure(s) contacting the respective surface at one or more discrete points (e.g. a series of discrete points) provides a simple means of ensuring that the flexible wiper is supported by the support structure(s).

20 Optionally, the front support structure and/or the rear support structure comprises a guide projection (e.g. a guide wall) angled such that the projection extends in a generally rearward direction.

The front and/or rear support structure being angled such that the guide projection(s) extend in a generally rearward direction facilitates angling of the flexible
25 wiper. In some embodiments, the respective guide projection of the front support structure and/or rear support structure comprises a contact face arranged to contact the respective front or rear surface of the squeegee blade. In this way, the contact area between the support structure(s) and the respective surface(s) of the flexible wiper is increased (e.g. in contrast to a support structure which contacts the flexible wiper at a single point or line
30 of contact).

Optionally, the elongated squeegee blade is a rear elongated squeegee blade and wherein the squeegee assembly further comprises a front elongated squeegee blade supported by the mounting arrangement, wherein the squeegee assembly comprises a suction region defined, at least in part, by the front and rear elongated squeegee blades.

Such an arrangement of front and rear squeegee blades has been found to be effective for removing liquid from a surface to be treated (e.g. when used as part of a scrubber dryer machine).

Optionally, the support formation of the rear elongated squeegee blade is a first support formation, wherein the front elongated squeegee blade comprises a fixed portion secured to the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use, wherein the squeegee assembly comprises a second support formation configured to cooperate with the front squeegee blade such that at least a portion of the flexible wiper of the front squeegee blade is arranged to extend in a generally rearward direction, optionally such that deflection of at least said portion of the flexible wiper of the front squeegee blade in a generally forward direction is inhibited.

Having a second support formation configured to cooperate with the front squeegee blade (e.g. to direct at least a portion of the front squeegee blade) such that at least a portion of the flexible wiper of the front squeegee blade is arranged to extend in a generally rearward direction and such that deflection of at least said portion of the flexible wiper of the front squeegee blade in a generally forward direction is inhibited, facilitates an optimal orientation of the flexible wiper of the front squeegee blade regardless of the forces or movements applied to the squeegee assembly when in use.

Optionally, the front squeegee blade comprises a first end and a second end and a length extending therebetween, such that the fixed portion and the flexible wiper of the front squeegee blade extend between the first and second ends of the front squeegee blade, and wherein the second support formation is configured to cooperate with the front squeegee blade such that at least a portion of the flexible wiper of the front squeegee blade proximal the first end and/or at least a portion of the flexible wiper of the front squeegee blade proximal the second end is arranged to extend in a generally rearward direction, and such that deflection of at least the respective portion of the flexible wiper of the front squeegee blade in a generally forward direction is inhibited.

It will be understood that portions of a flexible wiper proximal the first and second ends are most vulnerable to flexing in opposite directions when the squeegee blade is moved on a surface. Therefore, the second support formation being configured to cooperate with the front squeegee blade such that at least a portion of the flexible wiper of the front squeegee blade proximal the first and/or second end of the front squeegee blade extends rearwards and is inhibited from flexing forwards, facilitates an optimal orientation of the first and/or second ends of the flexible wiper of the front squeegee blade (which are most vulnerable to flexing in use).

Optionally, the second support formation is configured to cooperate with the front squeegee blade such that the flexible wiper of the front squeegee blade is arranged to extend in a generally rearward direction along the entire length of the front squeegee blade, and such that deflection of the flexible wiper of the front squeegee blade in a generally forward direction is inhibited along the entire length of the front squeegee blade.

The second support formation being configured to cooperate with the front squeegee blade such that the flexible wiper of the front squeegee blade extends rearwards and is inhibited from flexing forwards across the entire length of the front squeegee blade facilitates optimal orientation of the flexible wiper of the front squeegee blade along its entire length.

Optionally, the front squeegee blade comprises a front surface facing in a generally forward direction, and a rear surface, facing in a generally rearward direction.

Optionally, in use, the front surface of the front squeegee blade forms a contact angle with a surface to be treated, wherein the second support formation is configured to cooperate with the front squeegee blade such that the contact angle is an acute angle, and such that deflection of the flexible wiper of the front squeegee blade such that the contact angle is greater than 90° is inhibited; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is in the range of 35° to 55° ; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is substantially 45° .

Such an acute contact angle has been found to facilitate effective movement of the flexible wiper of the front squeegee blade over a surface to be treated, and to provide good contact between the flexible wiper of the front squeegee blade and the surface to be treated (e.g. for directing fluid on a surface and/or creating a seal with the surface).

Optionally, the second support formation is configured to cooperate with at least a portion of the front surface and/or rear surface of the front squeegee blade.

The second support formation cooperating with the front and/or rear surface of the front squeegee blade provides a simple means for suitably arranging and inhibiting flexing of the flexible wiper of the front squeegee blade.

Optionally, the second support formation comprises a front support structure configured to contact the front surface of the front squeegee blade and/or a rear support structure configured to contact the rear surface of the front squeegee blade.

Such a front and/or rear support structure of the second support formation provides a simple means for suitably arranging and inhibiting flexing of the flexible wiper of the front squeegee blade.

Optionally, the respective support structure of the second support formation is configured to contact the respective surface of the front squeegee blade along a continuous line of contact, and/or is configured to contact the respective surface of the front squeegee blade at one or more discrete points (e.g. a series of discrete points).

5 The support structure(s) of the second support formation contacting the respective surface along a continuous line of contact ensures that the flexible wiper of the front squeegee blade is supported by the support structure(s) of the second support formation along the entire continuous line of contact.

10 The support structure(s) of the second support formation contacting the respective surface at one or more discrete points (e.g. a series of discrete points) provides a simple means of ensuring that the flexible wiper of the front squeegee blade is supported by the support structure(s) of the second support formation.

15 Optionally, the front support structure of the second support formation and/or the rear support structure of the second support formation comprises a guide projection (e.g. a guide wall) angled such that the projection extends in a generally rearward direction.

20 The front and/or rear support structure being angled such that the guide projection(s) extend in a generally rearward direction facilitates angling of the flexible wiper. In some embodiments, the respective guide projection of the front support structure and/or rear support structure comprises a contact face arranged to contact the respective front or rear surface of the squeegee blade. In this way, the contact area between the support structure(s) and the respective surface(s) of the flexible wiper is increased (e.g. in contrast to a support structure which contacts the flexible wiper at a single point or line of contact).

25 Optionally, the front and rear elongated squeegee blades are coupled together to form a continuously sealed suction region.

The front and rear squeegee blades being coupled together to form a continuously sealed suction region reduces the suction power required to remove liquid from the suction region and reduces noise levels.

30 Optionally, the suction region is defined by a resilient member formed as a continuous loop, wherein the resilient member comprises the front and rear elongate squeegee blades.

35 The front and rear squeegee blades being defined by a resilient member formed as a continuous loop (e.g. the front and rear squeegee blades being integrally formed) is a simple means of sealing the suction region to reduce the suction power required to remove liquid from the suction region and reduces noise levels.

Optionally, the front elongated squeegee blade comprises a first end and a second end, and the rear elongated squeegee blade comprises a first end and a second end.

Optionally, the front and rear elongated squeegee blades are gripped together or arranged to contact each other in use at the respective first ends and/or the respective
5 second ends.

The front and rear squeegee blades being gripped together or arranged to contact each other in use at the respective first and/or second ends increases the effectiveness of the seal between the front and rear squeegee blades, which reduces the suction power required to remove liquid from the suction region and reduces noise levels.

10 Optionally, the front elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use, wherein the front and rear elongated squeegee blade comprise a respective first edge proximal the respective fixed portion and a respective second edge proximal the respective flexible wiper, the respective first and second edges defining a
15 respective height therebetween.

Optionally, proximal the first and/or second ends of the respective elongated squeegee blade, the fixed portion of the front elongate squeegee blade is mounted further from a surface to be treated than that of the rear elongated squeegee blade, when in use.

It will be understood that the squeegee assembly will be driven in a treatment
20 direction (i.e. in the generally forward direction) in use, which will urge the front squeegee blade towards the rear squeegee blade.

Having the fixed portion of the front squeegee blade mounted further from a surface to be treated than the fixed portion of the rear squeegee blade proximal the first and/or second ends (i.e. at locations where the distance between the front and rear
25 squeegee blades is at a minimum) inhibits the front squeegee blade from passing underneath the rear squeegee blade and separating the rear squeegee blade from the ground. Therefore, this inhibits breakage of a seal between the suction region and a surface on which the squeegee blades rest.

In other words, having the fixed portion of the front squeegee blade mounted
30 further from a surface to be treated than the fixed portion of the rear squeegee blade proximal the first and/or second ends facilitates a closer arrangement of the front and rear squeegee blades at the first and/or second ends (which facilitates improved sealing at the first and/or second ends of the suction region), whilst maintaining a seal between the suction region and a surface on which the squeegee blades rest.

Furthermore, mounting the fixed portion of the front squeegee blade further from a surface (e.g. as opposed to modifying the height of the ends of the front squeegee blade by having a tapered blade profile) allows a standard front squeegee blade of constant height to be used in the squeegee assembly.

5 Optionally, the front elongate squeegee blade is mounted further from a surface to be treated than the rear elongated squeegee blade by a distance in the range of 0.5mm to 2mm, optionally in the range of 0.75mm to 1.5mm, optionally by substantially 1mm.

10 Such distances have been found to be effective for inhibiting disengagement of the rear squeegee blade whilst keeping the front squeegee blade engaged with a surface to be treated.

15 Optionally, the front elongate squeegee blade and the mounting arrangement comprise a series of lugs and receivers configured to receive the lugs, wherein proximal the first and/or second end of the front elongated squeegee blade, when the front elongate squeegee blade is mounted on the mounting arrangement, the lugs and receivers are located further from a surface to be treated than those proximal a central portion of the front elongate squeegee blade, when in use.

 Such an arrangement of lugs and receivers provides a simple means of raising the first and/or second sides of the front squeegee blade relative to the central portion of the front squeegee blade.

20 Optionally, proximal the first and/or second ends of the respective elongated squeegee blades, the height of the front elongate squeegee blade is less than the height of the rear squeegee blade.

25 The front squeegee blade having a height which is less than the height of the rear squeegee blade towards the first and/or second ends provides a simple means of inhibiting the front squeegee blade from passing underneath the rear squeegee blade and separating the rear squeegee blade from the ground. Therefore, this inhibits breakage of a seal between the suction region and a surface on which the squeegee blades rest.

30 In other words, the front squeegee blade having a height which is less than the height of the rear squeegee blade towards the first and/or second ends facilitates a closer arrangement of the front and rear squeegee blades at the first and/or second ends (which facilitates improved sealing at the first and/or second ends of the suction region), whilst maintaining a seal between the suction region and a surface on which the squeegee blades rest.

Optionally, the height of the front elongate squeegee blade is less than the height of the rear elongated squeegee blade by an amount in the range of 0.5mm to 2mm, optionally in the range of 0.75mm to 1.5mm, optionally by substantially 1mm.

5 Such distances have been found to be effective for inhibiting disengagement of the rear squeegee blade whilst keeping the front squeegee blade engaged with a surface to be treated.

Optionally, the or each squeegee blade comprises a first end and a second end and a length extending therebetween, wherein the or each squeegee blade comprises a central portion located between the first and second ends, and wherein the first and second ends project forwards of the central portion of the squeegee assembly.

10 Having first and second ends which project forwards of the central portion of the squeegee assembly (e.g. having a V-shape, U-shape, crescent shape or any other suitable shape in which the ends project forwards of the central portion) is an effective configuration for guiding liquid on a surface to be treated, since it effectively funnels liquid towards the central portion as the squeegee assembly is moved in a treatment direction (i.e. a forward direction).

Optionally, the squeegee assembly is configured such that a load applied to the mounting arrangement is applied to a surface to be treated exclusively by the flexible wiper(s) of the squeegee blade(s).

20 The squeegee assembly being configured such that a load applied to the mounting arrangement is applied to a surface to be treated exclusively by the flexible wiper(s) of the squeegee blade(s) (i.e. the squeegee assembly not having wheels or other components which engage a surface to be treated and distribute a portion of the load applied to the mounting arrangement) improves contact between the flexible wiper(s) of the squeegee blade(s), which results in better guiding of fluid on a surface by the flexible wiper(s) and a better seal between the flexible wiper(s) and said surface (e.g. when the squeegee blade(s) at least partly define a suction region). This also enables a simpler, lighter and more streamlined device to be provided.

30 According to a further aspect of the disclosure surface treatment head for a surface treatment tool is provided, the surface treatment head comprising a squeegee assembly as disclosed herein; optionally, wherein the surface treatment head comprises: a joint arrangement configured for coupling to an elongate body of a surface treatment tool, wherein the joint arrangement is configured to permit pivoting of the surface treatment head with respect to said elongate body about a first axis, and optionally about a second axis perpendicular to the first axis, optionally wherein the second axis intersects the first axis; and/or a surface treatment element configured to engage a surface to be treated,

optionally wherein the surface treatment element is movable and the surface treatment head comprises a driving means comprising a motor configured to drive the movable surface treatment element to effect cleaning of said surface; and/or a fluid outlet configured to introduce cleaning liquid to a surface to be treated; and/or a squeegee assembly as disclosed here, and a suction connection arrangement configured to connect the suction region to a source of suction of a surface treatment tool.

Such a surface treatment head benefits from the advantages of the squeegee assembly disclosed herein.

Such a joint arrangement facilitates easy movement of the surface treatment head and quick changing of direction of movement of the surface treatment head. In combination with the features of the squeegee assembly disclosed herein (which facilitate optimal arrangement of the squeegee blade(s) regardless of the forces or movements applied to the squeegee assembly when in use), such a surface treatment head facilitates effective treatment (e.g. cleaning) of a surface to be treated.

Such a surface treatment element facilitates treatment (e.g. cleaning) of a surface to be treated.

Such a fluid outlet facilitates application of cleaning liquid which improves the cleaning performance of the surface treatment element.

Such a suction region and suction connection arrangement facilitate drying and/or removal of waste liquid/particles from a surface to be treated when connected to a source of suction.

According to a further aspect of the disclosure, a surface treatment tool is provided, the surface treatment tool comprising an elongate body coupled to a surface treatment head as disclosed herein.

Such a surface treatment tool benefits from the advantages of the squeegee assembly and surface treatment head disclosed herein. In addition, the elongate body facilitates simple guiding of the surface treatment head along a surface to be treated.

Optionally, the surface treatment tool is a scrubber dryer tool comprising a source of suction coupled to said suction region.

Such a scrubber dryer tool benefits from the advantages of the squeegee assembly and surface treatment head disclosed herein.

According to a further aspect of the disclosure, a squeegee assembly for use with a surface treatment device is provided, the squeegee assembly comprising a mounting arrangement for supporting an elongated squeegee such that said elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper

configured to contact a surface to be treated when in use; wherein the squeegee assembly comprises a support formation configured to cooperate with said squeegee blade, optionally to control deflection of the squeegee blade, optionally such that at least a portion of said flexible wiper is arranged to extend in a generally rearward direction, optionally such that deflection of at least said portion of said flexible wiper in a generally forward direction is inhibited.

According to a further aspect of the disclosure, there is provided a surface treatment head for a surface treatment tool, the surface treatment head comprising: a chassis comprising one or more guide portions configured to dampen impact of the surface treatment head with other structures when in use; and a surface treatment element coupled to the chassis and configured to engage a surface to be treated, wherein the surface treatment element defines a treatment area of a surface to be treated. Optionally, wherein the one or more guide portions extend within, up to or beyond the treatment area.

In other words, the one or more guide portions may be contained within the perimeter of the treatment area, may extend up to the perimeter of the treatment area or may extend beyond the perimeter of the treatment area. Having one or more guide portions configured to dampen impact of the surface treatment head with other structures when in use inhibits the surface treatment element from hitting or scuffing any adjacent structure(s) (e.g. walls, furniture or the like) when the surface treatment head is moved close to the adjacent structure(s). This inhibits damage of the adjacent structure(s) and/or reduces noise. For example, when in use to treat a floor adjacent a wall, the guide portions prevent the surface treatment element hitting against or scuffing the wall.

Having one or more guide portions which extend up to or beyond the treatment area (i.e. arranged such that the surface treatment element does not extend beyond the one or more guide element portions in use) inhibits the surface treatment element from hitting or scuffing any adjacent structure(s) (e.g. walls, furniture or the like) when the surface treatment head is moved close to the adjacent structure(s). This inhibits damage of the adjacent structure(s) and/or reduces noise. For example, when in use to treat a floor adjacent a wall, the guide portions prevent the surface treatment element hitting against or scuffing the wall.

In some embodiments, the surface treatment element is configured to be static with respect to the chassis or a portion of the chassis (e.g. a body of the chassis). In such embodiments, the treatment area of the surface to be treated corresponds to the area of the surface treatment element which is configured to contact the surface to be treated when in use.

In some embodiments, the guide portions are configured to extend in a direction parallel to the surface to be treated.

5 In some embodiments, the guide portions are displaced with respect to a surface to be treated (i.e. spaced apart from a surface to be treated) in a direction perpendicular to the surface. It will be appreciated that the guide portions are arranged to be contained within the treatment area, or extend up to or beyond the treatment area when the surface treatment head is viewed in a plan view (i.e. top down view with respect to a surface to be treated).

10 Optionally, the surface treatment element is configured for movement with respect to the chassis in order to effect treatment of a surface. The surface treatment head may comprise a driving means configured to drive movement of the surface treatment element relative to the chassis to effect treatment of said surface, wherein movement of the surface treatment element defines a perimeter of the treatment area and wherein the one or more guide portions extend up to or beyond the perimeter of the treatment area.

15 In other words, when the surface treatment element is moveable, the treatment area corresponds to the area defined by the surface treatment element throughout its full range of movement (i.e. taking the position of the chassis to be fixed). Put another way, the treatment area corresponds to the area of the surface which is treated by the surface treatment element during its full range of movement (i.e. when the chassis remains in a constant position with respect to the surface).

20 The perimeter of the treatment area corresponds to a boundary of movement of the surface treatment element. In other words, the surface treatment element does not move beyond this boundary (i.e. taking the position of the chassis to be fixed with respect to the surface).

25 Such a movable surface treatment element facilitates improved treatment (e.g. cleaning) as compared to a static surface treatment element.

30 In some embodiments, the one or more guide regions extending up to or beyond the perimeter of the treatment area (i.e. being arranged such that the surface treatment element does not extend beyond the one or more guide regions throughout the entire range of movement of the surface treatment element), inhibits the surface treatment element from hitting or scuffing any adjacent structure(s) or wall(s) as it moves. This inhibits damage of the adjacent structure(s) or wall(s). This may also reduce noise associated with the surface treatment element hitting against the adjacent structure(s) or wall(s).

35 Optionally, the driving means comprises an eccentric drive mechanism configured such that the moveable surface treatment element engages a surface to be treated in a

cyclical motion in which a portion of the moveable surface treatment element faces in substantially the same direction throughout the cyclical motion. For example, a front portion of the moveable surface treatment element faces substantially forwards throughout the cyclical motion. In such embodiments, movement of the surface treatment element throughout the cyclical motion defines the perimeter of the treatment area, and wherein the one or more guide portions extend up to or beyond the perimeter of the treatment area.

Such a cyclical motion of the surface treatment element facilitates use of a straight-sided surface treatment element which can clean into corners of a surface (e.g. in contrast to a circular/rotating surface treatment element which cannot go right into the corner of a surface). This facilitates improved treatment (e.g. improved cleaning) of a surface.

Such a cyclical motion could result in the surface treatment element repeatedly moving towards and away from an adjacent structure (i.e. wall, furniture or the like), e.g. in an oscillating fashion, which would result in a banging or vibrating motion which could damage the adjacent structure and/or create a loud noise. Therefore, having the one or more guide regions configured to dampen impact of the surface treatment head with other structures when in use (e.g. to extend up to or beyond the perimeter of the treatment area (i.e. arranged such that movement of the surface treatment element in said cyclical motion does not extend beyond the one or more guide regions through the entire movement cycle)) inhibits such a banging or vibrating motion against adjacent structures which inhibits damage and/or noise.

Optionally, the one or more guide portions comprise one or more guide elements coupled to the chassis.

Optionally, the chassis comprises a body having a periphery and wherein the one or more guide elements are coupled to the body such that they are located proximal the periphery of the body.

In some embodiments, the chassis comprises a body having a periphery comprising the one or more guide portions. In some embodiments, each of the one or more guide portions comprises a portion of the body.

Optionally, the surface treatment element comprises one or more recesses for at least partly accommodating the one or more guide elements; and/or wherein the body comprises one or more recesses for at least partly accommodating the one or more guide elements.

Such recesses reduce the extent to which the guide elements project beyond the perimeter of the treatment area and/or the periphery of the body. In other words, such recesses allow the guide elements to be at least partly positioned within the lateral and

vertical extent of the surface treatment element and/or body (e.g. as opposed to being positioned entirely on top, below or to the side of the surface treatment element and/or body), wherein "lateral" refers to a direction substantially parallel to a surface to be treated, and "vertical" refers to a direction substantially perpendicular to a surface to be treated. In other words, the guide elements can be positioned at least partially within a footprint defined by the surface treatment element and/or body in the lateral and/or vertical directions. This provides a compact surface treatment head which facilitates cleaning of small spaces (e.g. between or under furniture).

Optionally, the or each recess is recessed with respect to an upper surface of the surface treatment element and/or an upper surface of the body; and/or wherein the or each recess is recessed with respect to a lower surface of the surface treatment element and/or a lower surface of the body; and/or wherein the or each recess is recessed with respect to a side surface of the surface treatment element and/or a side surface of the body.

Such recesses reduce the extent to which the guide elements project above, below or to the side of the surface treatment element and/or body. In other words, such recesses allow the guiding elements to be at least partly positioned within the vertical and/or lateral extent of the surface treatment element and/or body (e.g. as opposed to being positioned entirely on top, below or to the side of the surface treatment element and/or body). This provides a compact surface treatment head which facilitates cleaning of spaces with low overhead coverage (e.g. under furniture) and enable the surface treatment element to clean close to or up to surface edges (e.g. next to walls).

Optionally, the surface treatment head comprises a first end and a second end, wherein the first end is provided at a first side with respect to a treatment direction and wherein the second end is provided at a second side with respect to a treatment direction, wherein the one or more guide elements are provided proximal the first and/or second ends.

When in use, a surface treatment head may be moved forwards along a surface to be treated with one of the first and second ends running next to (e.g. along) a perpendicular structure such as a side wall or piece of furniture. Therefore, having the one or more guide elements proximal the first and/or second ends facilitates easy movement of the respective first and/or second ends along the perpendicular structure without excessive friction and/or without causing damage to the perpendicular structure.

Optionally, the one or more guide elements comprise a pair of guide elements which define a line linking outermost points on the pair of guide elements, wherein the line

extends within the treatment area, along an edge of the treatment area or is located outside of the treatment area.

In some embodiments, the line may coincide with an edge of the treatment area, but does not extend further into the treatment area.

5 Having such a pair of guide elements has been found to be an effective arrangement for facilitating easy movement of the surface treatment head adjacent to perpendicular structures such as side walls and/or furniture. For example, when the line linking outermost points on the pair of guide elements extends along an edge of the treatment area or is located outside of the treatment area, and is arranged adjacent to a
10 perpendicular structure (i.e. with the outermost points of the guide elements in contact with the perpendicular structure), because the line extends along an edge of or is located outside of the treatment area, the surface treatment element will extend no further than the line.

 Optionally, the one or more guide elements comprise a pair of first-side guide
15 elements which define a first-side line linking outermost points on the first-side guide elements, wherein the first-side line extends within the treatment area, along an edge of the treatment area or is located outside of the treatment area, and wherein the first-side line is arranged on a first side of the treatment area; and/or wherein the one or more guide elements comprise a pair of second-side guide elements which define a second-side
20 line linking outermost points on the second-side guide elements, wherein the second-side line extends within the treatment area, along an edge of the treatment area or is located outside of the treatment area, and wherein the second-side line is arranged on a second side of the treatment area.

 Having guide elements defining such first-side and/or second-side lines facilitates
25 easy movement of either side of the surface treatment head along perpendicular structures such as walls or furniture.

 Optionally, the one or more guide elements comprise a pair of front guide elements which define a front line linking outermost points on the front guide elements, wherein the front line extends within the treatment area, along an edge of the treatment area or is
30 located outside of the treatment area, and wherein the front line is arranged on a front side of the treatment area.

 Having guide elements defining such a front-side line facilitates easy movement of the front of the surface treatment head along perpendicular structures such as walls or furniture. It will be understood that the two front guide elements may comprise front guide
35 elements of the first-side and second-side guide elements (e.g. the first-side, second-side and front guide elements may comprise four guide elements in total with two of the guide

elements being part of both the front guide element pair and a respective side guide element pair).

Optionally, the or each guide element comprises a roller, wheel or ball.

5 Rollers or wheels offer a simple and reliable means of reducing friction and spacing the surface treatment element from a perpendicular structure.

Balls can rotate in a plurality of directions to reduce friction, which is useful in scenarios where the surface treatment head is moved along a perpendicular structure in multiple directions (e.g. transversely and vertically at the same time).

10 Optionally, the chassis comprises one or more mounting arrangements, and wherein each guide element is mounted in a respective mounting arrangement such that each guide element is configured for rotation with respect to the chassis; optionally, wherein the chassis comprises a body comprising the one or more mounting arrangements.

15 In embodiments where the or each guide element comprises a ball, each mounting arrangement may be configured to permit rotation of the ball in a plurality of directions with respect to the mounting arrangement.

20 Optionally, the one or more mounting arrangements each extend below an upper surface of the surface treatment element, and wherein the surface treatment element is recessed around the one or more mounting arrangements; and/or wherein the one or more mounting arrangements each extend from a side surface of the surface treatment element in a direction towards the surface treatment element, and wherein the surface treatment element is recessed around the one or more mounting arrangements.

25 Having the mounting arrangement(s) extend below the upper surface of the surface treatment element allows the height of the roller/wheel to be increased to improve contact with a perpendicular surface whilst inhibiting or limiting the extent to which the roller/wheel protrudes above an upper surface of the chassis.

30 Having the mounting arrangement(s) extend below the upper surface of the surface treatment element allows the height of the ball to be increased to provide a more robust ball whilst inhibiting or limiting the extent to which the roller/wheel protrudes above an upper surface of the chassis.

35 Having the mounting arrangement(s) extend from a side surface of the surface treatment element in a direction towards the surface treatment element allows the width of the roller/wheel/ball to be increased to provide a more robust roller/wheel/ball whilst inhibiting or limiting the extent to which the roller/wheel protrudes above an upper surface of the chassis.

The surface treatment element being recessed around the one or more mounting arrangements facilitates increased overall size of the surface treatment element (i.e. increased overall size of the treatment area) for a given chassis size (e.g. in comparison to having a surface treatment element which has no recesses and is instead sized smaller to fit between the mounting arrangements). This increased surface treatment element size (i.e. increased treatment area size) facilitates cleaning closer to the edges of a surface to be treated.

Optionally, the one or more guide elements are removably mounted to the chassis.

This increases the life of the surface treatment head, as the guide elements can be replaced when worn. This also facilitates use of different types of guide elements for different perpendicular structures.

Optionally, the one or more guide portions are configured to reduce friction between the surface treatment head and a structure arranged perpendicular to the surface to be treated when the surface treatment head is moved adjacent to said perpendicular structure in use.

The one or more guide portions being configured to reduce friction (e.g. being movable rollers, wheels or balls, and/or being formed of a material with a low coefficient of friction) facilitates movement of the surface treatment head along a structure arranged perpendicular to a surface to be treated (e.g. side walls, furniture and/or other perpendicular structures). In other words, such guide portions facilitate easy cleaning of edges of a surface to be treated.

Optionally, the guide portions are spaced apart from a surface to be treated in a direction perpendicular to the surface.

It will be appreciated that the guide portions are arranged to extend within the treatment area, up to or beyond the treatment area when the surface treatment head is viewed in a plan view (i.e. top-down view with respect to a surface to be treated).

Optionally, the surface treatment element is replaceable.

This increases the life of the surface treatment head, as the surface treatment element can be replaced when worn. This also facilitates use of different types of surface treatment elements for different surfaces to be treated (e.g. sponges, brushes, pads or the like).

Optionally, the surface treatment head comprises a fluid outlet for introduction of cleaning fluid to the surface to be treated.

This facilitates more effective cleaning of a surface to be treated.

Optionally, the surface treatment head comprises a suction region for sucking fluid and/or debris from the surface to be treated.

This facilitates drying of a surface to be treated (e.g. after the introduction of cleaning fluid).

5 Optionally, the eccentric drive mechanism is configured to drive the moveable surface treatment element so that each point on the moveable surface treatment element moves along a circular path, wherein the circular paths each have a unique centre point but a common radius dimension.

10 If such a surface treatment element was pushed against a structure perpendicular to the surface to be treated (e.g. side wall or furniture), the cyclical motion of the surface treatment element would cause the surface treatment element to repeatedly hit the perpendicular structure (e.g. it would vibrate against the perpendicular structure). This could cause damage to the perpendicular structure and/or produce unwanted noise.

15 Therefore, having one or more guiding portions configured to dampen impact of the surface treatment head with other structures when in use (e.g. which extend up to or beyond the treatment area (i.e. configured to space the movable surface treatment element from a structure perpendicular to the surface to be treated) inhibits the movable surface treatment element hitting or scuffing the perpendicular structure as it is driven in a cyclical motion by the driving means. This inhibits damage of the perpendicular structure(s) and/or reduces noise.

20

 According to a further aspect of the disclosure a surface treatment tool is provided, the surface treatment tool comprising an elongate body coupled to a surface treatment head as disclosed herein.

25 Such a surface treatment tool has all of the benefits of the surface treatment head disclosed herein.

 Further, the guide portions facilitate steering of the surface treatment tool.

30 According to a further aspect of the disclosure a surface treatment element for coupling to a chassis of a surface treatment head is provided, the surface treatment element comprising: an upper surface, a lower surface and a periphery extending between the upper and lower surfaces; wherein the surface treatment element comprises one or more recesses in the upper surface and/or lower surface and/or periphery for accommodating a guide element and/or a mounting arrangement for a guide element.

35 The surface treatment element having one or more recesses in the upper surface and/or lower surface and/or periphery for accommodating a guide element and/or a mounting arrangement for a guide element allows the surface treatment element to fit

right to the edge of the surface treatment head in the non-recessed portions (for improved treatment of edges of a surface to be treated), whilst offering a space to accommodate the guide element(s)/mounting arrangement(s) which facilitates a reduced height of the surface treatment head.

5 Optionally, the surface treatment element comprises a rear edge with respect to a treatment direction, having a first end, a second end and a middle portion located between the first and second ends, wherein the middle portion projects rearwards of the first and second ends with respect to a treatment direction of the surface treatment element.

10 According to a further aspect of the invention a treatment portion for a surface treatment element is provided, wherein the treatment portion is configured for coupling to a drivable portion of a surface treatment tool to form said surface treatment element, wherein the treatment portion comprises an edge comprising a first end, a second end and a middle portion located between the first and second ends, wherein the first and second ends project forward of the middle portion in a treatment direction of the treatment
15 portion; optionally, wherein the treatment portion comprises a pad, brush and/or sponge.

 Optionally wherein the edge of the treatment portion is a rear edge with respect to the treatment direction, or wherein the edge of the treatment portion is a front edge with respect to the treatment direction; or wherein the treatment portion comprises a front edge and a rear edge, wherein each of the front and rear edges comprise a first end, a
20 second end and a middle portion located between the first and second ends, wherein the first and second ends project forward of the middle portion in a treatment direction of the treatment portion.

 In some embodiments, the treatment portion comprises an intermediate component (e.g. a support plate), wherein the intermediate component is configured to
25 be coupled (e.g. releasably) to said drivable portion; optionally, wherein said one or more brushes, sponges, cloths towels, cleaning pads or other material suitable for treating a surface are releasably coupled to the intermediate component. In some embodiments, the treatment portion is configured to be coupled (e.g. releasably) directly to the drivable portion.

30 According to a further aspect of the invention a surface treatment head for a surface treatment tool is provided, the surface treatment head comprising: a chassis comprising one or more guide portions configured to dampen impact of the surface treatment head with other structures when in use; a drivable portion configured to be coupled to a treatment portion arranged to engage a surface to be treated, wherein the drivable portion
35 is coupled to the chassis and configured for movement with respect to the chassis, wherein, in use, the drivable portion and the treatment portion form a surface treatment element which defines a treatment area of a surface to be treated; and a driving means

configured to drive movement of the drivable portion relative to the chassis, wherein the driving means comprises an eccentric drive mechanism configured such that, when in use, the surface treatment element is configured to engage a surface to be treated in a cyclical motion in which a portion of the surface treatment element faces in substantially the same direction throughout the cyclical motion, wherein movement of the surface treatment element throughout the cyclical motion defines a perimeter of the treatment area. Optionally wherein the one or more guide portions extend within, up to or beyond the perimeter of the treatment area.

In some embodiments, the surface treatment head comprises an intermediate component (e.g. a support plate) configured to be coupled (e.g. releasably) to said drivable portion and releasably coupled to said treatment portion. In some embodiments, the treatment portion is configured to be coupled (e.g. releasably) directly to the drivable portion.

It will be appreciated that any of the optional features disclosed herein may be applied to any of the aspects of the disclosure. All possible combinations are not recited herein for the sake of brevity.

BRIEF DESCRIPTION OF THE DRAWINGS

The present disclosure will now be described, by way of example only, with reference to the following figures in which:

Figure 1 is an exploded perspective view of a surface treatment tool according to an embodiment;

Figure 2 is a cross-sectional view of a spine of the surface treatment tool of Figure 1;

Figure 3 is a perspective view of a surface treatment head of the surface treatment tool of Figure 1, according to an embodiment;

Figure 4 is a plan view of the surface treatment head of Figure 3;

Figure 5 is a side view of the surface treatment head of Figures 3 and 4, taken in cross-section along line A-A of Figure 4;

Figure 6 is an enlarged view of a limiting mechanism of Figure 5;

Figure 7 is a side view of the surface treatment head of Figures 3 to 6, taken in cross-section along line B-B of Figure 4;

Figure 8 is a side view of the surface treatment head of Figures 3 to 7, taken in cross-section along line C-C of Figure 4;

Figure 9 is a schematic representation of the surface treatment head view of Figures 3 to 8;

Figure 10 is a perspective view of a surface treatment head of the surface treatment tool of Figure 1, according to a further embodiment;

5 Figure 11 is a plan view of the surface treatment head of Figure 10;

Figure 12 is a schematic representation of the surface treatment head view of Figures 10 and 11;

Figure 13 is an enlarged cross-sectional view of a squeegee assembly of the surface treatment heads of Figures 3 to 12, according to an embodiment;

10 Figure 14 is an enlarged cross-sectional view of a squeegee assembly of the surface treatment heads of Figures 3 to 12, according to a further embodiment;

Figure 15 is a perspective view of an end of the squeegee assemblies of Figures 13 and 14;

Figure 16 is a front view of the squeegee assembly of Figure 13;

15 Figure 17 a schematic representation of the movable surface treatment element and guide elements of the surface treatment heads of Figures 3 to 12;

Figure 18 is an enlarged view of an end of the surface treatment head of Figure 4; and

20 Figure 19 a schematic representation of a movable surface treatment element and a body with guide portions of a surface treatment head, according to a further embodiment;

DETAILED DESCRIPTION

25 Referring firstly to Figure 1, a surface treatment tool is indicated at 200. The surface treatment tool 200 has an elongate body 202 with a first end 204, having a handle 206 with a first handgrip portion 208a and a second handgrip portion 208b, and a second end 210 distal the first end 204 configured to be coupled to a surface treatment head 10.

30 The surface treatment tool 200 has a fluid outlet 212 (as shown in Figure 5) configured to apply fluid to a surface S to be treated. In the illustrated embodiment, the fluid outlet 212 is provided on the surface treatment head 10. As will be described in more detail below, the surface treatment head 10 also includes a suction region 106 (as shown in Figure 5) configured to suck fluid from the surface S to be treated.

35 The elongate body 202 includes: a fluid tank 214 in fluid communication with the fluid outlet 212; a waste tank 216A in fluid communication with the suction region 106 and configured to collect fluid and/or debris removed from the surface S via the suction

region 106; and a power source 218 configured to supply power to the surface treatment tool 200. In the illustrated embodiment, the elongate body 202 also includes user controls 220 for controlling operation of the surface treatment tool 200.

5 In the illustrated embodiment, the elongate body 202 includes a spine 222 defining a longitudinal axis A_L extending between the first end 204 and the second end 206 of the elongate body 202. The fluid tank 214, waste tank 216A and power source 218 are each removably coupled to the spine 222.

10 In the illustrated embodiment, the fluid tank 214 is shaped to wrap around a portion of the spine 222 and the waste tank 216A is shaped to wrap around a portion of the spine 222. In the illustrated embodiment, the power source 218 is located proximal the spine 222 and the fluid tank 214 is also shaped to wrap around a portion of the power source 218. In alternative embodiments, the waste tank 216A is shaped to wrap around a portion of the power source 218.

15 In the illustrated embodiment, each of the fluid tank 214, the waste tank 216A and the power source 218 are coupled to the spine 222 such that the bulk of the fluid tank 214, the waste tank 216A and the power source 218 is located at a first side 224 of the spine 222. In other words, while the fluid tank 214 and waste tank 216A partially wrap around the spine 222 (and thus have portions behind the first side 224), the majority of these components 214, 216A, 218 is located at the first side 224. In the illustrated
20 embodiment, the first side 224 corresponds to a treatment direction D_t when the surface treatment tool 200 is in normal use. In alternative embodiments, one or more of the fluid tank 214, waste tank 216A, and/or power source 218 is located on an opposite side of the spine 222 to the first side 224.

25 In the illustrated embodiment, the first handgrip portion 208a is an elongate handle with a longitudinal axis A_h which is coaxial with the longitudinal axis A_L of the elongate body 202 (i.e. the longitudinal axis A_L of the spine 222). In alternative embodiments, the longitudinal axis A_h of the first handgrip portion 208a is parallel to, but not coaxial with, the longitudinal axis A_L of the elongate body 202 (i.e. the longitudinal axis A_L of the spine 222).

30 In the illustrated embodiment, the second handgrip portion 208b is an elongate handle with a longitudinal axis A_i which is coaxial with the longitudinal axis A_L of the elongate body 202 (i.e. the longitudinal axis A_L of the spine 222). In alternative embodiments, the longitudinal axis A_i of the second handgrip portion 208b is parallel to, but not coaxial with, the longitudinal axis A_L of the elongate body 202 (i.e. the longitudinal
35 axis A_L of the spine 222).

In the illustrated embodiment, the first and second handgrip portions 208a,b are substantially parallel to each other and co-axial with each other. The first and second

handgrip portions 208a,b are spaced apart from each other along the elongate body 202. In the illustrated embodiment, the first and second handgrip portions 208a,b are spaced apart from each other by about 20-30cm, e.g. 25cm.

5 With reference to Figure 2, the spine 222 has an interior profile 226 configured to carry a fluid supply path arranged to couple the fluid outlet 212 with the fluid tank 214, and/or a waste removal path arranged to couple the suction region 106 to the waste tank 216A, and/or a power supply line arranged to carry power from the power source 218 to the surface treatment head 10.

10 In some embodiments (not shown), the interior profile 226 of the spine 222 is configured to receive the power source 218 such that the power source 218 may be located at least partially within the spine 222. In other embodiments, the handle 206 has an interior profile configured to receive the power source 218 such that the power source 218 may be located at least partially within the handle 206. In other embodiments, the power source 218 is partially located within the interior region 226 of the spine 222 and partly
15 located within an interior region of the handle 206.

In such embodiments, the power source 218 may be removably located at least partially within the spine 222 and/or handle 206. As shown in Figure 1, the power source 218 has an elongate portion 218a (i.e. a lower portion as viewed in the figure). In
20 embodiments where the power source 218 is removably located within the spine 222, the elongate portion 218a of the power source 218 is coaxial with the longitudinal axis A_L of the spine 222, when the power source 218 is located at least partly within the spine 222.

As illustrated in Figure 2, the interior profile 226 of the spine 222 defines a volume V_f corresponding to the fluid supply path between the fluid tank 214 and fluid outlet 212. It will be understood that such a fluid path runs from the fluid tank 214, downwards
25 through volume V_f to the second end 210 of the spine 222 and through a fluid conduit (not shown) to the fluid outlet 212 on the surface treatment head 10. The interior profile 226 also defines a volume V_w corresponding to the waste removal path between the suction region 106 and the waste tank 216A. It will be understood that such a waste path runs from the suction region 106 of the surface treatment head 10, through a suction
30 connection arrangement 138 (e.g. a pipe in the embodiment of Figure 1) and then upwards through volume V_w to the waste tank 216A via connection point 223. In other embodiments, part of the fluid supply path and/or waste removal path may be provided within a profile of the spine 222 (e.g. a recess on an outer surface of the spine 222) and another part of the fluid supply path and/or waste removal path may be provided by
35 another component (e.g. a pipe or cover). The interior profile 226 of the spine 222 also defines a volume V_p in which a power supply line (e.g. for supplying power to components below the power source 218) can be located.

In the illustrated embodiment, the elongate body 202 also includes a suction source 228 for sucking fluid and/or debris from the suction region 106 to the waste tank 216A. In particular, the suction source 228 is provided as a suction unit having a motor (e.g. a digital motor).

5 In the embodiment of Figure 1, the waste tank 216A is part of a waste tank module 216. The waste tank module 216 also includes a waste tank receiving structure 216B configured to couple the waste tank 216A to the spine 222 of the elongate body 202. The waste tank module 216 defines a volume (i.e. defined by the sum of a volume of the waste tank 216A and a volume of the waste tank receiving structure 216B).

10 In the illustrated embodiment, the suction source 228 is coupled directly to the waste tank module 216 such that it is in fluid communication with the volume defined by the waste tank module 216. In particular, the suction source 228 is coupled to the waste tank module 216 such that a seal is formed between the suction source 228 and the waste tank module 216. In some embodiments, the suction source 228 and/or waste tank
15 module 216 has a seal (e.g. gasket) for this purpose.

When the surface treatment tool 200 is assembled, the elongate body 202 is coupled to a bracket arrangement 30 of the surface treatment head 10 via a joint arrangement 230. For example, Figures 3, 4, 5, 7 and 8 show a first connecting member 211 for coupling to a second connecting member (not shown) provided at the second end
20 210 of the elongate body 202 (i.e. a bottom end of the spine 222). The first connecting member 211 is coupled to the bracket arrangement 30 via the joint arrangement 230. The joint arrangement 230 is configured to permit pivoting of the elongate body 202 with respect to the surface treatment head 10 about a first axis 232 (shown in Figure 8) and about a second axis 234 (shown in Figure 4). The second axis 234 is perpendicular to the
25 first axis 232.

In the illustrated embodiment, the second axis 234 intersects the first axis 232. In addition, the joint arrangement 230 is located below an upper surface of the surface treatment head 10 (i.e. below an upper surface of the cover 25 described below), which helps to keep a height of the surface treatment head 10 low.

30 In alternative embodiments, the first and second axes 232, 234 are spaced apart. For example, one of the first and second axes 232, 234 may be located above the upper surface of the surface treatment head 10.

In alternative embodiments, the elongate body 202 is coupled to the surface treatment head 10 (e.g. to the bracket arrangement 30) via a resilient coupling such as a
35 spring or rubber cylinder.

In the illustrated embodiment, the joint arrangement 230 is offset from the longitudinal axis A_L of the elongate body 202 (i.e. the longitudinal axis A_L of the spine

222). In other words, the second end 210 of the elongate body 202 is coupled to the bracket arrangement 30 by a bent/angled portion 236 which is out of alignment with the elongate body 202 (i.e. out of alignment with the spine 222). This enhances manoeuvrability of the surface treatment tool 200.

5 In exemplary embodiments, the joint disclosed in patent application GB2104339.3 may be used. Alternatively a universal joint may be used, or any other suitable joint arrangement.

10 Referring now to Figures 3 to 8, the surface treatment head 10 of the surface treatment tool 200 is shown in more detail. The surface treatment head 10 is configured to engage the surface S to be treated and has a first end 12, middle portion 13, second end 14, front edge 16, rear edge 18, and a chassis 20.

15 The surface treatment head 10 has a first treatment component 22 having a body 24 and a first treatment element 26 configured to engage a surface S to be treated. In the illustrated embodiment, the first treatment element 26 is configured for movement with respect to the body 24, and the first treatment component 22 has a driving means 27 (shown in Figure 1) such as an electric motor (e.g. digital motor) configured to drive the surface treatment element 26 to effect treatment of a surface S to be treated. The body 24 has an annular mount 28 for the driving means 27 which is visible in Figures 3 to 7 without the driving means 27 in place. In alternative embodiments, the first treatment element 26 may be configured to move in unison with the body 24 (i.e. may be a static treatment element).

25 In the illustrated embodiment, the first treatment element 26 is formed of a drivable portion 26A coupled to the driving means of the body 24, and a treatment portion 26B coupled to the drivable portion 26A. In some embodiments, the entire first surface treatment element 26 is releasably coupled to the driving means of the body 24 (e.g. for cleaning and/or replacement when dirty and/or worn after use). In other embodiments, the drivable portion 26A is fixed to the driving means of the body 24 and the treatment portion 26B is releasably coupled to the drivable portion 26A (e.g. for cleaning and/or replacement when dirty and/or worn after use).

30 In some embodiments, an intermediate component (e.g. a support plate) is located between the treatment portion 26B and the drivable portion 26A. For example, the treatment portion 26B may be coupled (e.g. releasably) to the intermediate component and/or the intermediate component may be coupled (e.g. releasably) to the drivable portion 26A. In such embodiments, it may be easier to remove the treatment portion 26B from the first treatment component 22 by first de-coupling the intermediate component from the drivable portion 26A, and then de-coupling the treatment portion 26B from the intermediate component. In effect, the intermediate component can be considered a part

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(e.g. a removable part) of the treatment portion 26B, or a part (e.g. a removable part) of the drivable portion 26A.

Such couplings (e.g. releasable couplings) between the treatment portion 26B, drivable portion 26A and/or intermediate component may be of any suitable kind (e.g. hook-and-eye fasteners, magnetic coupling, snap-fit coupling, resilient coupling, threaded coupling, or any other suitable type of releasable coupling).

In embodiments where the first treatment element 26 is static with respect to the body 24, the surface treatment element 26 may just be formed of the treatment portion 26B (e.g. the treatment portion 26B may be directly mounted to the body 24, or to an intermediate component directly mounted to the body 24, and the drivable portion 26A may be omitted).

The treatment portion 26B may be a pad, brush and/or sponge (e.g. for cleaning) or any other suitable type of element (e.g. elements for alternative types of treatment such as polishing or waxing).

The first treatment component 22 has a cover 25 which covers the body 24, driving means 27 and mount 28. The cover 25 is shown in partial cutaway view in Figure 1, but is omitted from Figures 3 to 8 to show the components underneath more clearly. It will be understood that the full cover 25 will correspond substantially to the size and shape of the body 24 in plan view.

The first treatment component 22 includes the fluid outlet 212 which is provided proximal the front edge 16 of the first treatment component 22 (e.g. coupled to a front of the body 24 and/or cover 25). In this way, the fluid outlet 212 is configured to apply fluid to a region of the surface to be treated forward of the first surface treatment element 26 with respect to the treatment direction D_t .

The surface treatment head 10 also has a second treatment component 100 having a mounting arrangement 102 and a second treatment element 104 configured to engage the surface S to be treated. As will be described in more detail below, the second treatment element 104 in the illustrated embodiment is formed of a rear elongate squeegee blade 104A and a front elongate squeegee blade 104B which define a suction region 106 therebetween. The suction region 106 is configured to suck fluid and/or debris from the surface S to be treated. The suction region 106 is provided to a rear of the first treatment element 26 with respect to the treatment direction D_t (i.e. proximal, but behind the first treatment element 26).

As best illustrated in Figure 4, the first and second ends 12, 14 of the surface treatment head 10 project forward of the middle portion 13 in the treatment direction D_t . In the illustrated embodiment, this is achieved by having a curved front edge 16 and rear edge 18. In alternative embodiments, a rear edge the surface treatment head with respect

to a treatment direction of the surface treatment tool comprises a first end, a second end and a middle portion located between the first and second ends, wherein the middle portion of the rear edge projects rearward of the first and second ends with respect to a treatment direction of the surface treatment head. In some embodiment, the front edge
5 may be V-shaped, curved or substantially straight.

In the illustrated embodiment, the portions of the first and second treatment components 22, 100 at the first and second ends 12, 14 of the surface treatment head 10 project forward of the portions of the first and second treatment components 22, 100 at the middle portion 13 of the surface treatment head 10. In other words, the front edge 16
10 of the surface treatment head 10 is defined by a curved front edge of the first treatment component 22, the rear edge 18 of the surface treatment head 10 is defined by a curved rear edge of the second treatment component 100, edges of the first and second treatment components 22, 100 which face each other are also curved (e.g. of complementary profile to each other). In alternative embodiments, the front and/or rear edges 16, 18 are defined
15 by a substantially V-shaped profile in plan view. In alternative embodiments, edges of the first and second treatment components which face each other are substantially straight, or comprise any other desired profile. In alternative embodiments, the rear edge of the second treatment component may be substantially straight, or comprise any other desired profile.

20 In the illustrated embodiment, the first treatment element 26 is of a similar shape to the first treatment component 22 in which the first and second ends project forward of the middle portion in the treatment direction D_t .

In other embodiments, the surface treatment head 10, and/or the first and second treatment components 22, 100 and/or the first treatment element 26 are of a different
25 shape in which the first and second ends do not project forward of the middle portion. For example, they may be of substantially rectangular shape (as shown in Figure 19), triangular, trapezoidal, or of any other suitable shape.

In the illustrated embodiment, the body 24 of the first treatment component 22 and the mounting arrangement 102 of the second treatment component 100 form the
30 chassis 20 together with a bracket arrangement 30.

With reference to Figure 3, the bracket arrangement 30 is configured to couple the first and second treatment components 22, 100 together. The bracket arrangement 30 is also configured such that when a load L is applied to the bracket arrangement 30 (e.g. by the elongate body 202), the load L is distributed between the first and second treatment
35 components 22, 100 and applied to the surface S to be treated, such that the entire load is transferred to the surface S via the first and second treatment components 22, 100. In particular, a first predetermined amount L_1 of the load L is applied to the first treatment

component 22 and a second predetermined amount L2 of the load L is applied to the second treatment component 100. Although Figure 3 shows two arrows labelled L1 and two arrows labelled L2 (i.e. each arrow shown on a different arm of the bracket arrangement 30), it will be understood that the first predetermined amount L1 is the total amount of load L applied to the first treatment component 22 (i.e. the sum of the loads applied via the arrows marked L1 in Figure 3) and the second predetermined amount L2 is the total amount of load L applied to the second treatment component 100 (i.e. the sum of the loads applied via the arrows marked L2 in Figure 3).

In some embodiments, the first predetermined amount L1 is in the range of 30 to 70% (e.g. 40 to 60% or 45% to 55%) of the total load L applied to the bracket arrangement 30. In some embodiments, the second predetermined amount L2 is in the range of 30 to 70% (e.g. 40 to 60% or 45% to 55%) of the total load L applied to the bracket arrangement. For example, 50% of the load L applied to the bracket arrangement 30 is transferred to the first treatment component 22 and 50% of the load L applied to the bracket arrangement 30 is transferred to the second treatment component 100.

In the illustrated embodiment, a contact plane P (as shown in Figure 5) of the surface treatment head 10 is defined only by the first and second treatment elements 26, 104. In other words, when the surface treatment head is resting on a surface S, the first and second treatment elements 26, 104 are the only parts of the surface treatment head 10 that contact the surface S. In this way, the entire load L applied to the bracket arrangement 30 is transferred to the first and second treatment elements 26, 104. Put another way, the sum of the first and second predetermined amounts L1, L2 equals the load L applied to the bracket arrangement 30. This improves contact between each of the first and second treatment elements 26, 104 and the surface S to be treated, which improves performance of the surface treatment head 10.

In the illustrated embodiment, the bracket arrangement 30 has a first connection structure 32 coupled to the first treatment component 22. The first connection structure 32 includes a first arm 32A and a second arm 32B each coupled to the first treatment component 22 along a first transverse axis A_{t1} (as shown in Figure 4) extending perpendicular to a treatment direction D_t of the surface treatment head 10. In particular, the first treatment component has an upper surface (i.e. an upper surface 34 of the body 24) and arm recesses 35A, 35B provided in the upper surface 34. The first and second arms 32A, 32B are coupled to the first treatment component 22 within the respective arm recesses 35A, 35B such that the first and second arms 32A, 32B are partly located below the upper surface 34. Although not clearly visible in the figures, the cover 25 described above also has an upper surface and arm recesses provided in the upper surface of the cover 25 such that the first and second arms 32A, 32B are partly located below the

upper surface of the cover 25. In alternative embodiments, the first and second arms 32A, 32B are coupled to an upper surface (e.g. the upper surface 34 of the body 24, or an upper surface of the cover 25).

5 The first and second arms 32A, 32B are arranged on either side of a central axis A_c (see Figure 4) of the surface treatment head 10 (which also corresponds to a central axis of the first treatment component 22). The central axis A_c extends along the treatment direction D_t of the surface treatment head 10. In the illustrated embodiment, the first and second arms 32A 32B are symmetrically positioned with respect to the central axis A_c . In the illustrated embodiment, the first transverse axis A_{t1} extends through a midpoint of the driving means 27. For example, the midpoint of the driving means may be a geometric
10 midpoint or a midpoint with respect to a centre of gravity of the driving means 27.

In some embodiments, the transverse axis A_{t1} is located proximal a midpoint of the driving means, optionally extending behind a midpoint of the driving means (i.e. towards a rear of the first treatment component. In some embodiments, the first transverse axis
15 A_{t1} extends within a centre third of the first treatment component 22, between a frontmost and rearmost point of the first treatment component 22, e.g. the first transverse axis A_{t1} defines a midpoint between a frontmost and rearmost point of the first treatment component 22.

The bracket arrangement 30 also has a second connection structure 36 coupled to
20 the second treatment component 100. The second connection structure 36 includes a third arm 36A and a fourth arm 36B each coupled to an upper surface 136 of the second treatment component 100 (i.e. an upper surface of the mounting arrangement 102) along a second transverse axis A_{t2} extending perpendicular to the treatment direction D_t of the surface treatment head 10. In alternative embodiments, the third and fourth arms 36A,
25 36B are embedded below the upper surface 136 of the second treatment component 100 (e.g. in arm recesses similar to those described above in relation to the first treatment component 22).

In the illustrated embodiment, the second transverse axis A_{t2} is in alignment with the joint arrangement 230. In some embodiment, the second transverse axis A_{t2} extends
30 within a centre third of the second treatment component 100, between a frontmost and rearmost point of the second treatment component 100, e.g. the second transverse axis A_{t2} defines a midpoint between a frontmost and rearmost point of the second treatment component 100.

The third and fourth arms 36A, 36B are arranged on either side of the central axis
35 A_c of the surface treatment head 10 (which also corresponds to a central axis of the second treatment component 100). In the illustrated embodiment, the third and fourth arms 36A, 36B are symmetrically positioned with respect to the central axis A_c .

It will be understood that the first to fourth arms 32A, 32B, 36A, 36B spread out the application of load L from the bracket arrangement 30 across the respective first and second treatment components 22, 100. For example, half of the first predetermined amount L1 is applied to the first treatment component 22 by the first arm 32A and the other half of the first predetermined amount L1 is applied to the first treatment component 22 by the second arm 32B. Similarly, half of the second predetermined amount L2 is applied to the second treatment component 100 by the third arm 36A and the other half of the second predetermined amount L2 is applied to the second treatment component 100 by the fourth arm 36B.

In alternative embodiments, the first connection structure 32 has a single arm or more than two arms and/or the second connection structure 36 has a single arm or more than two arms.

As best illustrated in Figures 5 and 9, the bracket arrangement 30 is configured to couple the first and second treatment components 22, 100 together such that relative movement therebetween is permitted in a direction D_v perpendicular to the surface S to be treated. For example, where the surface S is horizontal (and thus the direction D_v perpendicular to the surface S is vertical), vertical movement between the first and second treatment components 22, 100 is permitted. This facilitates engagement of each treatment component 22, 100 with a surface S having varying heights (e.g. the stepped surface S of Figure 9). In other words, as the surface treatment head 10 moves over an uneven/undulating surface S, the first and second treatment components 22, 100 can rise or fall with respect to each other as they pass over undulations in the surface S.

In the illustrated embodiment, the first treatment component 22 is pivotally coupled to the bracket arrangement 30 and the second treatment component 100 is pivotally coupled to the bracket arrangement 30. The bracket arrangement 30 is also configured to be pivotally coupled to the elongate body 202 (i.e. by virtue of the joint arrangement 220). In this way, by simultaneous pivoting of the first and second treatment components 22, 100 in the same direction relative to the bracket arrangement 30, as well as pivoting of the bracket arrangement 30 relative to the elongate body 202, linear movement between the first and second treatment components 22, 100 (i.e. in direction D_v) is achieved.

In the illustrated embodiment, each of the first to fourth arms 32A, 32B, 36A, 36B includes a pivot pin 38. The pivot pins 38 are received in clamps 40 of the respective treatment components 22, 100 (see Figure 7). The clamps 40 prevent linear movement of the pivot pins 38 relative to the respective treatment components 22, 100, but permit rotation of the pivot pins 38 within the respective clamps 40. In this way, pivoting of the

first and second treatment components 22, 100 relative to the bracket arrangement 30 is achieved.

Referring now to Figures 5 and 6, the surface treatment head 10 has a limiting mechanism 42 configured to limit relative movement between the first and second treatment components 22, 100. In particular, the first connection structure 32 and first treatment component 22 are configured to interact to define a permitted range of movement (i.e. pivoting) therebetween. Similarly, the second connection structure 36 and second treatment component 100 are configured to interact to define a permitted range of movement (i.e. pivoting) therebetween.

As best illustrated in Figure 6, the limiting mechanism 42 includes abutment surfaces 44 on the first treatment component 22 configured to abut the first connection structure 32 (i.e. the first and second arms 32A, 32B) to limit relative movement between the first treatment component 22 and the bracket arrangement 30. In the illustrated embodiment, the abutment surfaces 44 of the first treatment component are configured to abut opposing sides of the first and second arms 32A, 32B to define a maximum and minimum of the permitted range of movement.

In the illustrated embodiment, each abutment surface 44 is angled relative to the surface contact plane P defined by the first treatment element 26. While Figures 5 and 6 illustrate the first arm 32A in a middle position of the range of movement, it will be understood that when the first arm 32A is pivoted so that it abuts one of the abutment surfaces 44, the first arm 32A and respective abutment surface 44 would be parallel to each other.

With reference to Figure 5, the limiting mechanism 42 also includes similar abutment surfaces 44 on the second treatment component 100 configured to abut the second connection structure 36 (i.e. the third and fourth arms 36A, 36B) to limit relative movement between the second treatment component 100 and the bracket arrangement 30. In the illustrated embodiment, the abutment surfaces 44 of the second treatment component 100 are configured to abut opposing sides of the third and fourth arms 36A, 36B to define a maximum and minimum of the permitted range of movement.

It will be understood that since linear movement between the first and second treatment components 22, 100 (i.e. in direction D_v) is achieved by simultaneous pivoting of the first and second treatment components 22, 100 relative to the bracket arrangement, having abutment surfaces 44 of the limiting mechanism 42 which limit pivoting between the respective treatment components 22, 100 and bracket arrangement also limits relative linear movement between the first and second treatment components 22, 100 (i.e. in direction D_v).

In some embodiments, the limiting mechanism 42 is adjustable. For example, the abutment surfaces 44 may be movable to adjust the extent to which the respective treatment component 22, 100 is free to pivot with respect to the bracket arrangement 30. In such embodiments, a distance between the abutment surfaces 44 and the respective arms 32A, 32B, 36A, 36B may be adjustable. For example, each abutment surface 44 may be coupled to the respective treatment component 22, 100 via an attachment mechanism (e.g. having complementary threads), and the distance between each abutment surface 44 and the respective arm 32A, 32B, 36A, 36B is adjustable by adjustment of the attachment mechanism (e.g. by relative rotation between the complementary threads). In such embodiments, each abutment surface 44 may include a bolt, screw or other threaded fastener coupled to a complementary threaded bore in the respective treatment component 22, 100, or vice versa. In some embodiments, each abutment surface 44 comprises a bolt, screw or other threaded fastener (e.g. the bolt, screw or threaded fastener directly abuts against the respective arm 32A, 32B, 36A, 36B).

Alternatively (or additionally), an angle of the abutment surfaces 44 relative to the surface contact plane P may be adjustable.

In the illustrated embodiment (see Figure 6) the first arm 32A comprises abutment surfaces 33 for abutment with abutment surfaces 44 of the first treatment component 22. In the illustrated embodiment the abutment surfaces 33 of the first arm are parallel to each other. In alternative embodiments, the abutment surfaces may be angled with respect to each other. A similar arrangement is provided at all the arms 32B, 36A, 36B.

It will be appreciated that any suitable configuration of corresponding abutment surfaces can be used to achieve the desired limiting effect. For example, pivot pins 38 may be fixed with respect to the respective arm and comprise abutment surfaces configured to engage corresponding abutment surfaces of the respective treatment component.

Referring now to Figures 10 to 12, an alternative surface treatment head 10 for the surface treatment tool 200 is shown. Common features between the surface treatment heads 10 of Figures 3 to 9 and 10 to 12 are given the same reference numeral.

It will be understood that as the surface treatment head 10 of Figures 3 to 9 is moved along the surface S in the treatment direction D_t , friction between the respective surface treatment elements 26, 104 and the surface S may urge the rearmost treatment component (i.e. the second treatment component 100) to pivot to such an extent that the rearmost surface treatment element (i.e. second surface treatment element 104) lifts or disengages from the surface S to some extent. This may cause a seal between a rear of the suction region 106 and the surface S to be broken. This may also lead to increased drag making it harder to push the surface treatment head 10 in the treatment direction D_t .

In the embodiment of Figures 10 to 12, the surface treatment head 10 is configured to restrict pivoting of the first and second treatment components 22, 100 relative to each other to a pre-determined range of movement. This inhibits such an undesirable pivoting of the second treatment component 100 when in use. In particular, the second treatment component 100 has projections 140 (e.g. "tabs") configured to co-operate with the first treatment component 22 to limit relative movement therebetween. In alternative embodiments, the first treatment component 22 has projections 140 which are configured to co-operate with the second treatment component 22 to limit movement therebetween.

In the embodiment of Figures 10 to 12, the projections 140 co-operate with the upper surface 34 of the first treatment component 22 to limit pivoting of the second treatment component 100 out of engagement with the surface S. In alternative embodiments, the projections 140 may co-operate with a lower surface of the first treatment component 22 (or the second treatment component 100 when the projections 140 are provided on the first treatment component 22). In alternative embodiments, the projections 140 are received in corresponding recesses in the first treatment component 22 (or the second treatment component 100 when the projections 140 are provided on the first treatment component 22). In some embodiments, the projections 140 are received in corresponding channels in the first treatment component 22 (or the second treatment component 100 when the projections 140 are provided on the first treatment component 22). The projection 140 is configured to move along the corresponding channel, thereby permitting relative linear movement between the first and second treatment components, but limiting relative pivotal movement.

With reference to Figure 12, it will be understood that since the projections 140 contact the upper surface 34 of the first treatment component 22, pivoting of the second treatment component 100 in the opposite direction (e.g. in a clockwise direction as viewed in Figure 12) is not inhibited (e.g. when this is necessary for tracking an angle change in the surface S). In alternative embodiments, pivoting in both directions (i.e. clockwise and anti-clockwise as viewed in Figure 12) is inhibited.

Because of the curved shape of the second surface treatment element 104 (i.e. curved shape of squeegee blades 104A, 104B), the portions proximal the first and second ends 12, 14 of the surface treatment head may have a greater frictional force applied as they move over surface S. Therefore, in the embodiment of Figures 10 to 12 the projections 140 are provided proximal the first and second ends 12, 14 of the surface treatment head 10.

In alternative embodiments, a different mechanism to inhibit pivoting other than the projections 140 is provided. Such an alternative mechanism to inhibit pivoting, but permit relative vertical movement, can be of any suitable type including one or more

structures 140 on a first of the treatment components 22, 100 configured to co-operate with one or more complementary structures 141 of the other treatment component 22, 100 (e.g. to co-operate by abutting, or by one structure 140 being received at least partly within a complementary structure 141).

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Referring now to Figures 13, 15 and 16, the second treatment component 100, which defines a squeegee assembly, is shown in more detail.

As a reminder, the squeegee assembly 100 has a rear elongate squeegee blade 104A and a front elongate squeegee blade 104B which define a suction region 106 therebetween.

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The rear squeegee blade 104A has a fixed portion 108A secured by the mounting arrangement 102. Similarly, the front squeegee blade 104B has a fixed portion 108B secured by the mounting arrangement 102. In the illustrated embodiment, the fixed portions 108A, 108B are secured to the mounting arrangement 102 by lugs 110 of the mounting arrangement 102 and corresponding receivers 111 (e.g. apertures) in the respective squeegee blade 104A, 104B. In alternative embodiments, the squeegee blades 104A, 104B have lugs 110 and the mounting arrangement 102 has corresponding receivers 111. In alternative embodiments, other fasteners are used, and/or the mounting arrangement 102 is configured to grip the fixed portion 108 (e.g. to hold via an interference fit/friction).

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The rear squeegee blade 104A also has a flexible wiper 112A configured to contact the surface S to be treated when in use (e.g. as illustrated in Figure 13). Similarly, the front squeegee blade 104B has a flexible wiper 112B configured to contact the surface S to be treated when in use (e.g. as illustrated in Figure 13).

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With reference to Figure 16, the rear squeegee blade 104A has a first end 114A and a second end 116A and a length extending therebetween. The fixed portion 108A and flexible wiper 112A of the rear squeegee blade 104A extend between the first and second ends 114A, 116A. When viewed from the sectional side view of Figure 13, it can be seen that the rear squeegee blade 104A has a front surface 118A facing in a generally forward direction (i.e. with respect to the treatment direction D_t), and a rear surface 120A facing in a generally rearward direction D_r . The rear squeegee blade 104A also has a first edge 122A proximal the fixed portion 108A and a second edge 124A proximal the flexible wiper 112A (i.e. in contact with surface S in use). The first and second edges 122A, 124A define a height H1 of the rear squeegee blade 104A.

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Similarly, the front squeegee blade 104B has a first end 114B and a second end 116B and a length extending therebetween. The fixed portion 108B and flexible wiper 112B of the front squeegee blade 104B extend between the first and second ends 114B,

116B. When viewed from the sectional side view of Figure 13, it can be seen that the front squeegee blade 104B has a front surface 118B facing in a generally forward direction (i.e. with respect to the treatment direction D_t), and a rear surface 120B facing in a generally rearward direction D_r . The front squeegee blade 104B also has a first edge 122B proximal the fixed portion 108B and a second edge 124B proximal the flexible wiper 112B (i.e. in contact with surface S in use). The first and second edges 122B, 124B define a height H2 of the front squeegee blade 104B.

As will be described in more detail below, the squeegee assembly 100 has a first support formation 126 configured to cooperate with the rear squeegee blade 104A such that at least a portion of the flexible wiper 112A of the rear squeegee blade 104A is arranged to extend in a generally rearward direction D_r and such that deflection of at least said portion of the flexible wiper 112A in a generally forward direction D_t is inhibited.

As shown in Figure 13, the front surface 118A of the rear squeegee blade 104A forms a contact angle θ_1 with the surface S to be treated when the squeegee assembly 100 rests on the surface S. The first support formation 126 is configured to cooperate with the rear squeegee blade 104A such that the contact angle θ_1 is an acute angle, and such that deflection of the flexible wiper 112A of the rear squeegee blade 104A such that the contact angle θ_1 is greater than 90° is inhibited. In the illustrated embodiment, the contact angle θ_1 is approximately 45° . In some embodiments, the support formation 126 is configured to cooperate with the squeegee blade 104A such that the contact angle θ_1 varies along a length of the squeegee blade, e.g. such that the contact angle θ_1 increases proximal the first and/or second ends of the squeegee blade 104A.

To orient the rear squeegee blade 104A, the first support formation 126 is configured to cooperate with at least a portion of the front surface 118A and a portion of the rear surface 120A of the rear squeegee blade 104A. In particular, the first support formation 126 includes a front support structure 126a configured to contact the front surface 118A of the rear squeegee blade 104A and a rear support structure 126b configured to contact the rear surface 120A of the rear squeegee blade 104A.

It will be understood that the front support structure 126a is sufficient to cooperate with the front surface 118A of the rear squeegee blade 104A such that the flexible wiper 112A of the rear squeegee blade 104A extends in the generally rearward direction D_r and such that deflection of the flexible wiper 112A in the generally forward direction (i.e. the treatment direction D_t) is inhibited. However, with the addition of the rear support structure 126b, the flexible wiper 112A of the rear squeegee blade 104A is also inhibited from flexing further in the rearward direction D_r , even if a load is applied to the rear squeegee blade 104A). In other words, the front and rear support structures 126a, 126b together maintain a contact angle θ_1 within a predetermined range, which allows a suitable

contact angle θ_1 to be maintained throughout a wide range of operating conditions and loads applied to the rear squeegee blade 104A.

In alternative embodiments, only the rear support structure 126b is provided (i.e. the front support structure 126a is not present). This provides a simple means for
5 controlling the degree of deflection of the rear squeegee blade 104A when in use.

In the illustrated embodiment, the front and rear support structures 126a, 126b each have a guide projection in the form of a guide wall 128a, 128b which contacts the respective surface of the rear squeegee blade 104A along a continuous line of contact along the length of the rear squeegee blade 104A. The guide walls 128a, 128b are angled
10 to extend in the generally rearward direction D_r (i.e. the guide walls 128a, 128b form an acute angle to the surface S which is within the predetermined range of the contact angle θ_1). As can be seen in figure 13, the guide walls 128a, 128b are also configured to contact the rear squeegee blade 104A along a portion of a height of the rear squeegee blade 104. In this way, the guide walls 128a, 128b are arranged to contact an area of the rear
15 squeegee blade 104A.

In some embodiments, the front and/or rear support structure 126a,b is provided by a rigid structure, e.g. the guide wall 128a, 128b. In some embodiments, the front and/or rear support structure 126a,b is provided by another squeegee or similar flexible component.

In some embodiments, one or both of the front and rear support structures 126a, 126b includes a plurality of guide projections (e.g. a plurality of guide walls) which contact the respective surface of the rear squeegee blade 104A at one or more discrete points (e.g. a series of discrete points).

In the illustrated embodiment, the first support formation 126 is configured to
25 cooperate with the rear squeegee blade 104A such that the flexible wiper 112A is arranged to extend in the generally rearward direction D_r along the entire length of the rear squeegee blade 104A, and such that deflection of the flexible wiper 112A in the generally forward direction (i.e. the treatment direction D_t) is inhibited along the entire length of the rear squeegee blade 104A. In other words, the guide walls 128a, 128b of the front and
30 rear support structures 126a, 126b of the first support formation 126 extend along the majority, e.g. substantially all, of the length of the rear squeegee blade 104A (e.g. from (e.g. proximal) the first end 114A to (e.g. proximal) the second end 116A of the rear squeegee blade 104A).

It will be understood that portions of the flexible wiper 112A proximal the first and
35 second ends 114A, 116A are most vulnerable to flexing in unwanted directions when the rear squeegee blade 104A is moved on the surface S. Therefore, in some embodiments, only a portion of the flexible wiper 112A of the rear squeegee blade 104A proximal the

first end 114A and/or a portion of the flexible wiper 112A of the rear squeegee blade 104A proximal the second end 116A is arranged to extend in the generally rearward direction D_r and inhibited from flexing forwards. In other words, the guide walls 128a, 128b of the first support formation 126 may be provided only proximal the first and second ends 114A, 116A, with a central portion 130A of the flexible wiper 112A (i.e. a portion between the first and second ends 114A, 116A) unsupported.

In the embodiment of Figure 13, the flexible wiper 112B of the front squeegee blade 104B is free to flex in either direction, at least at the point of the cross-section along line C-C of Figure 4 (i.e. at a central portion 130B of the front squeegee blade 104B). In other words, while there is a front support formation 132 in Figure 13 having front and rear support structures 132a, 132b configured to contact the respective front and rear surfaces 118B, 120B, these front and rear support structures 132a, 132b only contact the fixed portion 108B and not the flexible wiper 112B of the front squeegee blade 104B (at least in cross-section along line C-C). In this embodiment, the flexible wiper 112B of the front squeegee blade 104B is caused to extend in a substantially rearward direction due to the load applied to the squeegee assembly 100 and the forward movement of the surface treatment head 10. However, a second support formation (e.g. a support formation similar to the first support formation 126 and variants described above) may be provided proximal the first and second ends 114B, 116B of the front squeegee blade 104B, or along the entire length (as described below with reference to Figure 14).

In the embodiment of Figure 14, the squeegee assembly 100 has an alternative second support formation 132 configured to cooperate with the front squeegee blade 104B such that at least a portion of the flexible wiper 112B of the front squeegee blade 104B is arranged to extend in a generally rearward direction D_r and such that deflection of at least said portion of the flexible wiper 112B in the generally forward direction D_f is inhibited.

The front surface 118B of the front squeegee blade 104B forms a contact angle θ_2 with the surface S to be treated when the squeegee assembly 100 rests on the surface S. The second support formation 132 is configured to cooperate with the front squeegee blade 104B such that the contact angle θ_2 is an acute angle, and such that deflection of the flexible wiper 112B of the front squeegee blade 104B such that the contact angle θ_2 is greater than 90° is inhibited. In this way, the contact angle θ_2 remains within a predetermined range. In the illustrated embodiment, the contact angle θ_2 is approximately 45° .

In the embodiment of Figure 14, the contact angles θ_1 and θ_2 are approximately equal. In alternative embodiments, the contact angles θ_1 and θ_2 are different to each other (although both still acute angles).

The second support formation 132 includes a front support structure 132a configured to contact the front surface 118B of the front squeegee blade 104B and a rear support structure 132b configured to contact the rear surface 120B of the front squeegee blade 104B. In the embodiment of Figure 14, the rear support structure 132b of the second support formation 132 only contacts the fixed portion 108B and not the flexible wiper 112B of the front squeegee blade 104B. In alternative embodiments, the rear support structure 132b of the second support formation 132 may contact the flexible wiper 112B of the front squeegee blade 104B in a similar manner to the way in which the rear support structure 126b of the first support formation 126 contacts the flexible wiper 112A of the rear squeegee blade 104A.

In the embodiment of Figure 14, the front support structure 132a of the second support formation 132 has a guide projection in the form of a guide wall 134 which contacts the front surface 118B of the front squeegee blade 104B along a continuous line of contact along the length of the front squeegee blade 104B, and the guide wall 134 is angled to extend in the generally rearward direction D_r (i.e. the guide wall 134 forms an angle to the surface S which is within the predetermined range of the contact angle θ_2). As can be seen in figure 14, the guide wall 134 is also configured to contact the front squeegee blade 104B along a portion of a height of the front squeegee blade 104B. In this way, the guide wall 134 is arranged to contact an area of the front squeegee blade 104B.

In some embodiments, the front support structure 132a of the front squeegee blade 104B includes a plurality of guide projections (e.g. a plurality of guide walls) which contact the front surface 118B of the front squeegee blade 104B at one or more discrete points (e.g. a series of discrete points).

In the illustrated embodiment, the second support formation 132 is configured to cooperate with the front squeegee blade 104B such that the flexible wiper 112B is arranged to extend in the generally rearward direction D_r along the entire length of the front squeegee blade 104B, and such that deflection of the flexible wiper 112B in the generally forward direction (i.e. the treatment direction D_t) is inhibited along the entire length of the front squeegee blade 104B. In other words, the guide wall 134 of the second support formation 132 extends along the majority, e.g. substantially all, of the length of the front squeegee blade 104B (e.g. from (e.g. proximal) the first end 14B to (e.g. proximal) the second end 116B of the front squeegee blade 104B). In this way, the guide wall 134 of the second support formation 132 is visible in the cross-section along line C-C of Figure 4 (i.e. along the central axis A_c of the surface treatment head 10).

In alternative embodiments, only a portion of the flexible wiper 112B of the front squeegee blade 104B proximal the first end 114B and/or a portion of the flexible wiper 112B of the front squeegee blade 104B proximal the second end 116B is arranged to

extend in the generally rearward direction D_r and inhibited from flexing forwards. In other words, the guide walls 134 of the second support formation 132 may be provided only proximal the first and second ends 114B, 116B, with a central portion 130B of the flexible wiper 112B (i.e. a portion between the first and second ends 114B, 116B) being free to move in either direction.

Referring now to Figure 15, the rear and front elongated squeegee blades 104A, 104B are coupled together to form a continuously sealed suction region 106, to improve suction performance (e.g. as compared to an unsealed suction region). In particular, the rear and front squeegee blades 104A, 104B are gripped together at the first ends 114A, 114B and at the second ends 116A, 116B, for example by the mounting arrangement 102.

In some embodiments, the rear and front squeegee blades 104A, 104B are arranged to contact each other in use at the respective ends 114A, 114B, 116A, 116B. For example, the first and second ends 114B, 116B of the front squeegee blade 104B may be urged backwards towards the first and second ends 114A, 116A of the rear squeegee blade 104A when the squeegee assembly 100 is driven forwards in the treatment direction D_t . In such embodiments, the rear and front squeegee blades 104A, 104B may not be gripped together at the ends 114A, 114B, 116A, 116B. For example, when the squeegee assembly 100 is lifted from the surface the rear and front squeegee blades 104A, 104B may be spaced apart from each other, or the rear and front squeegee blades 104A, 104B may meet at a single point at each end 114A, 114B, 116A, 116B by virtue of not being parallel to each other at the ends 114A, 114B, 116A, 116B.

In some embodiments, the suction region 106 is defined by a resilient member formed as a continuous loop, and the resilient member includes the rear and front elongate squeegee blades 104A, 104B. In other words, the first ends 114A, 114B may be integrally formed and the second ends 116A, 116B may be integrally formed.

Referring now to Figure 16, the front support structure 132b of the second support formation 132 is omitted to show the front squeegee blade 104B more clearly. Proximal the first and second ends 114A, 114B, 116A, 116B, the fixed portion 108B of the front elongate squeegee blade 104B is mounted further from the surface S to be treated than the fixed portion 108A of the rear elongated squeegee blade 104A (i.e. when the squeegee assembly 100 is resting on the surface S in use). This inhibits the front squeegee blade 104B from passing underneath the rear squeegee blade 104A and separating the rear squeegee blade 104A (i.e. the second edge 124A of the rear squeegee blade 104B) from the ground. Put another way, this inhibits breakage of a seal between the suction region 106 and the surface S.

In some embodiments, the first and second ends 114B, 116B of the front elongate squeegee blade 104B are mounted further from the surface S than the first and second

ends 114A, 116A of the rear elongated squeegee blade 104A by a distance in the range of 0.5mm to 2mm, e.g. in the range of 0.75mm to 1.5mm, e.g. substantially 1mm.

In the illustrated embodiment, the mounting arrangement 102 has a series of lugs 110 and the front squeegee blade 104B has a corresponding series of receivers 111 (e.g. apertures) configured to receive the lugs 110. Proximal the first and second ends 114B, 116B of the front elongated squeegee blade 104B, when the front elongate squeegee blade 104B is mounted to the mounting arrangement 102, the lugs 110 of the mounting arrangement 102 and receivers 111 of the front squeegee blade 104B are located further from the surface S than those lugs 110 and receivers 111 proximal the central portion 130B of the front elongate squeegee blade 104B (i.e. when the squeegee assembly 100 is resting on the surface S in use).

In alternative embodiments, proximal the first and second ends 114A, 114B, 116A, 116B of the respective elongated squeegee blades 104A, 104B, the unflexed height H2 of the front elongate squeegee blade 104B is less than the unflexed height H1 of the rear squeegee blade 104A. In other words, the height H2 may gradually reduce towards the first and second ends 114B, 116B. In such embodiments, the height H2 of the front elongate squeegee blade 104B proximal the first and second ends 114B, 116B is less than the height H1 of the rear elongated squeegee blade 104A by an amount in the range of 0.5mm to 2mm, e.g. in the range of 0.75mm to 1.5mm, e.g. substantially 1mm.

In some embodiments, the squeegee blades 104A, 104B are releasable from the mounting arrangement 102 (i.e. by disengagement of the receivers 111 in the squeegee blades 104A, 104B with the lugs 110 of the mounting arrangement 102). In order to do so, the front support structure 132a of the second support formation 132 has to be removed (or at least flexed forwards/upwards), and/or the rear support structure 126b of the first support formation 126 has to be removed (or at least flexed rearwards/upwards). Therefore, one or more of these support structures 132A, 126b are removable. In some embodiments, one or more of the support structures 132A, 126b are flexible. In the illustrated embodiments, the lugs 110 are coupled to parts of the mounting arrangement 102 within an interior of the suction region 106 (e.g. to the front support structure 126a of the first support formation 126, and the rear support structure 132b of the second support structure 132). In alternative embodiments, the lugs 110 may be coupled to the parts of the mounting arrangement 102 outside of the suction region 106 (e.g. to the front support structure 132a of the second support formation 132 and the rear support structure 126b of the first support formation 126). In the illustrated embodiments, the lugs 110 have a hooked shape, which allows the squeegee blades 104A, 104B to be held in place during assembly.

In the illustrated embodiments, the rear support structure 132b of the second support formation 132 is fixedly coupled to the front support structure 126a of the first support formation 126. In this way, once the front support structure 132a of the second support formation 132 and or the rear support structure 126b of the first support formation 126 has been removed, the squeegee blades 104A, 104B can be removed together as one unit with the front support structure 126a of the first support formation 126, and the rear support structure 132b of the second support structure 132 (e.g. for removal and replacement of the squeegee blades 104A, 104B).

As mentioned above, in the illustrated embodiment the first and second ends 114A, 114B, 116A, 116B of each squeegee blade 104A, 104B project forwards of the respective central portions 130A, 130B of the squeegee blades 104A, 104B. In this way, fluid is funnelled towards the central portions 130A, 130B as the squeegee assembly 100 is moved forwards in the treatment direction D_t . It will be understood that the profile of the squeegee blades 104A, 104B in the squeegee assembly 100 is complementary to the profile of the first treatment element 26 (particularly the front squeegee blade 104B which is provided proximal the first surface treatment element), to provide a compact arrangement and good uptake of fluid and/or debris displaced by the first treatment element 26.

In some embodiments, the front squeegee blade 104B is shaped to form openings when in use to permit fluid to enter the suction region 106 when the squeegee assembly 100 is moved in the treatment direction D_t . For example, the openings may be formed as cutaway portions in the second edge 124B of the front squeegee blade 104B. The cutaway portions may be covered by sealing flaps which are displaced when the front squeegee blade 104B is moved in the treatment direction D_t to form the openings (i.e. the flaps extends beyond the second edge 124B to create openings when in use), and which move to cover the respective cutaway portions when passing over uneven ground, to provide an improved seal between the front squeegee blade 104B and the surface S to be treated. Alternatively, the front surface 118B of the flexible wiper 112B of the front squeegee blade 104B may have corrugations which leads to the formation of openings (i.e. between the corrugations) when the flexible wiper 112B is angled rearwards as in the illustrated figures.

In the illustrated embodiment, the squeegee assembly 100 is configured such that a load L2 applied to the mounting arrangement 102 is applied to the surface S to be treated exclusively by the flexible wipers 112A, 112B of the squeegee blades 104A, 104B. In other words, there are no wheels or other components which engage the surface S to be treated, which improves the contact of the flexible wipers 112A, 112B with the surface S and streamlines the squeegee assembly 100.

With reference to Figure 1, the squeegee assembly 100 is coupled to a suction connection arrangement 138 configured to connect the suction region 106 to the suction

source 228 of the surface treatment tool 200. The suction connection arrangement 138 is illustrated in Figure 1 as a length of hose/pipe, but may alternatively be any other suitable structure.

5 Referring now to Figures 3 to 8, 10, 11, 17 and 18, the first surface treatment element 26 defines a treatment area 48 of the surface S to be treated (e.g. as best viewed in Figure 17). In the illustrated embodiments, since the first surface treatment element 26 is moveable, the treatment area 48 corresponds to the area defined by the first surface treatment element 26 throughout its full range of movement (i.e. taking the position of the chassis 20 of the surface treatment head 10 to be fixed). In other words, the treatment area 48 corresponds to the area of the surface S which is treated by the first surface treatment element 26 during its full range of movement (i.e. when the chassis 20 remains in a constant position with respect to the surface S). Put another way, the perimeter 50 of the treatment area 48 corresponds to a boundary of movement of the first surface treatment element 26. The first surface treatment element 26 does not move beyond this boundary (i.e. taking the position of the chassis 20 to be fixed with respect to the surface S).

As mentioned above, the surface treatment head 10 of Figures 3 to 11 has a driving means 27 configured to drive movement of the first surface treatment element 26 relative to the chassis 20. In the illustrated embodiments, the driving means 27 includes an eccentric drive mechanism configured such that the first surface treatment element 26 engages the surface S to be treated in a cyclical motion in which at least portion of the first surface treatment element 26 faces in substantially the same direction throughout the cyclical motion. For example, the front portion of the first surface treatment element 26 faces substantially forwards throughout the cyclical motion. The eccentric drive mechanism is not shown on the figures, but it will be understood to consist of an arrangement of one or more shafts and cam arrangements coupled to the driving means (e.g. located in recesses 29 of the drivable portion 26A of the first treatment element 26 below the mount 28, as illustrated in Figure 8). For example, the drive mechanism as disclosed in patent application GB2104339.3 may be used, or any other suitable drive mechanism.

In particular, the eccentric drive mechanism of the driving means 27 is configured to drive the first surface treatment element 26 so that each point on the first surface treatment element 26 moves along a circular path, wherein the circular paths each have a unique centre point but a common radius dimension.

In alternative embodiments, a different type of movement is provided (e.g. the first surface treatment element 26 may rotate or reciprocate linearly).

In alternative embodiments, the first surface treatment element 26 is static with respect to the chassis 20 (or at least with respect to the body 24), and the treatment area 48 corresponds to the area of the first surface treatment element 26 which is configured to contact the surface S to be treated.

5 As will be described in more detail below, the chassis 20 of the surface treatment head 10 has a plurality of guide portions 46 which are configured to dampen impact of the surface treatment head with other structures when in use. In the illustrated embodiments, the guide portions 46 are configured to extend beyond the perimeter 50 of the treatment area 48 (e.g. when the surface treatment head is viewed in a plan view as in Figures 4, 10 11 and 17). In other words, the guide portions 46 extend beyond the perimeter 50 of the treatment area 48 in a direction parallel to the surface S to be treated). In this way, the first surface treatment element 26 is inhibited from hitting or scuffing any adjacent structure(s) such as walls or furniture when the surface treatment head 10 is moved close to the adjacent structure(s).

15 In other embodiments, the guide portions 46 extend up to, but not beyond, the perimeter 50 of the treatment area 48, which may provide a similar effect.

In alternative embodiments, the guide portions are provided within the perimeter of the treatment portion, which also inhibits the first surface treatment element 26 from hitting or scuffing any adjacent structure(s) such as walls or furniture when the surface treatment head 10 is moved close to the adjacent structure(s). In the embodiments of Figures 20 3, 4, 10, 11 and 17, the guide portions 46 are provided in the form of guide elements 52 coupled to the chassis 20. In particular, the body 24 of the chassis 20 has a periphery 54 and the guide elements 52 are coupled to the body 24 such that they are located proximal the periphery 54 of the body 24.

25 In the illustrated embodiment, the body 24 has recesses 56 for accommodating the guide elements 52. In Figures 3, 4, 10 and 11, the guide elements 52 on the left hand side of the surface treatment head 10 have been omitted to show the recesses 56 of the body 24 more clearly. However, it will be understood that when fully assembled the guide elements 52 would be provided in each of the recesses 56.

30 In addition to the recesses 56 in the body 24, the first surface treatment element 26 has recesses 58 for accommodating the guide elements 52. For example, the recesses 58 in the first treatment element 26 are recessed around the recesses 56 in the body 24 and the guide elements 52. In the illustrated embodiment, only the drivable portion 26A of the first surface treatment element 26 has the recesses 58. In this way, the guide elements 52 are displaced with respect to the surface S to be treated (i.e. spaced apart from the surface S to be treated) in a direction perpendicular to the surface S by the treatment portion 26B. In alternative embodiments, the recesses 58 are also (or instead)

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provided in the treatment portion 26B, so that the guide elements 52 are closer to the surface S.

As can be seen in the isometric views of Figures 3 and 10, the recesses 56 of the body 24 are recessed with respect to an upper surface 34 of the body 24, a front surface and a side surface of the body 24 (i.e. the periphery 54). Similarly, the recesses 58 of the first treatment element 26 are recessed with respect to an upper surface of the first treatment element 26, a front surface and a side surface of the first treatment element 26. In an alternative embodiment, the recesses 56, 58 are formed on opposing facing surfaces of the body 24 and first treatment element 26 respectively (i.e. a lower surface of the body 24 and an upper surface of the first treatment element 26, so that the recesses 56, 58 are provided between the body 24 and first treatment element 26).

It can be seen that the recesses 56, 58 reduce the overall height and width of the surface treatment head 10 at the first and second ends 12, 14 compared with if the guide elements 52 were provided on top of and/or to the side of the body 24.

In the illustrated embodiments, the guide elements 52 are provided proximal the first and second ends 12, 14 of the surface treatment head 10. In particular, at each end 12, 14 there is a pair of guide elements 52 which define a line 64 linking outermost points on the pair of guide elements 52 (shown most clearly in Figure 18). In the illustrated embodiments, the line 64 is located outside of the treatment area 48. In other embodiments, the line 64 extends at least partly along the perimeter 50 of the treatment area 48 or within the treatment area 48.

Similarly, the two front guide elements 52 define a front line 66 linking outermost points on the front guide elements 52 (as shown most clearly in Figure 11). In the illustrated embodiments, the front line 66 is located outside of the treatment area 48. In other embodiments, the front line 66 extends at least partly along the perimeter 50 of the treatment area 48 or within the treatment area 48.

In the illustrated embodiments, the guide elements 52 are rollers/wheels. In alternative embodiments, the guide elements are balls. It will be understood that such rollers/wheels/balls are configured to reduce friction between the surface treatment head 10 and a structure extending transverse (e.g. perpendicular) to the surface S to be treated when the surface treatment head 10 is moved adjacent to said structure in use. In alternative embodiments, the guide elements 52 are non-rotating structures (e.g. pieces of felt/low friction material coupled to the body 24).

The chassis 20 has mounting arrangements 68, and each guide element 52 is mounted in a respective mounting arrangement 68 such that each guide element is configured for rotation with respect to the chassis 20. In particular, the mounting arrangements 68 are provided on lower surfaces of the recesses 56 in the body 24. It can

be seen from the isometric views of Figures 3 and 10 that portions of the body 24 bounding the recesses 56 extend below an upper surface of the first surface treatment element 26, from a front surface of the first treatment element 26 and from a side surface of the first treatment element 26. The first surface treatment element 26 is recessed around the portions of the body 24 bounding the recesses 56 (i.e. around lower, front and side surfaces of recesses 56). In other words, the mounting arrangements 68 (i.e. lower surfaces of recesses 56) are accommodated in the recesses 58 of the first treatment element 26.

In some embodiments, the guide elements 52 are removably mounted to the chassis 20 (i.e. removably mounted to the mounting arrangements 68) to be replaced when worn or changed to a different type (e.g. to adjust how far the linking lines 64 are positioned outside the perimeter 50 of the treatment area 48).

In alternative embodiments, instead of guide elements 52 the guide portions 46 are portions of the periphery 54 of the body 24. For example, in the embodiment of Figure 19 the periphery 54 of the body 24 surrounds the treatment area 48 such that the periphery 54 is spaced apart from the perimeter 50 of the treatment area 48.

Although the invention has been described in relation to one or more embodiments, it will be appreciated that various changes or modifications can be made without departing from the scope of the invention as defined in the appended claims. For example:

It should also be noted that whilst the appended claims set out particular combinations of features described above, the scope of the present disclosure is not limited to the particular combinations hereafter claimed, but instead extends to encompass any combination of features herein disclosed.

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CLAIMS

1. A surface treatment tool comprising:
an elongate body comprising a first end having a handle with a handgrip portion
5 and a second end distal the first end configured to be coupled a surface treatment head;
a fluid outlet configured to apply fluid to a surface to be treated; and
a surface treatment head configured to engage a surface to be treated and
comprising a suction region configured to suck fluid from a surface to be treated;
wherein the elongate body comprises:
10 a fluid tank in fluid communication with the fluid outlet;
a waste tank in fluid communication with the suction region and configured to
collect fluid removed from a surface to be treated via the suction region;
a power source configured to supply power to the surface treatment tool; and
15 a suction source for sucking fluid and/or debris from the suction region to the waste
tank.
2. The surface treatment tool of claim 1, wherein the elongate body comprises a spine
defining a longitudinal axis extending between the first end and the second end of the
elongate body, optionally wherein the fluid tank and/or the waste tank and/or the power
20 source is coupled to the spine; optionally wherein the fluid tank and/or the waste tank
and/or the power source is removably coupled to the spine.
3. The surface treatment tool of claim 2, wherein the fluid tank is shaped to wrap
around at least a portion of the spine, and/or wherein the waste tank is shaped to wrap
25 around at least a portion of the spine; optionally wherein the power source is located
proximal the spine; optionally wherein the fluid tank is shaped to wrap around at least a
portion of the power source and/or wherein the waste tank is shaped to wrap around at
least a portion of the power source.
- 30 4. The surface treatment tool of claim 2 or 3, wherein at least two of the fluid tank,
the waste tank and the power source are coupled to the spine such that the bulk of said
two components is located at a first side of the spine, optionally wherein the first side
corresponds to a treatment direction when the surface treatment tool is in normal use.
- 35 5. The surface treatment tool of any of claims 2 to 4, wherein the handgrip portion is
an elongate handle comprising a longitudinal axis which is substantially parallel to the
longitudinal body of the elongate body, optionally wherein the longitudinal axis of the
elongate handle is coaxial with the longitudinal axis of the elongate body.

- 5 6. The surface treatment tool of any of claims 2 to 5, wherein the spine comprises an interior profile configured to carry: a fluid supply path arranged to couple the fluid outlet with the fluid tank, and/or a waste removal path arranged to couple the suction region to the waste tank, and/or a power supply line arranged to carry power from the power source to the surface treatment head; optionally wherein the spine comprises an interior profile defining a volume forming to at least part of the fluid supply path, and/or wherein the spine comprises a profile defining a volume forming to at least part of the waste removal path.
- 10 7. The surface treatment tool of any preceding claim, wherein the elongate body is coupled to the surface treatment head via coupling, wherein the coupling comprises a joint arrangement comprising a first axis and a second axis perpendicular to the first rotational axis; optionally, wherein the first rotational axis intersects the second rotational axis; optionally wherein the coupling is offset from the longitudinal axis of the elongate body.
- 15 8. The surface treatment tool of any preceding claim, wherein a rear edge the surface treatment head with respect to a treatment direction of the surface treatment tool comprises a first end, a second end and a middle portion located between the first and second ends, wherein the middle portion of the rear edge projects rearward of the first and second ends with respect to a treatment direction of the surface treatment head.
- 20 9. The surface treatment tool of claim 8, where wherein the surface treatment head comprises at least a portion comprising a curved shaped profile in plan view; and/or wherein the surface treatment head comprises at least a portion comprising a substantially V-shaped profile in plan view.
- 25 10. The surface treatment tool of claim 8 or 9, wherein the surface treatment head comprises a front edge with respect to the treatment direction, and wherein at least one of the front edge and the rear edge are at least partially curved or V-shaped.
- 30 11. The surface treatment tool of any preceding claim, wherein the surface treatment head comprises a moveable surface treatment element configured to engage a surface to be treated and a driving means comprising a motor configured to drive the movable surface treatment element; optionally wherein the driving means comprises an eccentric drive mechanism, wherein the motor is coupled to the moveable surface treatment element via the eccentric drive mechanism so that the moveable surface treatment element engages a surface to be treated in a cyclical motion such that a portion of the

moveable surface treatment element faces in the same direction throughout the cyclical motion.

12. The surface treatment tool of claim 11, wherein the suction region is provided proximal the movable surface treatment element; optionally, wherein the suction region is provided to a rear of the movable surface treatment element with respect to a treatment direction of the surface treatment tool.

13. The surface treatment tool of any preceding claim, wherein the suction region is defined by one or more resilient guide members; optionally, wherein the profile of the or each resilient guide member(s) is complementary to the profile of the or a movable surface treatment element; optionally wherein the resilient guide members comprise a first resilient guide member provided proximal the or a movable surface treatment element, optionally wherein the first resilient guide member is shaped to form openings when in use to permit fluid to enter said suction region when the surface treatment tool is moved in a treatment direction; optionally wherein the suction region is defined, at least in part, by first and second resilient guide members.

14. A surface treatment tool comprising:
an elongate body comprising a first end having a handle with a handgrip portion and a second end distal the first end configured to be coupled a surface treatment head;
a fluid outlet configured to apply fluid to a surface to be treated; and
a surface treatment head comprising a chassis configured to be coupled to a treatment portion arranged to engage a surface to be treated when in use, the surface treatment head comprising a suction region configured to suck fluid from a surface to be treated;
wherein the elongate body comprises:
a fluid tank in fluid communication with the fluid outlet;
a waste tank in fluid communication with the suction region and configured to collect fluid removed from a surface to be treated via the suction region; and
a power source configured to supply power to the surface treatment tool.

15. A surface treatment tool comprising:
an elongate body comprising a first end having a handle with a first handgrip portion and a second end distal the first end configured to be coupled a surface treatment head;
and

a surface treatment head comprising a chassis configured to be coupled to a treatment portion arranged to engage a surface to be treated when in use;

wherein the elongate body comprises a second handgrip portion spaced apart from the first handgrip portion.

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16. A surface treatment tool according to claim 16, wherein the first and second handgrip portions are spaced apart by 70cm or less, for example between 10 and 50cm, for example between 20 and 30 cm, e.g. 25cm.

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17. A surface treatment tool according to claim 16 or 17, wherein the first handgrip portion and the second handgrip portion are substantially parallel to each other, e.g. co-axial.

18. A surface treatment head for a surface treatment tool, the surface treatment head comprising:

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a first treatment component having a first surface treatment element configured to engage a surface to be treated;

a second treatment component having a second surface treatment element configured to engage said surface to be treated; and

a bracket arrangement configured to couple the first and second treatment components together; and

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wherein the bracket arrangement is configured such that when a load is applied to the bracket arrangement, the load is distributed between the first and second treatment components and applied to said surface to be treated.

25

19. The surface treatment head of claim 18, wherein the first treatment component comprises a body and the first treatment element is a movable surface treatment element configured for movement with respect to the body, optionally wherein the first treatment component comprises a driving means configured to drive the movable surface treatment element to effect treatment of said surface to be treated; and/or wherein the second treatment element comprises a suction region configured to suck fluid from said surface to be treated; optionally, wherein the suction region is defined by one or more resilient members, the one or more resilient members comprising front and rear elongate squeegee blades.

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20. The surface treatment head of claim 18 or 19, wherein the bracket arrangement is configured such that when a load is applied to the bracket arrangement a first predetermined amount of said load is applied to the first treatment component and a second predetermined amount of said load is applied to the second treatment component; wherein the first predetermined amount is in the range of 30 to 70%, optionally 40 to

60%, optionally 45% to 55%, of the total load applied to the bracket arrangement; and/or wherein the second predetermined amount is in the range of 30 to 70%, optionally 40 to 60%, optionally 45% to 55% of the total load applied to the bracket arrangement.

5 21. The surface treatment head of any of claims 18 to 20, wherein the entire load applied to the bracket arrangement is transferred to the first and second treatment elements.

10 22. The surface treatment head of any of claims 18 to 21, wherein the bracket arrangement is configured to couple the first and second treatment components together such that relative movement therebetween is permitted; optionally wherein the bracket arrangement is configured to couple the first and second treatment components together such that relative movement therebetween is permitted in a direction perpendicular to the surface to be treated.

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23. The surface treatment head of claim 22, wherein the first treatment component is pivotally coupled to the bracket arrangement and/or wherein the second treatment component is pivotally coupled to the bracket arrangement; optionally wherein the bracket arrangement is configured to be pivotally coupled to an elongate body, and both of the first and second treatment components are pivotally coupled to the bracket arrangement such that relative linear movement between the first and second treatment components is permitted.

24. The surface treatment head of claim 22 or 23, wherein the surface treatment head comprises a limiting mechanism configured to limit relative movement between the first and second treatment components; optionally, wherein the limiting mechanism is adjustable.

25. The surface treatment head of claim 24, wherein the bracket arrangement comprises a first connection structure pivotally coupled to the first treatment component, wherein the first connection structure and first treatment component are configured to interact to define a permitted range of movement therebetween, and/or a second connection structure pivotally coupled to the second treatment component, wherein the second connection structure and second treatment component are configured to interact to define a permitted range of movement therebetween; optionally wherein the first treatment component comprises one or more abutment surfaces configured to abut the first connection arrangement to limit relative movement between the first treatment component and the bracket arrangement, optionally, wherein the one or more abutment

surfaces of the first treatment component comprise two abutment surfaces configured to abut opposing sides of the first connection structure to define a maximum and minimum of the permitted range of movement; optionally wherein the second treatment component comprises one or more abutment surfaces configured to abut the second connection arrangement to limit relative movement between the second treatment component and the bracket arrangement, optionally, wherein the one or more abutment surfaces of the second treatment component comprise two abutment surfaces configured to abut opposing sides of the second connection structure to define a maximum and minimum of the permitted range of movement.

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26. The surface treatment head of claim 25, wherein each abutment surface is angled relative to a surface contact plane defined by the respective surface treatment element; optionally wherein at least one abutment surface is movable to adjust the extent to which the respective treatment component is free to pivot with respect to the bracket arrangement; optionally, wherein a distance between said abutment surface and the respective connection structure is adjustable; and/or optionally, wherein an angle of said abutment surface relative to a surface contact plane defined by the respective surface treatment element is adjustable.

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27. The surface treatment head of any of claims 24 to 26, wherein the surface treatment head is configured to restrict pivoting of the first and second treatment components relative to each other to a pre-determined range of movement; optionally wherein the first and/or second treatment component comprises one or more structures configured to co-operate with the second and/or first treatment component to limit relative movement therebetween; optionally, wherein the one or more structures are configured to limit pivoting of the first and second treatment components relative to each other beyond a predetermined amount; and/or optionally, wherein the one or more structures are provided proximal first and second ends of the surface treatment head; and/or optionally, wherein the one or more structures are configured to co-operate with one or more complementary structures of the second and/or first treatment component to limit pivoting of the first and second treatment components relative to each other beyond a predetermined amount.

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28. The surface treatment head of any of claims 18 to 29, wherein the bracket arrangement comprises one or more arms coupled to the first treatment component and/or wherein the bracket arrangement comprises one or more arms coupled to the second treatment component; optionally wherein the bracket arrangement comprises a plurality of arms coupled to the respective treatment component such that the arms are arranged

on either side of a central axis of the respective treatment component extending along a treatment direction, optionally, such that the arms are symmetrically positioned with respect to the central axis.

5 29. The surface treatment head of claim 28, wherein the bracket arrangement comprises a plurality of arms each coupled to the respective treatment component along a transverse axis extending perpendicular to a treatment direction; optionally, wherein the transverse axis defines a midpoint between frontmost and rearmost portion of the respective treatment component

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30. The surface treatment head of claim 29, wherein the first treatment component comprises a driving means and the transverse axis is proximal a midpoint of the driving means (e.g. wherein the midpoint corresponds to a centre of gravity of the driving means).

15 31. The surface treatment head of any of claims 18 to 30, comprising a fluid outlet configured to introduce cleaning liquid to said surface to be treated; optionally, wherein the frontmost treatment component comprises the fluid outlet; optionally, wherein the fluid outlet is provided on a front region of the first and/or treatment component with respect to a treatment direction of the surface treatment head.

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32. A surface treatment head for a surface treatment tool, the surface treatment head comprising:

a first treatment component configured for coupling to a first surface treatment element configured to engage a surface to be treated;

25 a second treatment component configured for coupling to a second surface treatment element configured to engage said surface to be treated; and

a bracket arrangement configured to couple the first and second treatment components together; and

30 wherein the bracket arrangement is configured such that when first and second treatment elements are coupled to the respective treatment components in use and a load is applied to the bracket arrangement, the load is distributed between the first and second treatment components and applied to said surface to be treated.

35 33. A surface treatment tool comprising a surface treatment head according to any of claims 18 to 32 and an elongate body configured to be coupled to the bracket arrangement.

34. The surface treatment tool of claim 33,

wherein the second treatment element comprises a suction region configured to suck fluid and/or debris from said surface to be treated; optionally wherein the surface treatment tool comprises a waste tank in fluid communication with the suction region; optionally wherein the surface treatment tool comprises a suction source for sucking fluid from the suction region to the waste tank; and/or

wherein the surface treatment tool comprises a fluid tank and the surface treatment head comprises a fluid outlet configured to apply cleaning liquid from the fluid tank to said surface to be treated.

35. The surface treatment tool of claim 33 or 34, wherein the elongate body is coupled to the bracket arrangement by a joint arrangement; optionally, wherein the joint arrangement is configured to permit pivoting of the elongate body with respect to the surface treatment head about a first axis and about a second axis, wherein the second axis is perpendicular to the first axis; optionally, wherein the second axis intersects the first axis.

36. A squeegee assembly for use with a surface treatment device, the squeegee assembly comprising an elongated squeegee blade and a mounting arrangement for supporting the squeegee blade, wherein the elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use;

wherein the squeegee assembly comprises a support formation configured to cooperate with the squeegee blade such that at least a portion of the flexible wiper is arranged to extend in a generally rearward direction, optionally such that deflection of at least said portion of the flexible wiper in a generally forward direction is inhibited.

37. The squeegee assembly of claim 36, wherein the squeegee blade comprises a first end and a second end and a length extending therebetween, such that the fixed portion and the flexible wiper extend between the first and second ends, and wherein the support formation is configured to cooperate with the squeegee blade such that at least a portion of the flexible wiper proximal the first end and/or at least a portion of the flexible wiper proximal the second end is arranged to extend in a generally rearward direction, optionally such that deflection of at least the respective portion of the flexible wiper in a generally forward direction is inhibited; optionally wherein the support formation is configured to cooperate with the squeegee blade such that the flexible wiper is arranged to extend in a generally rearward direction along the entire length of the squeegee blade, optionally such that deflection of the flexible wiper in a generally forward direction is inhibited along the entire length of the squeegee blade.

38. The squeegee assembly of claim 36 or 37, wherein the squeegee blade comprises a front surface facing in a generally forward direction, and a rear surface, facing in a generally rearward direction.

39. The squeegee assembly of claim 38, wherein, in use, the front surface of the squeegee blade forms a contact angle with a surface to be treated, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is an acute angle; optionally such that deflection of the flexible wiper such that the contact angle is greater than 90° is inhibited; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is in the range of 35° to 55° ; optionally, wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle is substantially 45° ; optionally wherein the support formation is configured to cooperate with the squeegee blade such that the contact angle varies along a length of the squeegee blade.

40. The squeegee assembly of claim 38 or 39, wherein the support formation is configured to cooperate with at least a portion of the front surface and/or rear surface of the squeegee blade; optionally wherein the support formation comprises a front support structure configured to contact the front surface of the squeegee blade and/or a rear support structure configured to contact the rear surface of the squeegee blade; optionally wherein the respective support structure is configured to contact the respective surface along a continuous line of contact, and/or is configured to contact the respective surface at one or more discrete points (e.g. a series of discrete points); optionally wherein the front support structure and/or the rear support structure comprises a guide projection (e.g. a guide wall) angled such that the projection extends in a generally rearward direction.

41. The squeegee assembly of any of claims 36 to 40, wherein the elongated squeegee blade is a rear elongated squeegee blade and wherein the squeegee assembly further comprises a front elongated squeegee blade supported by the mounting arrangement, wherein the squeegee assembly comprises a suction region defined, at least in part, by the front and rear elongated squeegee blades; optionally wherein the support formation of the rear elongated squeegee blade is a first support formation, wherein the front elongated squeegee blade comprises a fixed portion secured to the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use, wherein the squeegee assembly comprises a second support formation configured to cooperate with the front squeegee blade such that at least a portion of the flexible wiper of the front squeegee blade is arranged to extend in a generally rearward direction; optionally such that deflection of at least said portion of the flexible wiper of the front squeegee blade in a generally forward direction is inhibited.

42. The squeegee assembly of claim 41, wherein the front and rear elongated squeegee blades are coupled together to form a continuously sealed suction region; optionally.

5 43. The squeegee assembly of claim 42, wherein the front elongated squeegee blade comprises a first end and a second end, and the rear elongated squeegee blade comprises a first end and a second end; optionally wherein the front and rear elongated squeegee blades are gripped together or arranged to contact each other in use at the respective first ends and/or the respective second ends.

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44. The squeegee assembly of claim 43, wherein the front elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use, wherein the front and rear elongated squeegee blade comprise a respective first edge proximal the respective fixed portion and a respective second edge proximal the respective flexible wiper, the respective first and second edges defining a respective height therebetween.

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45. The squeegee assembly of claim 44, wherein proximal the first and/or second ends of the respective elongated squeegee blade, the fixed portion of the front elongate squeegee blade is mounted further from a surface to be treated than that of the rear elongated squeegee blade, when in use; optionally wherein the front elongate squeegee blade and the mounting arrangement comprise a series of lugs and receivers configured to receive the lugs, wherein proximal the first and/or second end of the front elongated squeegee blade, when the front elongate squeegee blade is mounted on the mounting arrangement, the lugs and receivers are located further from a surface to be treated than those proximal a central portion of the front elongate squeegee blade, when in use.

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46. The squeegee assembly of claim 44, wherein proximal the first and/or second ends of the respective elongated squeegee blades, the height of the front elongate squeegee blade is less than the height of the rear squeegee blade.

30

47. The squeegee assembly of any of claims 36 to 46, wherein the or each squeegee blade comprises a first end and a second end and a length extending therebetween, wherein the or each squeegee blade comprises a central portion located between the first and second ends, and wherein the first and second ends project forwards of the central portion of the squeegee assembly.

35

48. The squeegee assembly of any of claims 36 to 47, wherein the squeegee assembly is configured such that a load applied to the mounting arrangement is applied to a surface to be treated exclusively by the flexible wiper(s) of the squeegee blade(s).

5 49. A surface treatment head for a surface treatment tool, the surface treatment head comprising a squeegee assembly according to any preceding claim; optionally, wherein the surface treatment head comprises:

10 a joint arrangement configured for coupling to an elongate body of a surface treatment tool, wherein the joint arrangement is configured to permit pivoting of the surface treatment head with respect to said elongate body about a first axis, and optionally about a second axis perpendicular to the first axis, optionally wherein the second axis intersects the first axis; and/or

15 a surface treatment element configured to engage a surface to be treated, optionally wherein the surface treatment element is movable and the surface treatment head comprises a driving means comprising a motor configured to drive the movable surface treatment element to effect cleaning of said surface; and/or

a fluid outlet configured to introduce cleaning liquid to a surface to be treated; and/or

20 a squeegee assembly according to any of claims 41 to 48 when dependent on claim 41, and a suction connection arrangement configured to connect the suction region to a source of suction of a surface treatment tool.

25 50. A surface treatment tool comprising an elongate body coupled to the surface treatment head of claim 49.

51. The surface treatment tool of claim 50 when dependent on claim 41, wherein the surface treatment tool is a scrubber dryer tool comprising a source of suction coupled to said suction region.

30 52. A squeegee assembly for use with a surface treatment device, the squeegee assembly comprising a mounting arrangement for supporting an elongated squeegee such that said elongated squeegee blade comprises a fixed portion secured by the mounting arrangement and a flexible wiper configured to contact a surface to be treated when in use;

35 wherein the squeegee assembly comprises a support formation configured to cooperate with said squeegee blade such that at least a portion of said flexible wiper is arranged to extend in a generally rearward direction and such that deflection of at least said portion of said flexible wiper in a generally forward direction is inhibited.

53. A surface treatment head for a surface treatment tool, the surface treatment head comprising:

5 a chassis comprising one or more guide portions configured to dampen impact of the surface treatment head with other structures when in use;

a surface treatment element coupled to the chassis, configured for movement with respect to the chassis, and configured to engage a surface to be treated, wherein the surface treatment element defines a treatment area of a surface to be treated; and

10 a driving means configured to drive movement of the surface treatment element relative to the chassis to effect treatment of said surface, wherein the driving means comprises an eccentric drive mechanism configured such that the surface treatment element is configured to engage a surface to be treated in a cyclical motion in which a portion of the surface treatment element faces in substantially the same direction throughout the cyclical motion, wherein movement of the surface treatment element
15 throughout the cyclical motion defines a perimeter of the treatment area.

54. The surface treatment head of claim 53, wherein the one or more guide portions extend within, up to or beyond the perimeter of the treatment area.

55. The surface treatment head of claim 53 or 54, wherein the one or more guide
20 portions comprise one or more guide elements coupled to the chassis; optionally wherein the chassis comprises a body having a periphery and wherein the one or more guide elements are coupled to the body such that they are located proximal the periphery of the body.

25 56. The surface treatment head of claim 55, wherein the surface treatment element comprises one or more recesses for at least partly accommodating the one or more guide elements; and/or wherein the body comprises one or more recesses for at least partly accommodating the one or more guide elements.

30 57. The surface treatment head of claim 56, wherein the or each recess is recessed with respect to an upper surface of the surface treatment element and/or an upper surface of the body; and/or wherein the or each recess is recessed with respect to a lower surface of the surface treatment element and/or a lower surface of the body; and/or wherein the or each recess is recessed with respect to a side surface of the surface treatment element
35 and/or a side surface of the body.

58. The surface treatment head of any of claims 55 to 57, wherein the surface treatment head comprises a first end and a second end, wherein the first end is provided

at a first side with respect to a treatment direction and wherein the second end is provided at a second side with respect to a treatment direction, wherein the one or more guide elements are provided proximal the first and/or second ends.

5 59. The surface treatment head of any of claims 55 to 58, wherein the one or more
guide elements comprise a pair of guide elements which define a line linking outermost
points on the pair of guide elements, wherein the line extends within the treatment area,
along an edge of the treatment area or is located outside of the treatment area; optionally
wherein the one or more guide elements comprise a pair of first-side guide elements which
10 define a first-side line linking outermost points on the first-side guide elements, wherein
the first-side line extends within the treatment area, along an edge of the treatment area
or is located outside of the treatment area, and wherein the first-side line is arranged on
a first side of the treatment area, and/or

wherein the one or more guide elements comprise a pair of second-side guide
15 elements which define a second-side line linking outermost points on the second-side
guide elements, wherein the second-side line extends within the treatment area, along an
edge of the treatment area or is located outside of the treatment area, and wherein the
second-side line is arranged on a second side of the treatment area, and/or wherein the
one or more guide elements comprise a pair of front guide elements which define a front
20 line linking outermost points on the front guide elements, wherein the front line extends
within the treatment area, along an edge of the treatment area or is located outside of the
treatment area, and wherein the front line is arranged on a front side of the treatment
area.

25 60. The surface treatment head of any of claims 55 to 59, wherein the or each guide
element comprises a roller, wheel or ball.

61. The surface treatment head of claim 60, wherein the chassis comprises one or more
mounting arrangements, and wherein each guide element is mounted in a respective
30 mounting arrangement such that each guide element is configured for rotation with respect
to the chassis; optionally, wherein the chassis comprises a body comprising the one or
more mounting arrangements.

62. The surface treatment head of claim 61, wherein the one or more mounting
35 arrangements each extend below an upper surface of the surface treatment element, and
wherein the surface treatment element is recessed around the one or more mounting
arrangements; and/or wherein the one or more mounting arrangements each extend from
a side surface of the surface treatment element in a direction towards the surface

treatment element, and wherein the surface treatment element is recessed around the one or more mounting arrangements.

5 63. The surface treatment head of any of claims 55 to 62, wherein the one or more guide elements are removably mounted to the chassis.

10 64. The surface treatment head of any of claims 53 to 63, wherein the one or more guide portions are configured to reduce friction between the surface treatment head and a structure arranged perpendicular to the surface to be treated when the surface treatment head is moved adjacent to said perpendicular structure in use.

65. The surface treatment head of any of claims 53 to 64, wherein the guide portions are spaced apart from a surface to be treated in a direction perpendicular to the surface.

15 66. The surface treatment head of any of claims 53 to 65, wherein the surface treatment element is replaceable.

20 67. The surface treatment head of any of claims 53 to 66, wherein the surface treatment head comprises a fluid outlet for introduction of cleaning fluid to the surface to be treated.

25 68. The surface treatment head of any of claims 53 to 67, wherein the surface treatment head comprises a suction region for sucking fluid and/or debris from the surface to be treated.

30 69. The surface treatment head of any of claims 53 to 68, wherein the eccentric drive mechanism is configured to drive the moveable surface treatment element so that each point on the moveable surface treatment element moves along a circular path, wherein the circular paths each have a unique centre point but a common radius dimension.

70. A surface treatment tool comprising an elongate body coupled to the surface treatment head of any of claims 53 to 69.

35 71. A surface treatment element for coupling to a chassis of a surface treatment head, the surface treatment element comprising:
an upper surface, a lower surface and a periphery extending between the upper and lower surfaces;

wherein the surface treatment element comprises one or more recesses in the upper surface and/or lower surface and/or periphery for accommodating a guide element and/or a mounting arrangement for a guide element.

5 72. A surface treatment head for a surface treatment tool, the surface treatment head comprising:

a chassis comprising one or more guide portions configured to dampen impact of the surface treatment head with other structures when in use;

10 a drivable portion configured to be coupled to a treatment portion arranged to engage a surface to be treated, wherein the drivable portion is coupled to the chassis and configured for movement with respect to the chassis, wherein, in use, the drivable portion and the treatment portion form a surface treatment element which defines a treatment area of a surface to be treated; and

15 a driving means configured to drive movement of the drivable portion relative to the chassis, wherein the driving means comprises an eccentric drive mechanism configured such that, when in use, the surface treatment element is configured to engage a surface to be treated in a cyclical motion in which a portion of the surface treatment element faces in substantially the same direction throughout the cyclical motion, wherein movement of the surface treatment element throughout the cyclical motion defines a
20 perimeter of the treatment area.

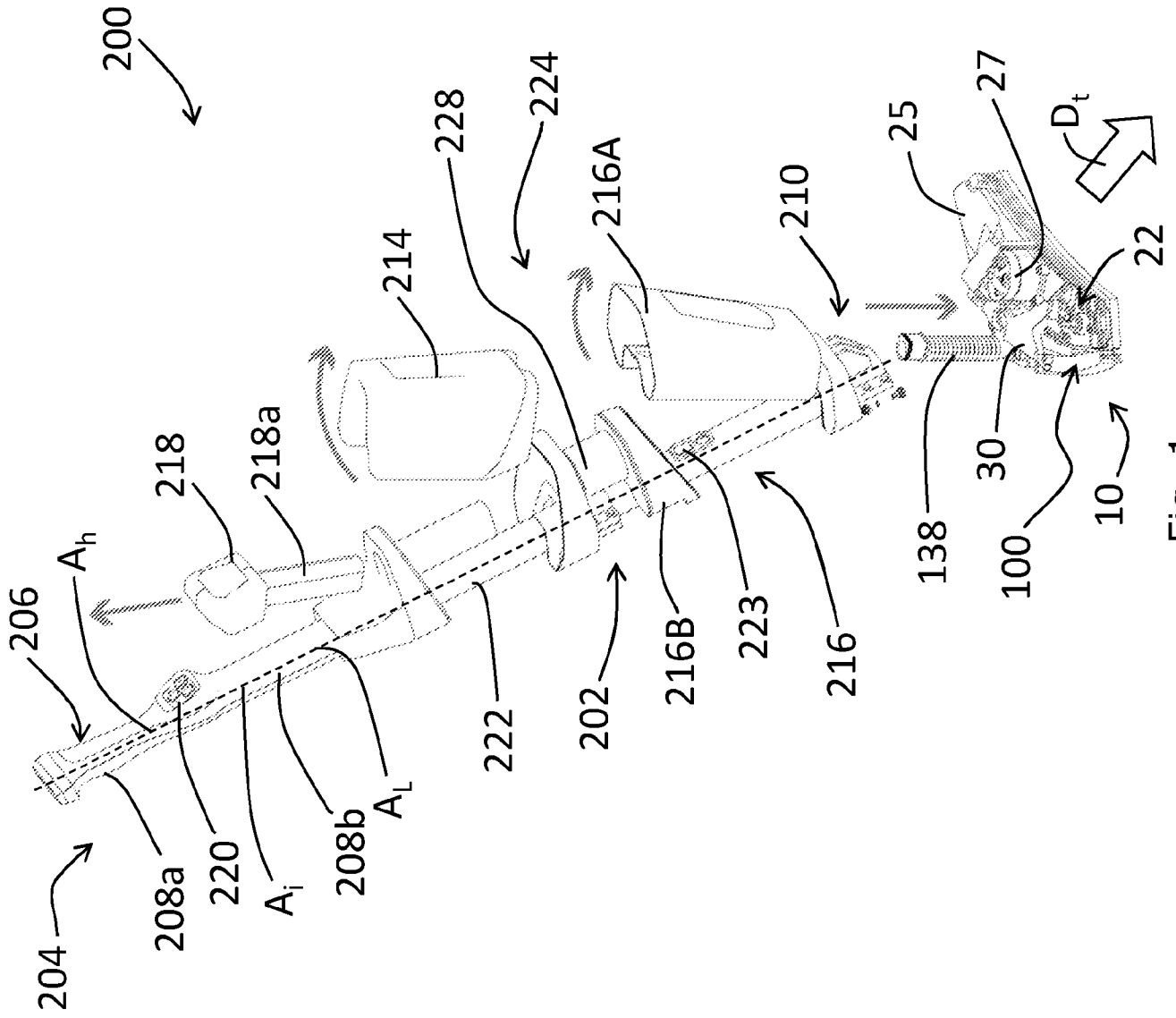


Fig. 1

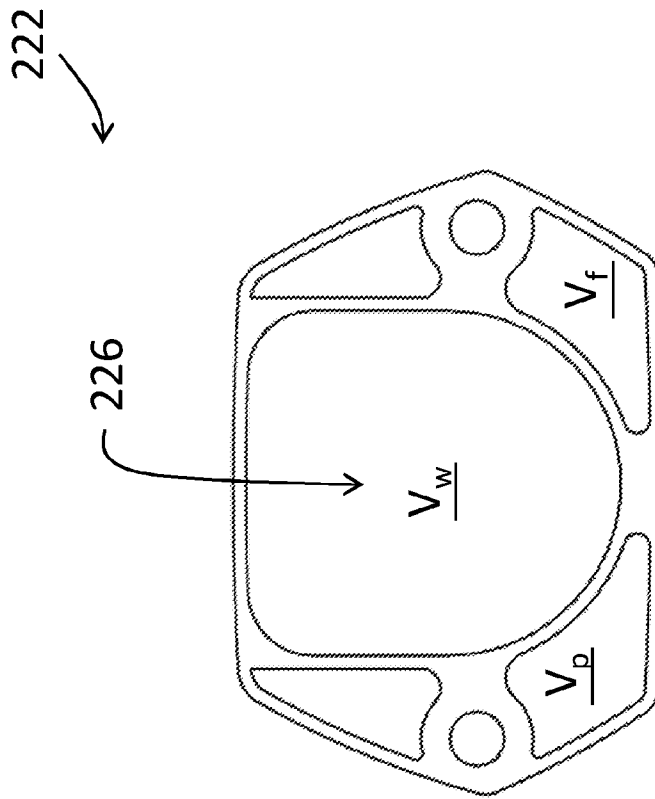


Fig. 2

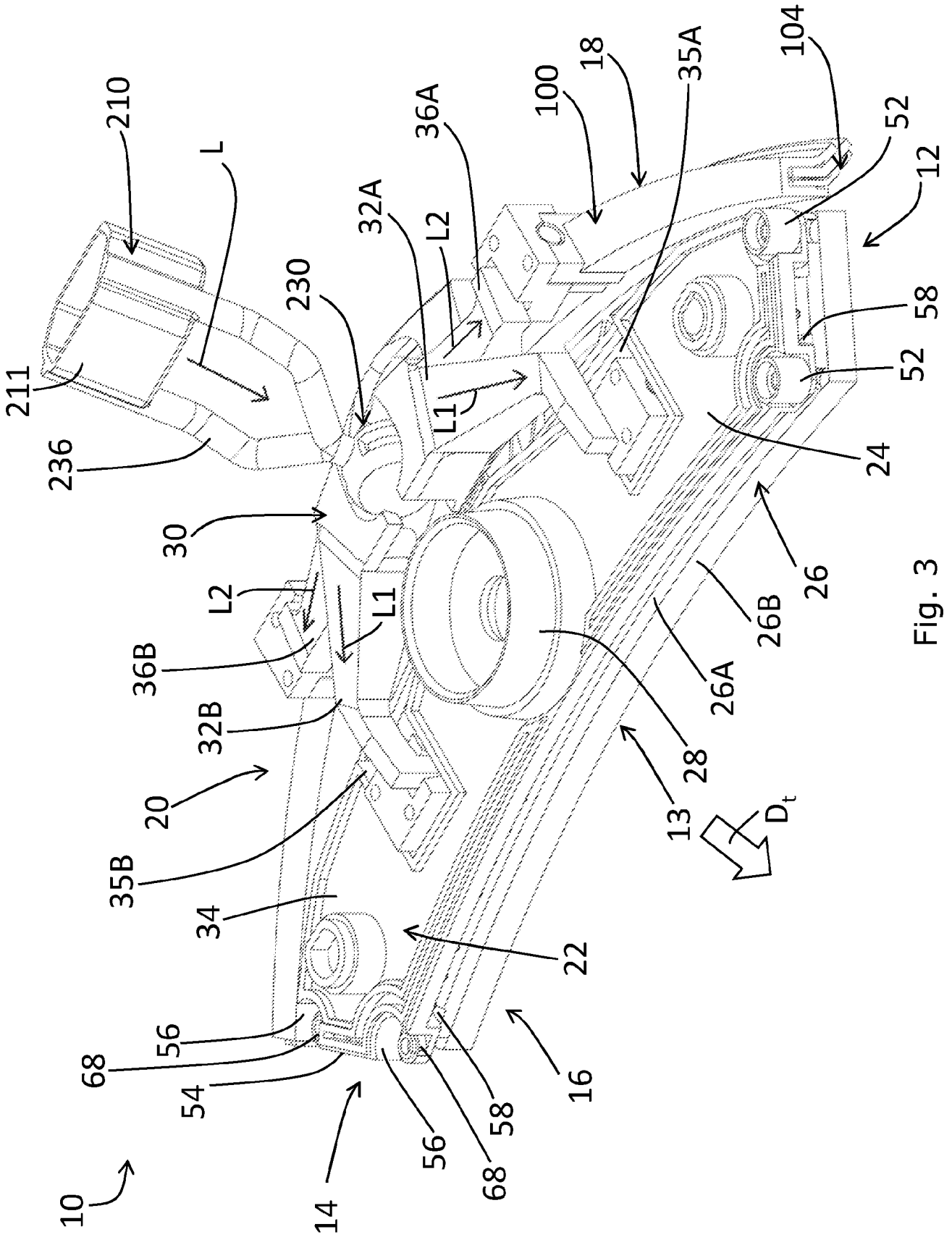


Fig. 3

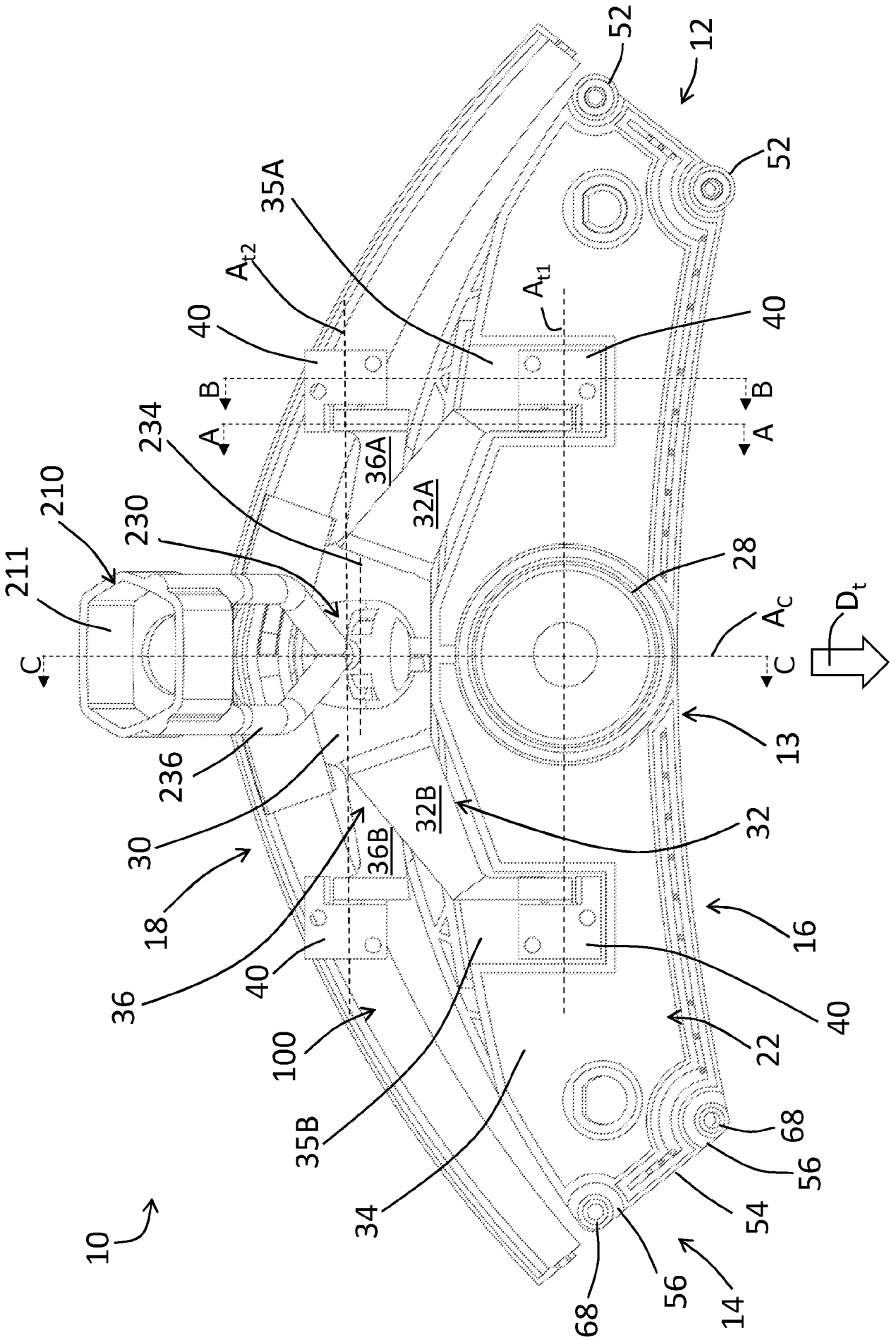


Fig. 4

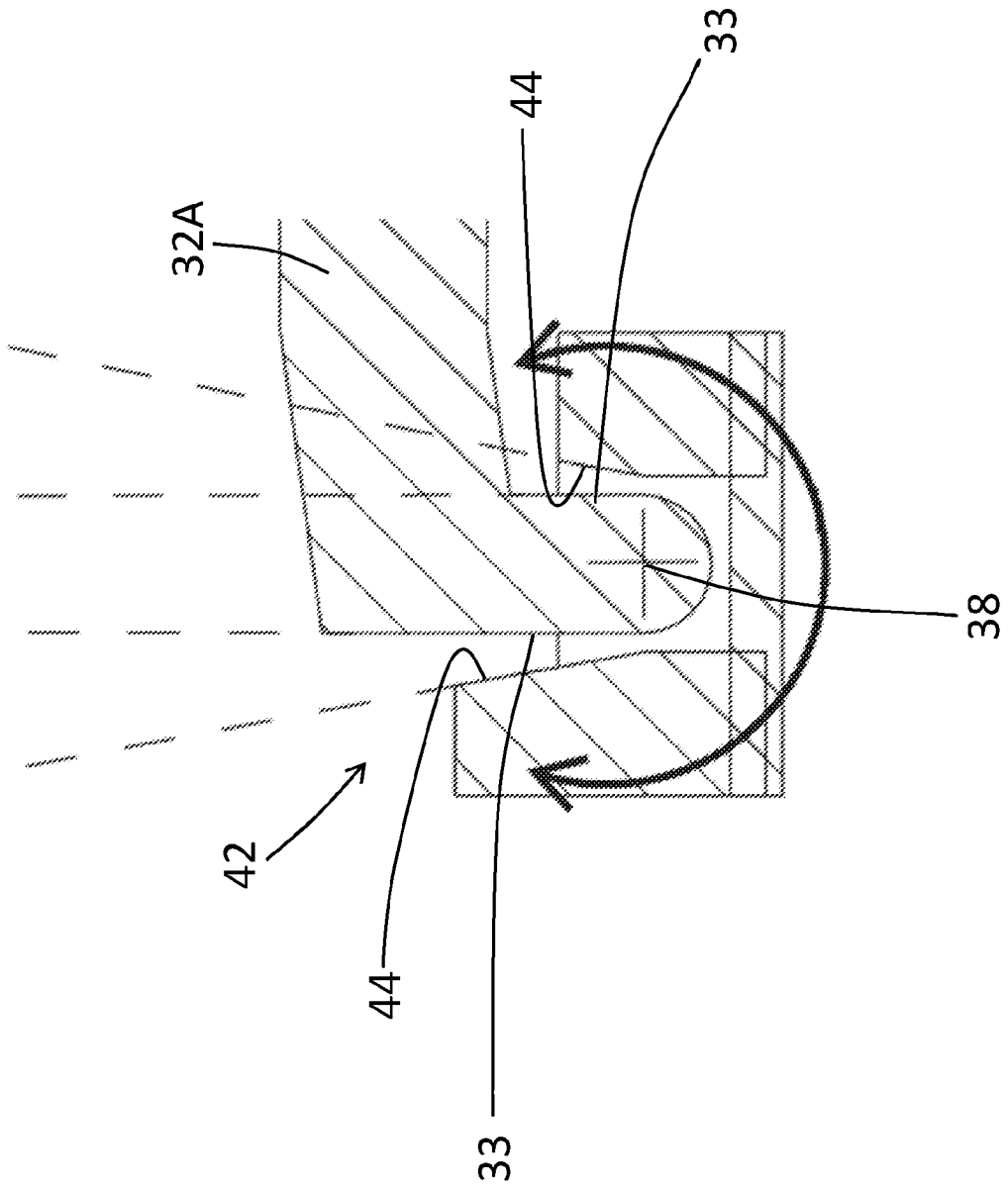


Fig. 6

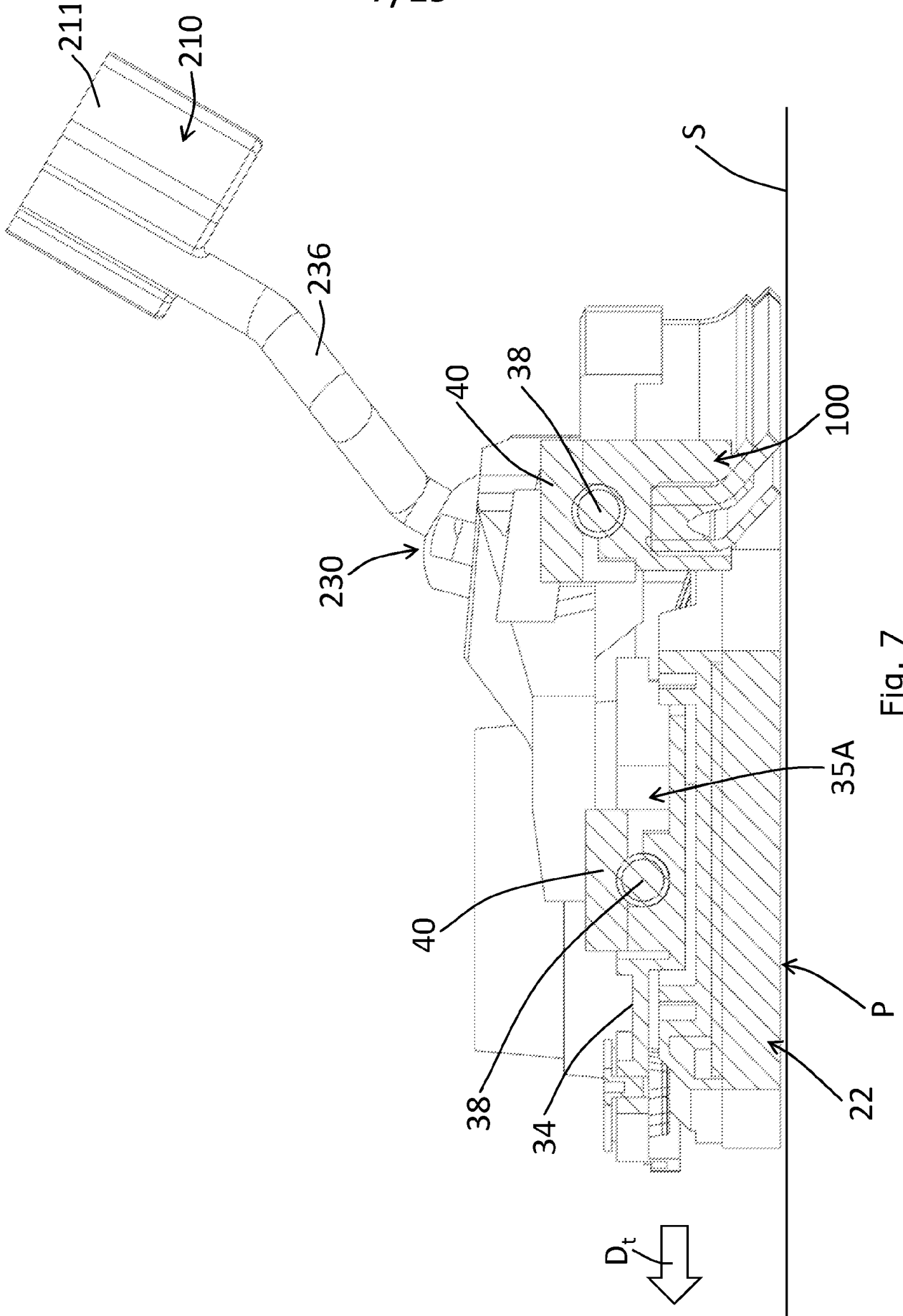


Fig. 7

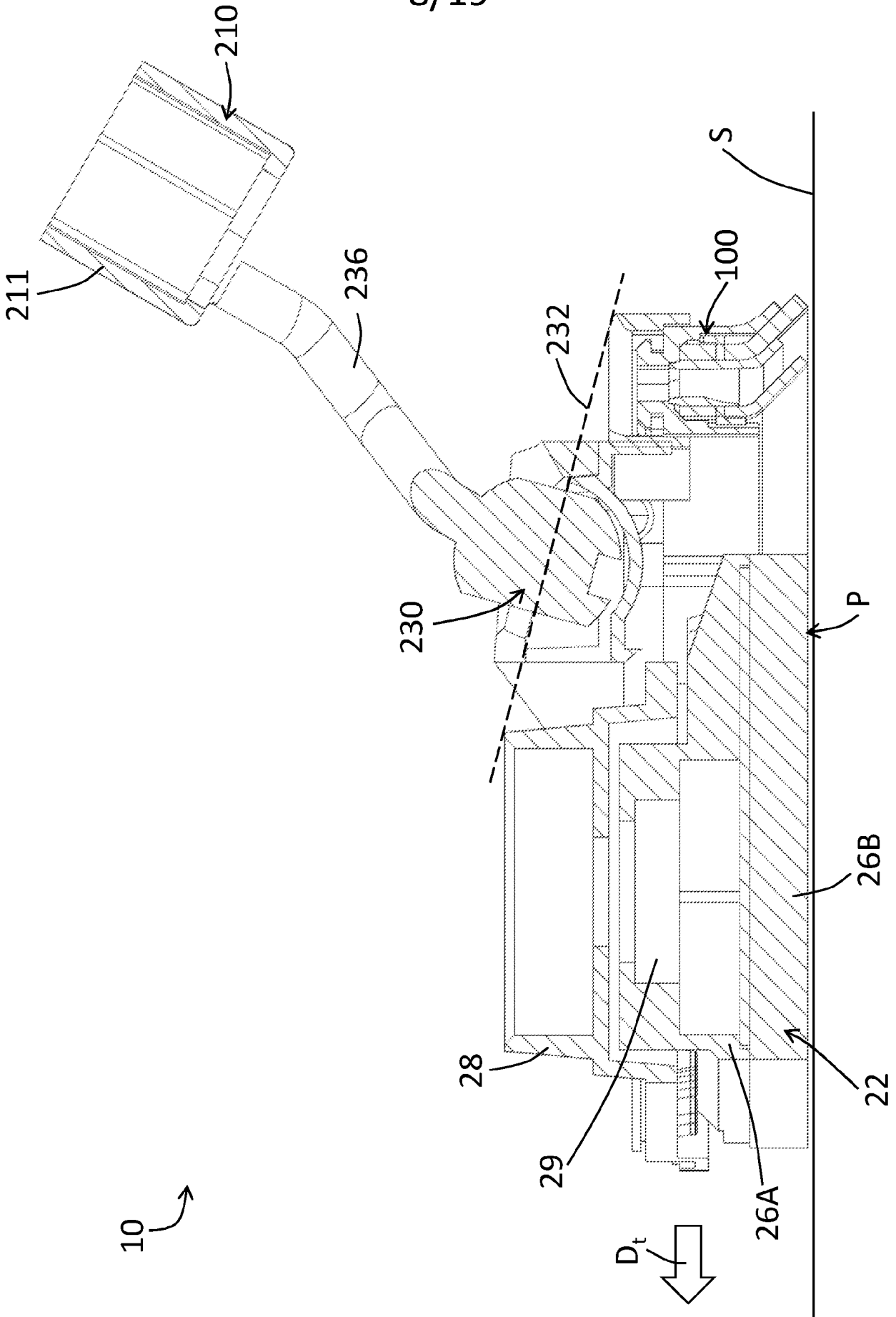


Fig. 8

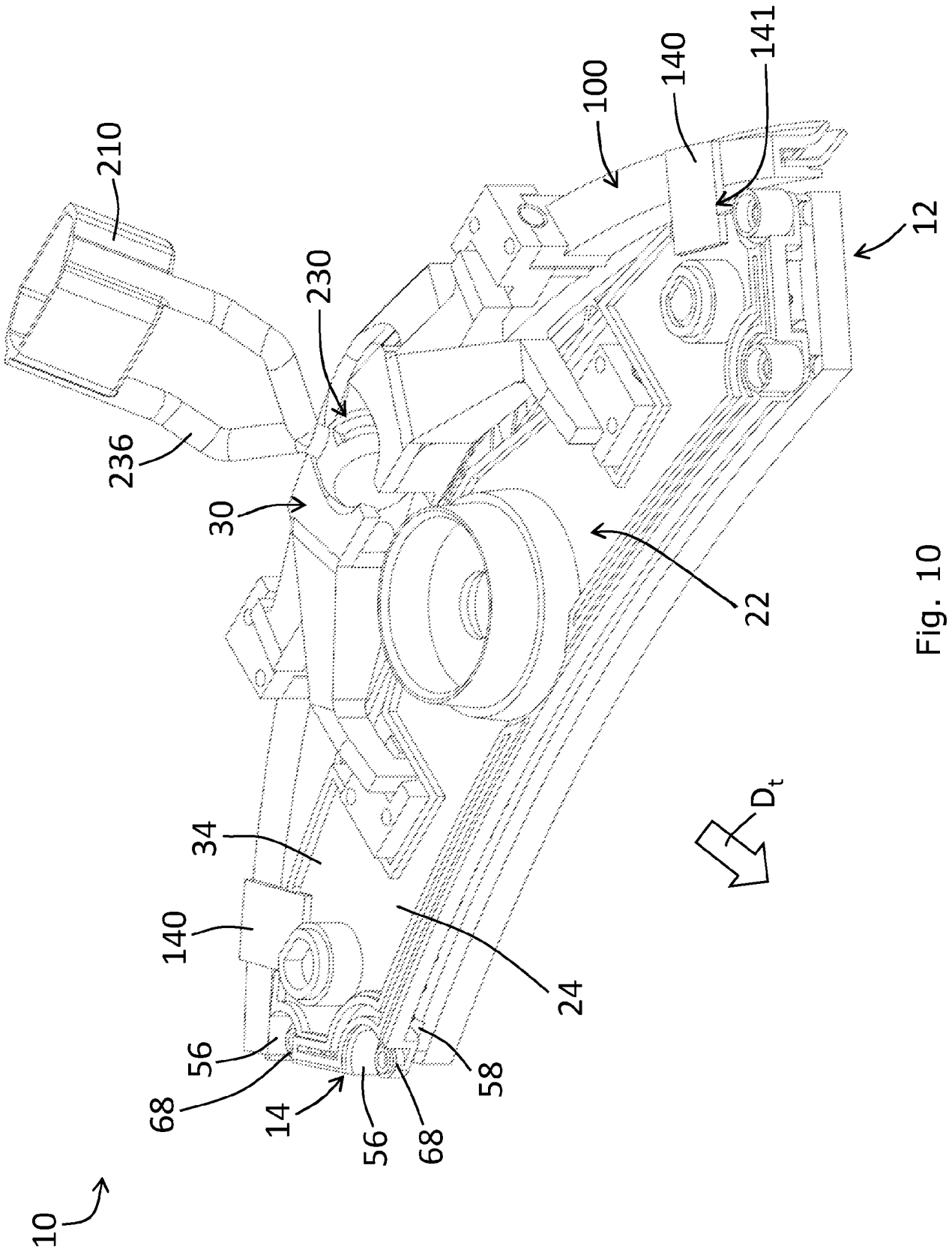


Fig. 10

11/19

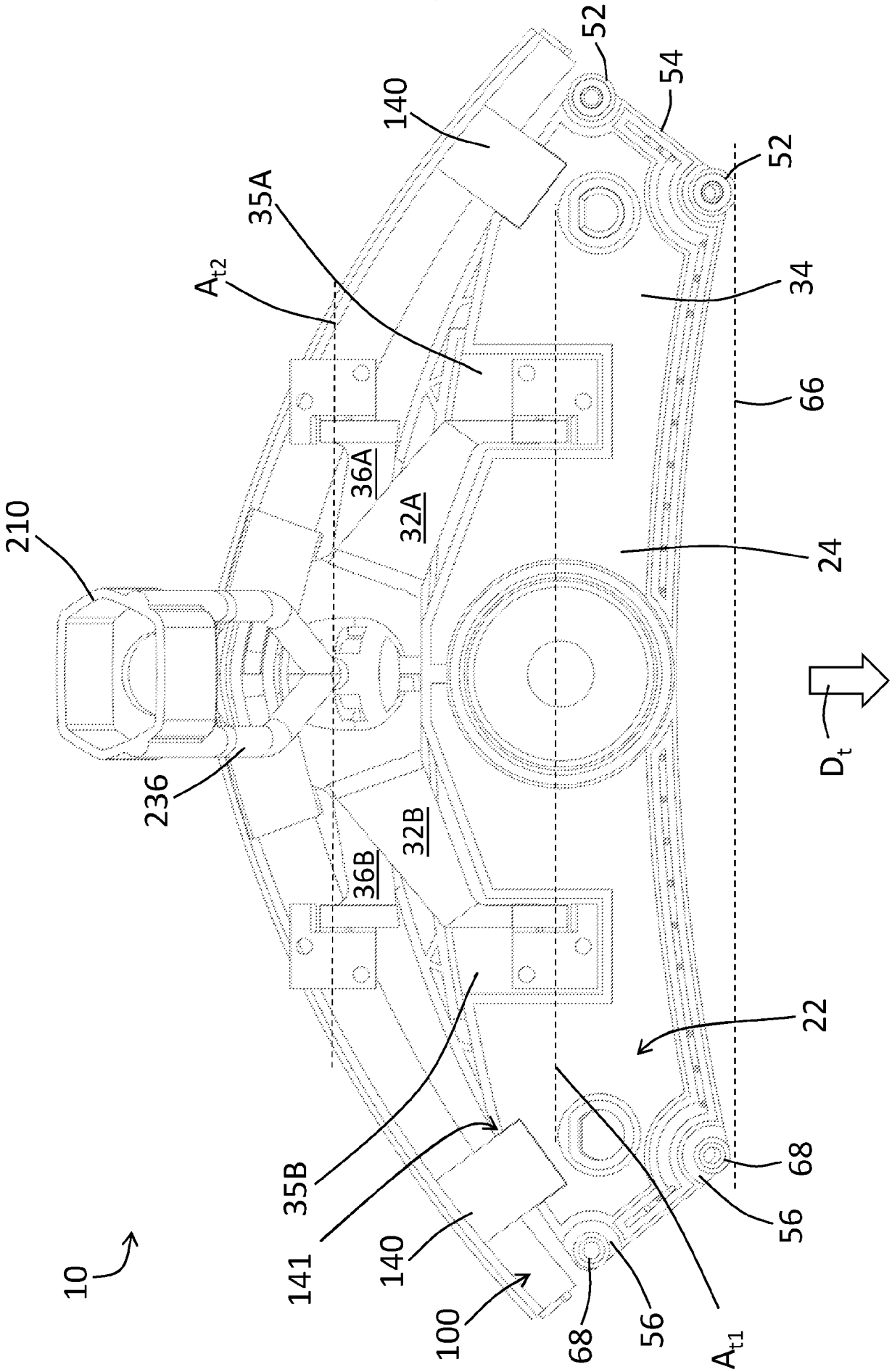


Fig. 11

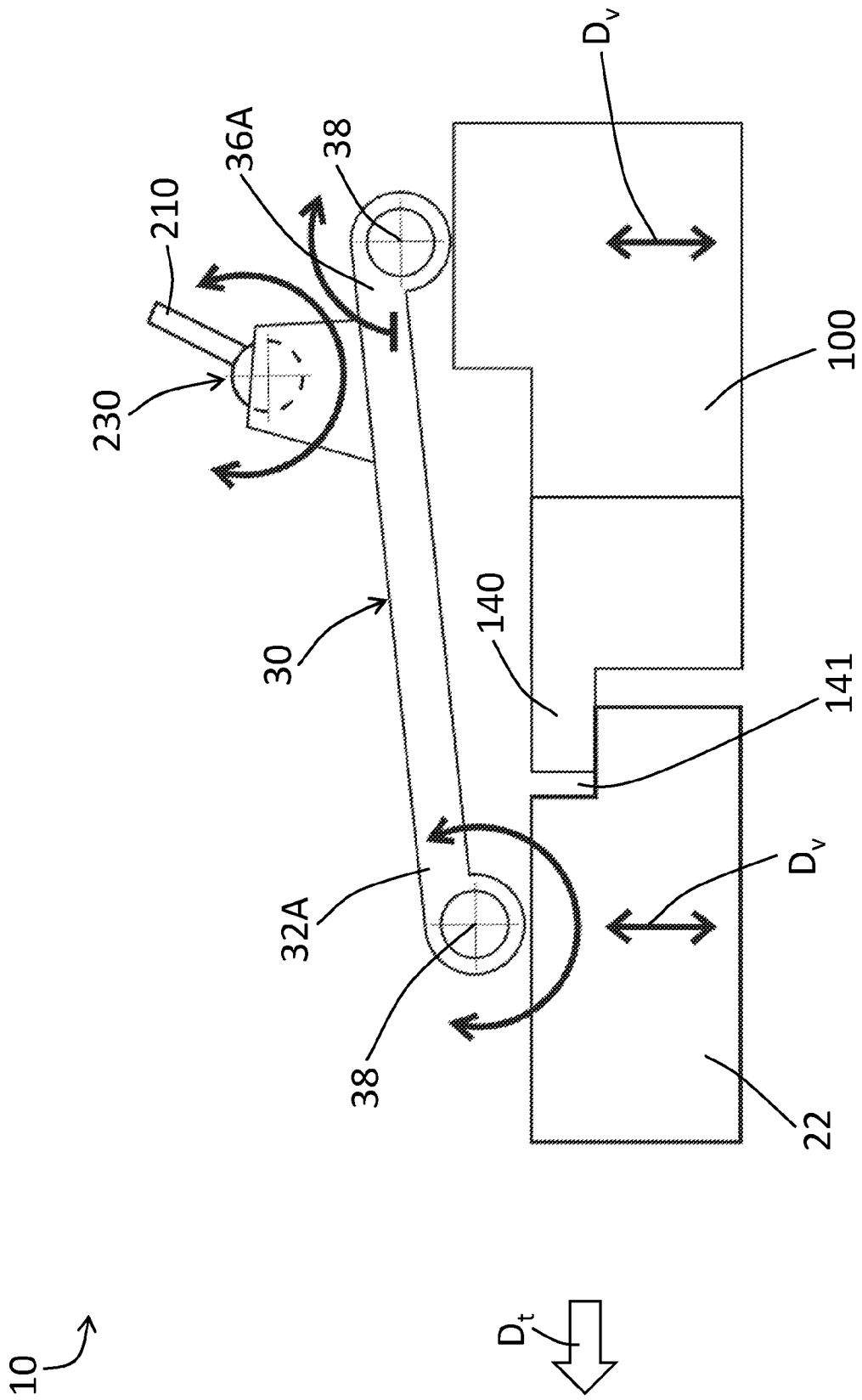


Fig. 12

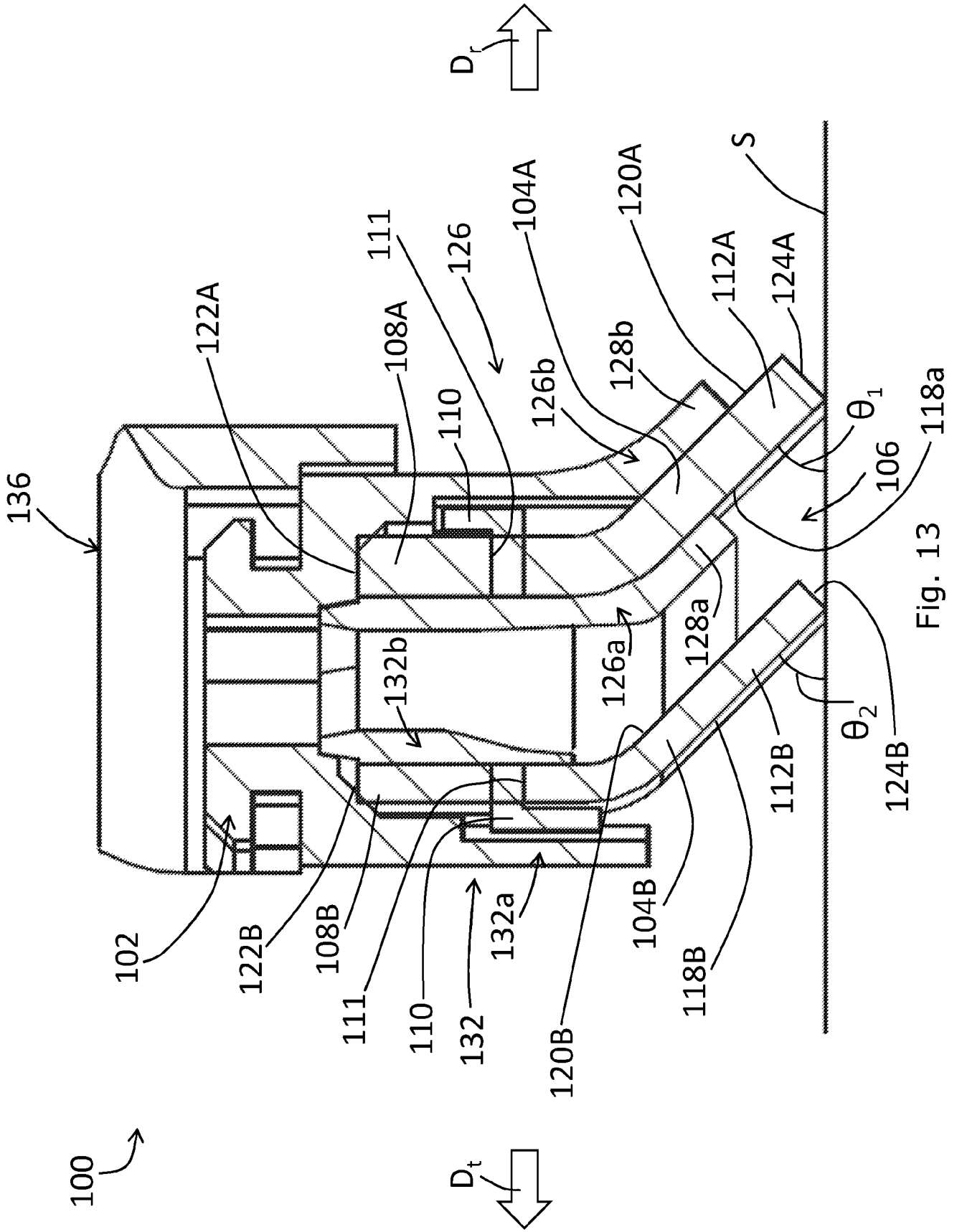


Fig. 13

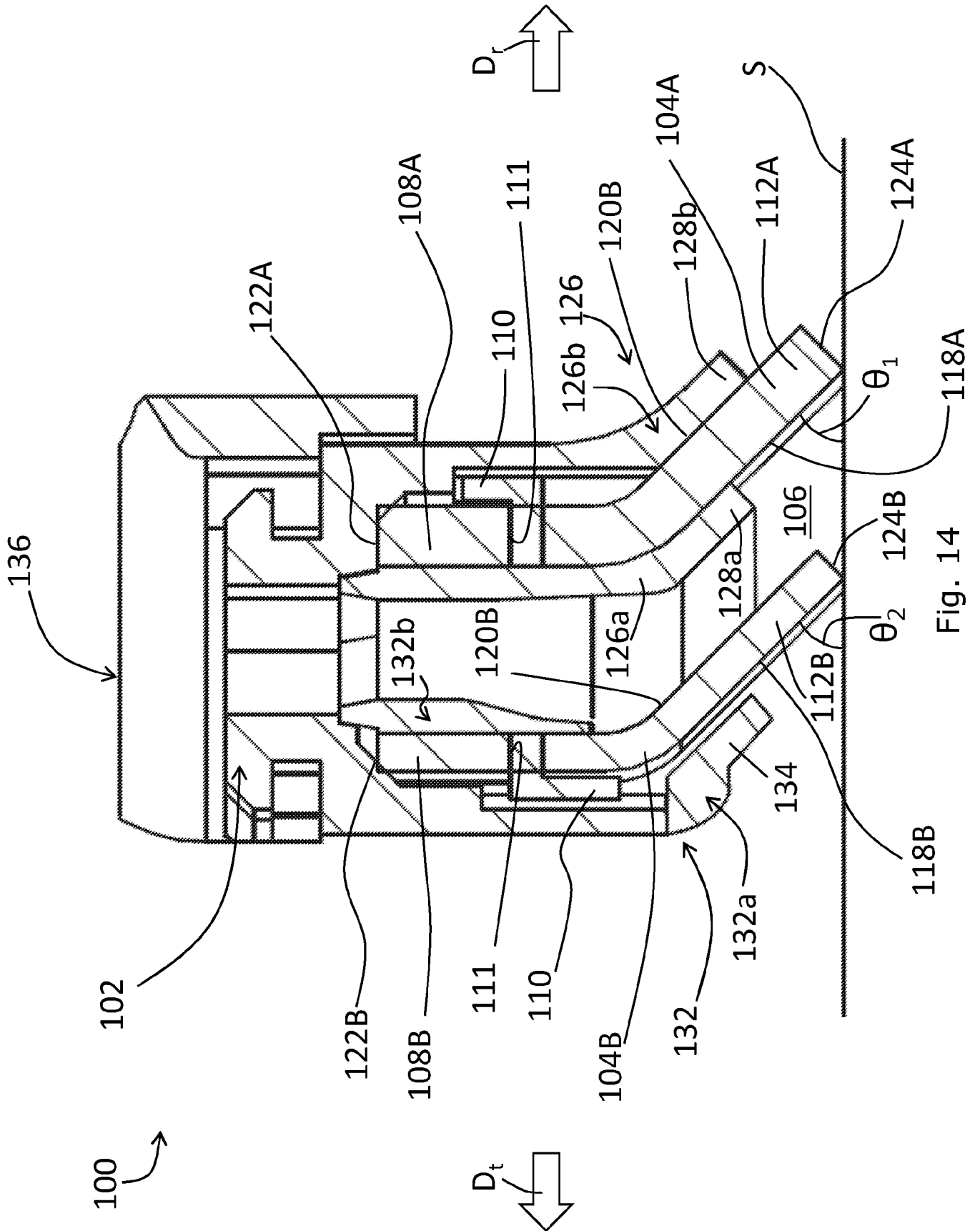


Fig. 14

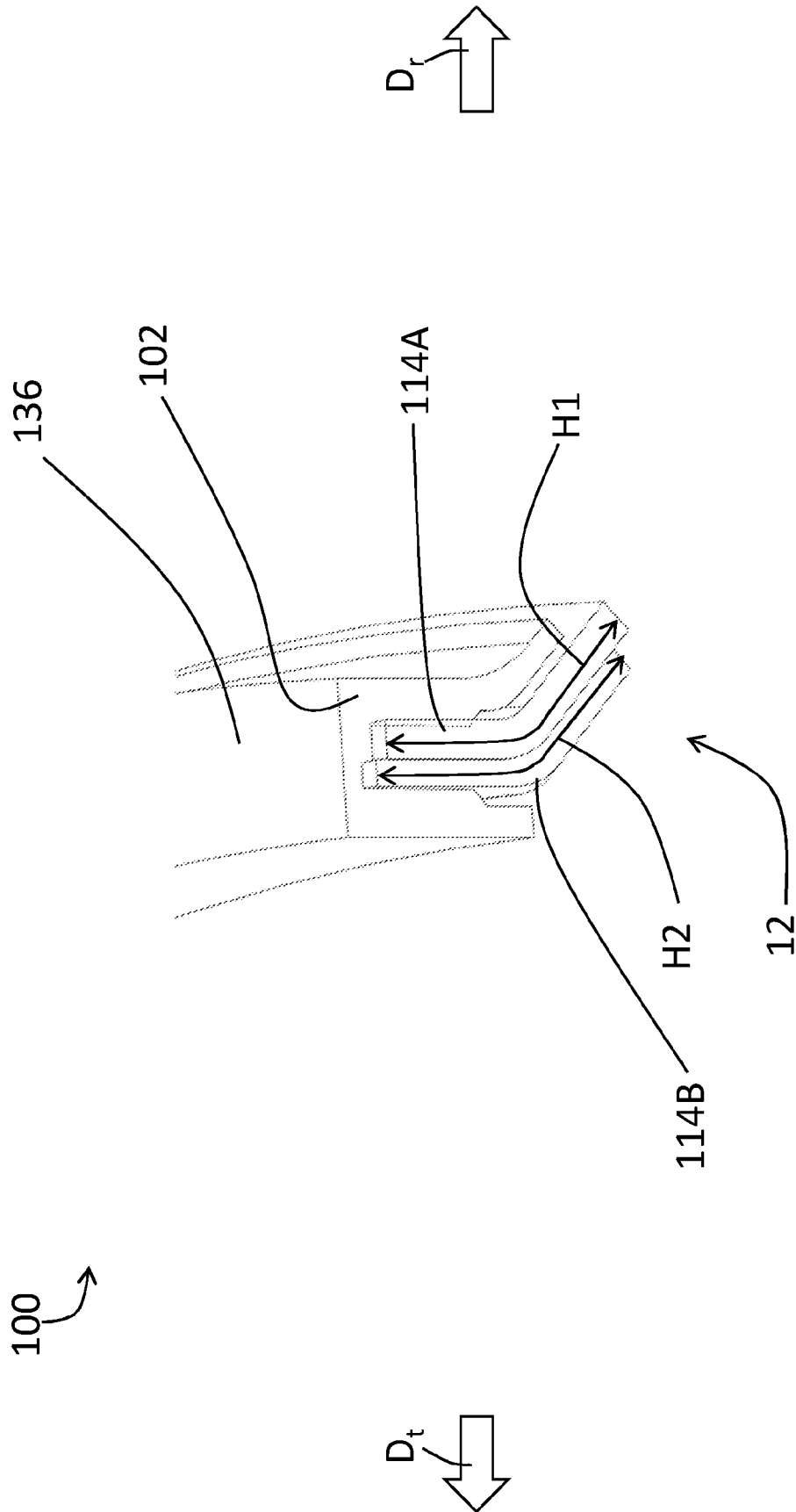


Fig. 15

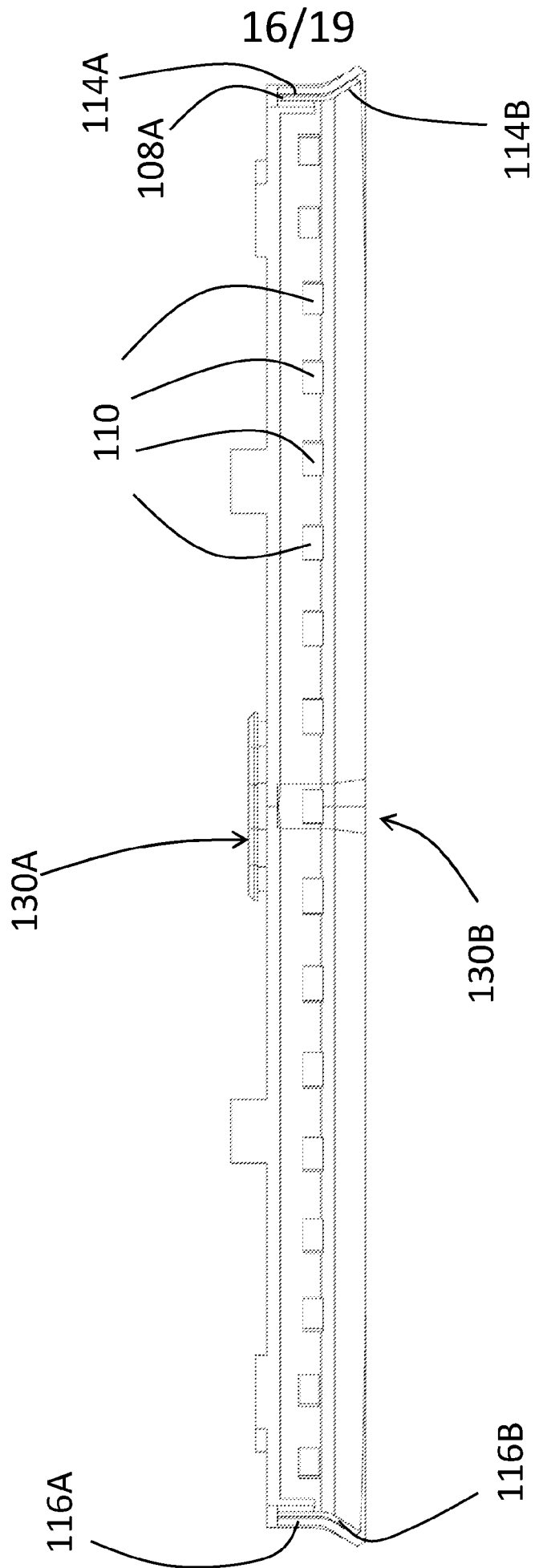


Fig. 16

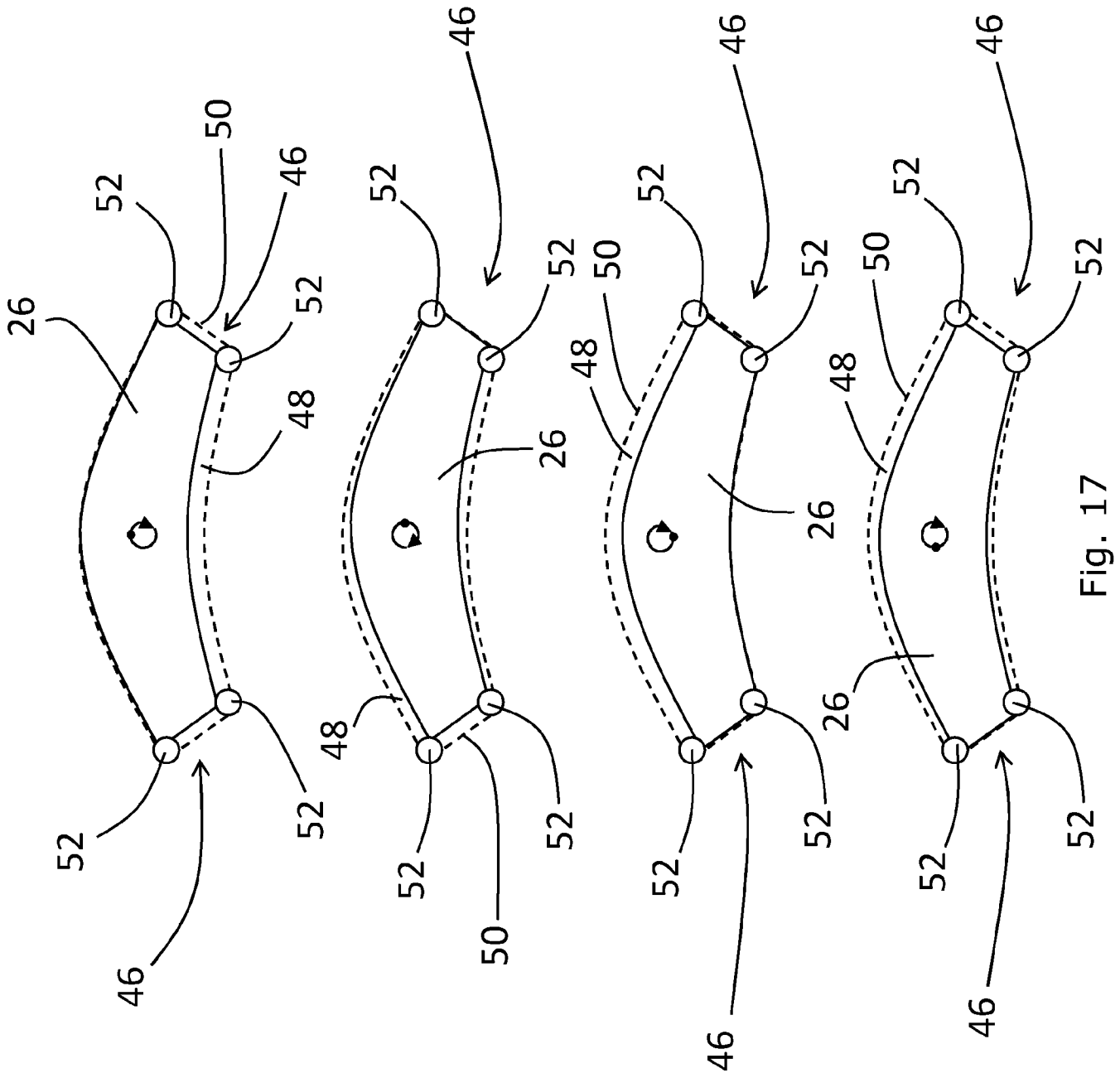


Fig. 17

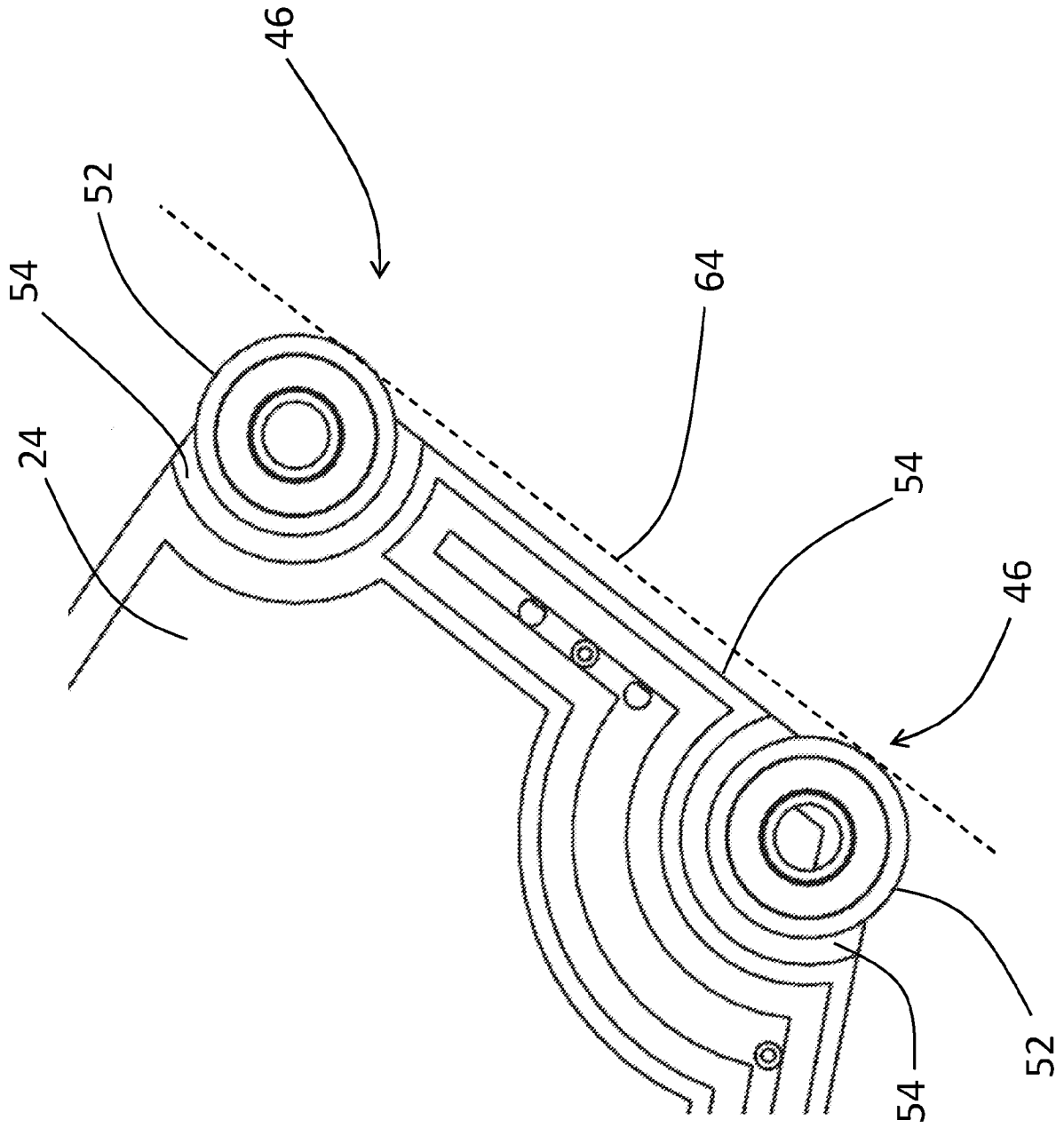


Fig. 18

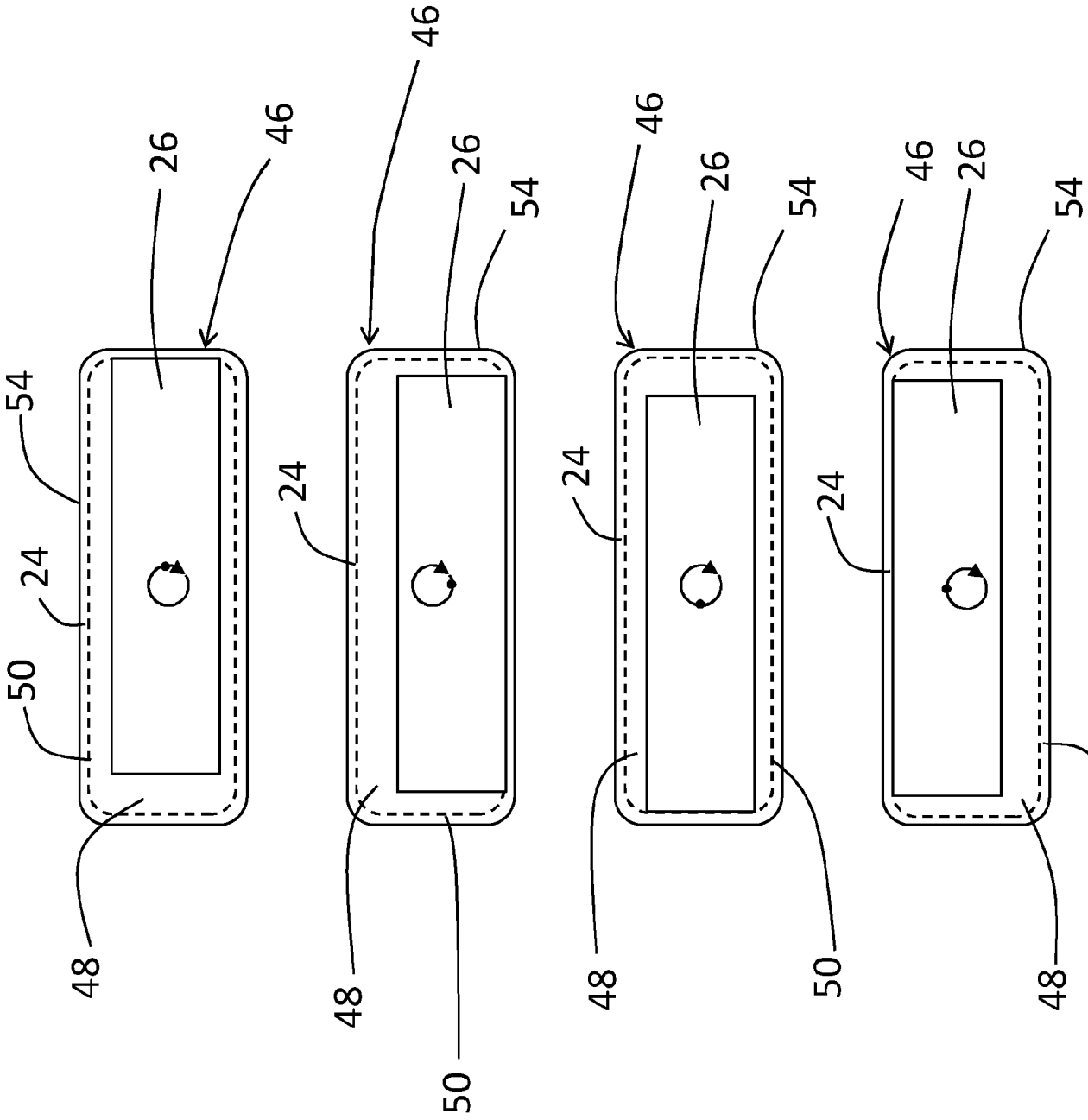


Fig. 19

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2022/050754

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L11/30
ADD.

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)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AU 2019 288 675 A1 (BISSELL INC [US]) 21 January 2021 (2021-01-21) paragraphs [0053] - [0077]; figures 1-8 -----	1-13
X	EP 2 229 865 A2 (ROYAL APPLIANCE MFG [US]) 22 September 2010 (2010-09-22) paragraphs [0041] - [0097]; figures 1-16 -----	1-13
X	EP 1 592 333 A2 (ROYAL APPLIANCE MFG [US]) 9 November 2005 (2005-11-09) paragraphs [0040] - [0075]; figures 1-17 -----	1-7, 13
X	EP 3 616 589 A2 (BISSELL INC [US]) 4 March 2020 (2020-03-04) paragraphs [0005] - [0054]; figures ----- -/--	1-7, 11-13

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
- "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)
- "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

- "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
- "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
- "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
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

23 June 2022

22/08/2022

Name and mailing address of the ISA/
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Authorized officer

Lopez Vega, Javier

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2022/050754

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 204 520 546 U (SHENZHEN ZHIYI TECHNOLOGY CO LTD) 5 August 2015 (2015-08-05) the whole document -----	1-7
A	WO 2011/111884 A1 (LG ELECTRONICS INC [KR]; HWANG JUNG BAE [KR]; HWANG MAN TAE [KR]) 15 September 2011 (2011-09-15) figures -----	8-10
A	CA 3 069 237 A1 (SHOP VAC CORP [US]) 7 March 2019 (2019-03-07) paragraphs [0066] - [0071]; figures -----	8-10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2022/050754

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:

see additional sheet

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 an 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.:

1-13

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13

surface treatment tool with different elements on its elongate body

2. claim: 14

surface treatment tool with chassis to be coupled to a treatment portion

3. claims: 15-31

surface treatment tool with two handgrip portions

4. claims: 32-35

Surface treatment head with two surface treatment components

5. claims: 36-52

squeegee assembly

6. claims: 53-72

dampening surface treatment element and surface treatment head

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2022/050754

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