

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 March 2009 (05.03.2009)

PCT

(10) International Publication Number
WO 2009/027643 A1

(51) International Patent Classification:
A47L 11/164 (2006.01) F16D 1/108 (2006.01)
A47L 11/40 (2006.01)

(21) International Application Number:
PCT/GB2008/002852

(22) International Filing Date: 22 August 2008 (22.08.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0716589.7 24 August 2007 (24.08.2007) GB

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA,
CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE,
EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID,
IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK,
LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW,
MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

(54) Title: ROTARY WORK HEAD ASSEMBLY

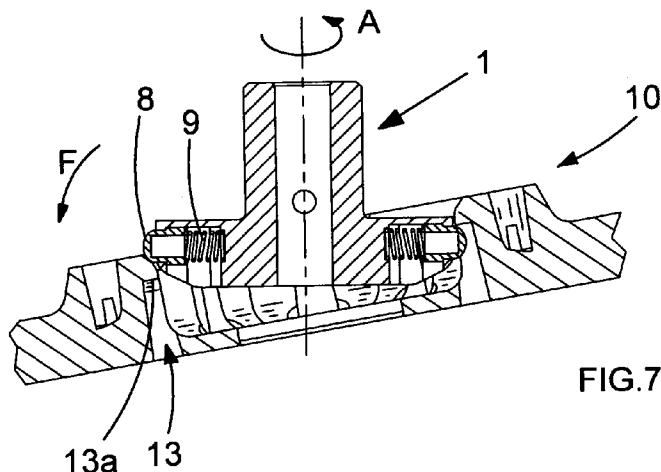


FIG. 7

(57) Abstract: A rotary work head assembly is provided suitable for connecting the drive hub (1) of a rotary floor cleaning machine (50) to a working head (10). The coupling comprises latching features associated with the hub (1) and working head (10). The latching features engage to retain the working head (10) on the hub (1) in a coaxial arrangement suitable for operation of the machine (50). To remove the working head (10), the operator tilts the working head (10) away from the coaxial position, which permits disengagement of the working head (10) from the hub (1).

Rotary work head assembly

The invention relates to a rotary work head assembly suitable for linking together a drive hub and a working tool. In particular, the invention relates to an assembly for
5 coupling a drive hub to the working head of a rotary floor cleaning or treatment machine.

This invention relates particularly to the field of rotary floor maintenance machines, of a type having a circular or annular rotating treatment head, provided on an
10 underside thereof with a working surface comprising, for example, a brush or a polishing pad, which rotates parallel and juxtaposed the surface to be cleaned.

Treatments may range from polishing, through cleaning, to aggressive treatments such as sanding, grinding, scouring or scarifying.

15 Floor treatment machines typically comprise one or more rotatable treatment heads, driven by for example an electric motor. Typical machines are described in WO 92/10128 (Numatic International Limited) and WO 93/14684 (Numatic International Limited). The working surface is formed on an annular ring or circular disc. The working surface may be formed by brushes, which may be soft and pliable, such as
20 for use in polishing, or stiff and wiry such as for use in scarifying or scouring. The working surface alternatively may be formed by sanding or grinding pads, for example formed of abrasive material. The working surface may also be formed by absorbent material such as felt or pads suitable for cleaning with the aid of a cleaning liquid applied to the floor.

Typically the working heads are demountable for replacement or cleaning.

Examples of known working heads are available from Numatic International Limited, of Chard, Somerset in the United Kingdom. These include accessories for the

5 Twintec® range and Nuspeed® ranges of floor treatment machines.

Other manufacturers have similar products that will also be well known to the person skilled in the art.

10 The working head (or pad) of such cleaning machines is typically releaseably attached to the drive shaft of a machine via a drive hub or chuck. Known working heads have a variety of mechanisms to help with the engagement/disengagement of the working head to the cleaning machine. For example, JP-A-2002065538 discloses a radially directed spring-loaded plunger carried on a hub collar, wherein the plunger engages
15 with a circumferential depression in a rotor hub. US-A-5243727 discloses a similar plunger arrangement.

US-A-5,421,053 discloses a coupling between a hub and a work head in which an hexagonal spring bar carried by the work head retains an hexagonal hub. The spring
20 bar has crossed over end regions which may be drawn together to allow detachment of the work head from the hub.

US-A-5,513,409 discloses a gimbaling connection between a work head and a hub which relies upon a domed hexagonal-section hub member and corresponding female
25 seat in the work head. This allows the axis of rotation of the work head to shift

slightly relative to the axis of rotation of the hub and drive rotor. The means by which the work head is attached to the hub is not disclosed, other than with reference to conventional means such as a retention spring or locking collar.

5 With the prior art arrangements, when it is desired to remove or replace a working head it may be difficult to access the head as it is typically floor facing and located on the base of the machine. Thus the manual fitting of the working pads can require rather awkward manipulation. Correct alignment and orientation of the pad and drive hub is required to ensure correct mating. Further, in order to ensure that the pad
10 remains connected to the drive hub during operation, a locking mechanism is usually employed, which is frequently difficult to access and operate due to the physical location. Incorporation of a locking mechanism, such as a spring bar or plunger, into the working head of the machine also increases the weight and cost of the working head.

15

The present invention seeks to provide a coupling mechanism for connecting a tool to a hub which ameliorates the above problems and facilitates the easy removal and remounting of tools, without reducing the effectiveness and integrity of the mechanical coupling.

20

A further problem which remains to be solved is the provision of a coupling mechanism for connecting a tool to a hub not requiring complex connection mechanisms on the tool.

25 The present invention addresses these and other problems of the prior art.

According to one aspect of the invention there is provided a rotary work head (tool) assembly comprising a hub carried by a drive shaft and a working head coupled to the hub for co-axial rotation therewith, the coupling comprising latching features associated with the hub and working head respectively, which latching features inter-engage to retain the working head on the hub, the coupling being adapted to permit tilting of the working head out of coaxial alignment with the hub, and the latching features being configured so that sufficient tilt serves to disengage a latching feature associated with the hub from a corresponding latching feature associated with working head so as to permit demounting of the working head from the hub.

In this way simple rocking or tilting of the work head may be used to detach the work head from the hub (and any associated floor treatment machine). This is useful where the work head is situated in an inaccessible location, such as under a floor treatment machine. One handed manipulation is typically all that is necessary to effect the required tilting for detachment of the work head.

The tilting may be achieved by the provision in the coupling of gimbal means operative between the hub and work head.

20

The coaxial coupling between the hub and work head may involve location of the hub in a corresponding female seat provided in an upper surface of the work head. The hub is preferably provided with a shaft end and a distal end, the distal end being formed with a domed or partially-domed surface portion which facilitates tilting of the work head on the hub for demounting.

25

An outer circumferential surface of the hub may be provided with tangentially extending facets so that the hub has a polygonal cross-section. A female seat in the work head preferably has a corresponding polygonal perimeter in which the hub can nest, thereby to permit rotation of the working head by the hub. One or more of the work head facets may be provided with a recess into which a latching spigot provided on a corresponding hub facet may be seated.

The latching means may comprise one or more spigots. Each spigot may be biased into a latching engagement configuration when the working head is coupled to the hub. Each spigot is typically provided on the hub and may project radially on the hub.

The latching means may comprise, or further comprise, one or more lip feature which constrains a corresponding spigot. The said one or more lip feature is provided on the working head.

In a preferred arrangement the latching means comprises one or more spigots associated with the hub and one or more lip features associated with the work head, the spigots and lip features being arranged so that coupling of the hub with the work head involves sliding travel of each spigot past a corresponding lip feature into an engaged configuration in which the lip retains the spigot.

The spigot is preferably formed with a cammed surface profile which facilitates sliding travel of each spigot past the lip. In particular an upper edge region of each lip may be tapered to facilitate travel of the spigot past the lip during entry into the facet

recess. One or more of the spigots may be biased so as to permit retraction of the spigot so as to allow travel of the spigot past the corresponding lip.

In a preferred configuration, the hub nests in a hub seat provided in the working head
5 and each lip feature is provided on a respective upper inner wall portion of the hub seat.

In a particular embodiment there are two retractable spigots, each one provided on a respective hub and two corresponding recesses each one formed in the inner wall of
10 the seat, each recess having a upper edge portion which defines an associated lip feature. The hub may be polygonal in cross section so that the perimeter of the hub comprises a plurality of facets and wherein the two spigots are located on opposite facets of the hub, so that tilting of the work head for demounting thereof causes one spigot to be displaced past out of the recess and past the corresponding lip feature in
15 the work head seat wall, while the other spigot is retained hooked in its associated recess until further tilting allows complete release of the work head.

A portion of the hub preferably has an octagonal cross-section which defines eight circumferential facets on the hub.

20 The work head is typically a generally disc shaped floor treatment tool which has a lower working face adapted to treat a floor surface when the work head is rotated. Thus the work head may be adapted be for scrubbing, scarifying, polishing or any other like treatment.

25

In another aspect of the invention there is provided a floor treatment machine comprising one or more a rotary work head assemblies as hereinbefore described. A typical machine has means such as wheels for translation movement over a floor surface and a drive motor for driving a demountable work head. The machines may be walk-behind or ride-on, in which case a seta is provided. The machines may also be provided with a wet cleaning apparatus which delivers a liquid to the floor surface in and lifts the liquid off the floor after treatment. Machines of this type will be well known to the person skilled in the art. Examples are described in WO 92/10128 (Numatic International Limited) and WO 93/14684 (Numatic International Limited).

According to a further aspect of the invention there is provided a work head as hereinbefore described but, in particular, a work head for a floor treatment machines comprising a generally annular or disc shaped member having an underside provided with a floor treatment surface an upper side provided with a polygonal hub seat for coupling with a corresponding drive hub of a treatment machine, the hub seat having a polygonal inner wall surface comprising a plurality of facets, each facet being formed with a recess for receiving a hub spigot.

An upper edge region of each recess may be provided with a lip feature which constrains the spigot against travel out of the seat recess. In a preferred embodiment the hub seat has a generally octagonal form.

Following is a description by way of example only and with reference to the drawings of one embodiment for putting the present invention into effect.

In the drawings:-

Figures 1a, 1b and 1c are respectively a side view, plan view from above and perspective view of a drive hub used in implementing invention;

5 Figure 2 is a cross-sectional view of the drive hub of figure 1;

Figures 3a and 3b are respectively a plan view from above and a diametric cross-sectional view of a rotary cleaning head of a floor cleaning machine;

10 Figure 4 is a cross-sectional view of the drive hub immediately prior to engagement with the cleaning head;

Figure 5 is a cross-sectional view of the drive hub during engagement with a the cleaning head;

15

Figure 6 is a cross-sectional view of the drive hub engaged with the cleaning head;

Figure 7 is a cross-sectional view of the drive hub during disengagement from the cleaning head;

20

Figure 8 is a perspective view of the hub and cleaning head arrangement shown in figure 4.

Figure 9 is a perspective view of the arrangement shown in figure 5.;

25

Figure 10 is a perspective view the arrangement shown in figure 6;

Figure 11 is a perspective view of the arrangement shown in figure 7.

5 Figure 12 is a floor cleaning machine according to the invention.

The drive hub (1) is shown generally as (1) in figures 1a to 1c. The hub is formed from a single piece of machined metal. The hub has an upper portion (2) (configured as a tubular collar). The tubular collar defines a bore for receiving a motor driven
10 drive shaft (not shown). Locking means (not shown) are provided securely to affix the hub to the drive shaft for rotation therewith. Suitable means will be known to the person skilled in the art and might include, for example, a dog stub (not shown). A lower portion (3) of the hub is formed as a generally domed cap. Side regions of the cap are machined with eight vertical facets 5 which provide an octagonal plan form.
15 The cap thus has an upper shoulder surface of generally octagonal annular plan extending around the upstanding tubular element. A lower surface of the cap is formed as a flat circular surface (6). The surface (6) tapers away its outer circumferential region following a domed profile which extends until intersecting with the octagonal vertical facets (5) on the side regions of the hub. The operational
20 axis of the hub (i.e. the axis about which it rotates in normal operation) is indicated as arrow A in figure 1.

The drive hub may be made of any suitable material, for example metal (e.g. brass, steel, or aluminium, preferably aluminium), or an engineering plastics material.

Two opposite facets provided with radially oriented stub bores (7) as shown in figure 2. These bores accommodate spring-biased dogs (8). The dogs are biased by means of respective spiral compression springs (9). Springs (9) bias dogs (8) to project radially outwards, and permit inward retraction of the dogs (8) on application of appropriate
5 force.

Figures 3a and 3b illustrate the upper face and cross-section respectively of a rotary cleaning head (10) of a floor cleaning machine (not shown). This cleaning head is suitable for engagement with the hub described above. The cleaning head is in the
10 form of a generally annular disc. A central portion of the head is formed with an octagonal plan recess (11) in the upper face. Surrounding the recess is an annular groove (17).

The periphery of the recess (11) is defined by eight contiguous vertical facets (12).
15 Each of the facets is formed with a depression (13).

An uppermost portion of each depression (13) is formed with an inwardly overhanging lip feature (14). An upper side of each lip is provided with a cammed (or inwardly and downwardly tapering) surface. The underside of the lip forms a retaining
20 latch as will be explained hereinafter. The recess features a flat floor portion (15) which in the embodiment illustrated includes a central circular hole. An underside (16) of the cleaning head is substantially planar and annular.

Although not shown in the present figures, the underside would in a floor scrubbing
25 embodiment be provided with a covering of downward facing bristles formed from a

plastics material (e.g. nylon or polypropylene). Naturally in alternative applications the underside could be provided with other features such as a sanding disk, polishing pad or any other working tool of types known in the art.

- 5 To connect the drive hub to the cleaning head, the head portion (3) of drive hub is inserted into the recess (11) provided in the upper face of the cleaning head, as shown in figure 4. Figure 8 presents a perspective view of this step.

- Two of the cammed surfaces (14) come into sliding contact with the two opposite
10 spring-loaded dogs (8), causing the spring-loaded dogs to retract, compressing springs (9) (figure 5, figure 9), and permitting head portion (3) of the drive hub to progress into the recess (11).

- When in the fully engaged position (figure 6, figure 10), the spring loaded dogs (8)
15 snap outwards under the bias of the compressed springs, causing the dogs (8) to engage with the corresponding depressions (13) provided in the facet walls (12) of the recess (11). The engagement of the spring loaded dogs (8) in depressions (13) retains the working head in position on the hub. The nesting of the hub facets with the corresponding working head facets locks the working head for axial rotation with the
20 hub when in use. Thus, turning driveshaft (18) and hub results in the tool being rotationally driven.

To detach the cleaning head from the hub, the cleaning head is tilted out of the plane normal to the axis of rotation (A) by rocking over the lower domed surface of the hub.

- 25 This causes one of the engaged spring loaded dogs (8) to travel up in the depression

and come into contact (figure 7) with the shoulder (13a) of the depression (13). This causes the dog to retract into the recess (7) and thus enables the dog to travel past the lip of the depression and out of latching engagement. In the embodiment shown, it is the domed profile of the base of the drive hub (6) which facilitates this tilting

5 movement of the lower working face (16) of the tool out of the plane normal to the axis of the drive hub. As the retracting dog travels past the lip of the depression, the opposite dog is remains in latched engagement until the cleaning head as rocked sufficiently to allow the trailing dog to be unhooked from its depression.

10 In practice the cleaning head will lie under a cleaning or scrubbing machine, with the working face in intimate contact with a floor surface. To detach the cleaning head the operator manually locates the cleaning head with one hand and tilts one edge of the head upwards slightly. This causes the working head to rock on the hub and detachment of the cleaning head from the hub as described in the foregoing. The
15 cleaning head may then be replaced by snapping a cleaning head back onto the hub, and floor cleaning can be resumed. In contrast to prior art engagement mechanisms, where complex engagements such as stub screws or detents are used, two handed access is not required to the remove a cleaning head. The cleaning machine itself need not be lifted for access to its underside. As the primary essential features of the
20 disengagement mechanism are carried by the hub, the cost, complexity and weight of the cleaning head is kept to a minimum. In prior art devices metal locking spigots and springs are carried by the working head which makes them expensive as spare part items.

The working head may then be attached to a floor-cleaning machine (50) of a type shown in figure 12. The machine has a motor housing (51), two spaced-apart transport rollers (52) and an articulated arm (53). The rollers are spaced apart from the floor surface when the working head is located flat on the floor, but engage with the floor when the working head and motor housing assembly are rotated from the floor surface. The machine may thereby be conveniently roller-transported across a surface when not in use. The arm is articulated at a lower end (54) to permit height adjustment. At an upper end of the arm, there is provided a handlebar (55) and control panel assembly (56). The operator (57) grasps the handle to direct and move the machine over a surface to be cleaned.

Claims

1. A rotary work head assembly comprising a hub carried by a drive shaft and a working head coupled to the hub for co-axial rotation therewith, the coupling
- 5 comprising latching features associated with the hub and working head respectively, which latching features inter-engage to retain the working head on the hub, the coupling being adapted to permit tilting of the working head out of coaxial alignment with the hub, and the latching features being configured so that sufficient tilt serves to disengage a latching feature associated with the hub from a corresponding latching
- 10 feature associated with working head so as to permit demounting of the working head from the hub.
2. An assembly as claimed in claim 1 wherein the coupling is adapted to tilt by the provision of gimbal means operative between the hub and work head.
- 15
3. An assembly as claimed in claim 1 or claim 2 wherein the coupling between the hub and work head involves location of the hub in a corresponding female seat provided in an upper surface of the work head.
- 20 4. An assembly as claimed in any preceding claim wherein the hub is provided with a shaft end and a distal end, the distal end being formed with a domed or partially-domed surface portion which facilitates tilting of the work head on the hub for demounting.

5. An assembly as claimed in any preceding claim wherein an outer circumferential surface of the hub is provided with tangentially extending facets so that the hub has a polygonal cross-section.

5 6. An assembly as claimed in claim 5 wherein a female seat in the work head has a corresponding polygonal perimeter in which the hub can nest, thereby to permit rotation of the working head by the hub.

7. An assembly as claimed in claim 6 wherein one or more of the work head facets is
10 provided with a recess into which a latching spigot provided on a corresponding hub facet may be seated.

8. An assembly as claimed in claim 7 wherein each recess is provided by an inwardly directed lip feature at an upper end region of each facet.

15

9. An assembly as claimed in any preceding claim wherein the latching means comprises a plurality of spigots and corresponding recesses.

10. An assembly as claimed in any of claims 7 to 9 wherein each spigot is biased into
20 a latching engagement configuration when the working head is coupled to the hub.

11. An assembly as claimed in any of claims 7 to 10 wherein each spigot is provided on the hub.

12. An assembly as claimed in claim 11 wherein each spigot projects radially on an associated hub facet.

13. An assembly as claimed in any preceding claim wherein the latching means
5 comprises one or more lip feature which constrains a corresponding spigot.

14. An assembly as claimed in claim 13 wherein the one or more lip features are provided on the working head.

10 15. An assembly as claimed in any preceding claim wherein the latching means comprises one or more spigots associated with the hub and one or more lip features associated with the work head, the spigots and lip features being arranged so that coupling of the hub with the work head involves sliding travel of each spigot past a corresponding lip feature into an engaged configuration in which the lip retains the
15 spigot.

16. An assembly as claimed in claim 13 wherein the spigot is formed with a cammed outer surface portion which facilitates sliding travel of each spigot past the lip.

20 17. An assembly as claimed in claim 15 or claim 16 wherein the one or more of the spigots is providing with biasing means so as to permit retraction of the spigot so as to allow travel of the spigot past the lip.

18. An assembly as claimed in any of claims 15 to 17 wherein the hub nests in a hub seat provided in the working head and each lip feature is provided on a respective upper inner wall portion of the hub seat.

- 5 19. An assembly as claimed in claim 18 wherein there are two retractable spigots, each one provided on a respective hub and two corresponding recesses each one formed in the inner wall of the seat, each recess having an upper edge region which defines an associated lip feature.
- 10 20. An assembly as claimed in claim 19 wherein the hub is polygonal in cross section so that the perimeter of the hub comprises a plurality of facets and wherein the two spigots are located on opposite facets of the hub, so that tilting of the work head for demounting thereof causes one spigot to be displaced past out of the recess and past the corresponding lip feature in the work head seat wall, while the other spigot is
- 15 retained hooked in its associated recess until further tilting allows complete release of the work head.

21. An assembly as claimed in any preceding claim wherein a portion of the hub has an octagonal cross-section which defines eight circumferential facets on the hub.

20

22. An assembly as claimed in any preceding claim wherein the work head is a generally disc shaped floor treatment tool which has a lower working face adapted to treat a floor surface when the work head is rotated.

23. A floor treatment machine comprising one or more a rotary work head assemblies as claimed in claim 22.

24. A work head for a floor treatment machines comprising a generally annular or disc shaped member having an underside provided with a floor treatment surface and an upper side provided with a polygonal hub seat for coupling with a corresponding drive hub of a treatment machine, the hub seat having a polygonal inner wall surface comprising a plurality of facets, each facet being formed with a recess for receiving a hub spigot, wherein each recess is defined by an inwardly facing lip formed at an upper edge region of each inner wall.

25. A work head as claimed in claim 24 wherein an upper edge region of each lip is tapered to facilitate travel of a hub spigot past the lip and into the recess during attachment of the work head to the hub.

26. A work head as claimed in claim 24 wherein an upper edge region of each recess is provided with a lip feature which constrains the spigot against travel out of the seat recess.

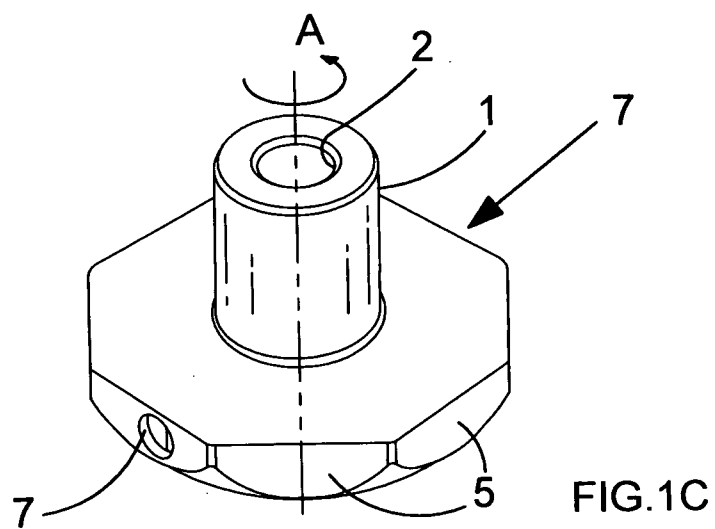
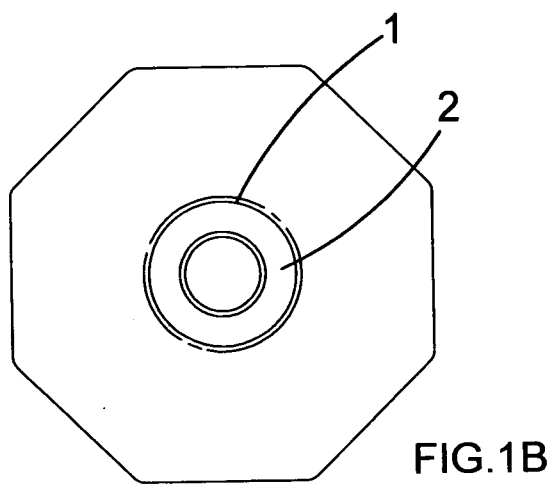
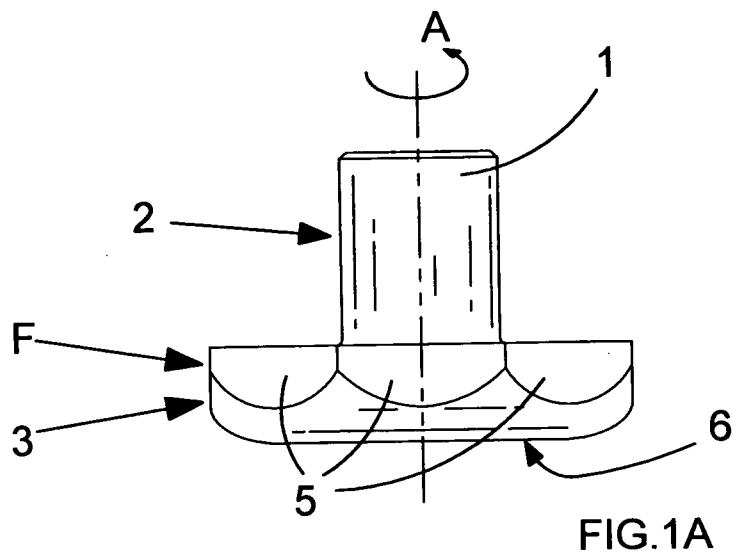
27. A work head as claimed in any of claims 24 to 26 wherein the hub seat has a generally octagonal form.

28. A rotary drive hub as hereinbefore described and shown in the figures 1, 2 and 4 to 11 of the drawings.

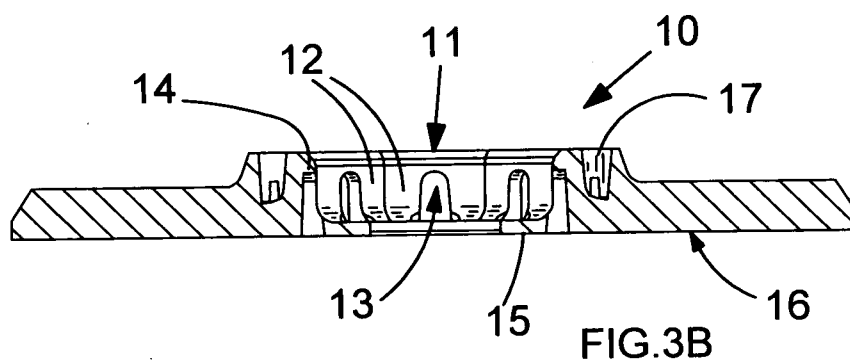
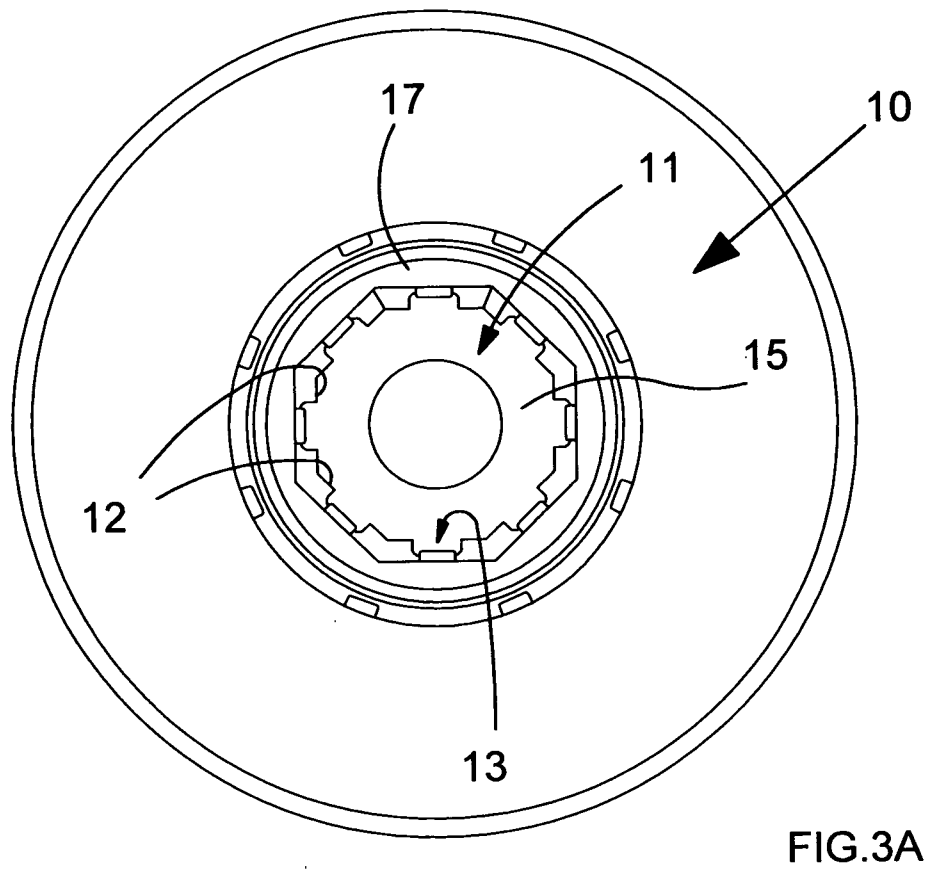
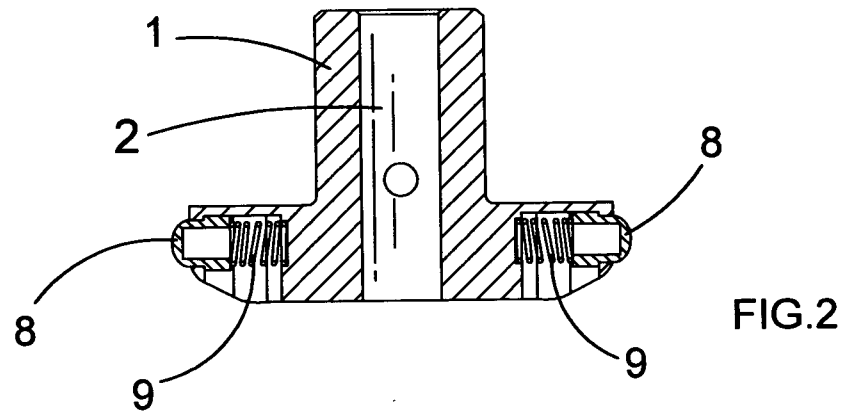
29. A cleaning head as hereinbefore described and shown in figures 3 to 11 of the drawings.

30. A rotary work head assembly comprising a rotary drive hub as claimed in claim
5 28 and a cleaning head as claimed in claim 29.

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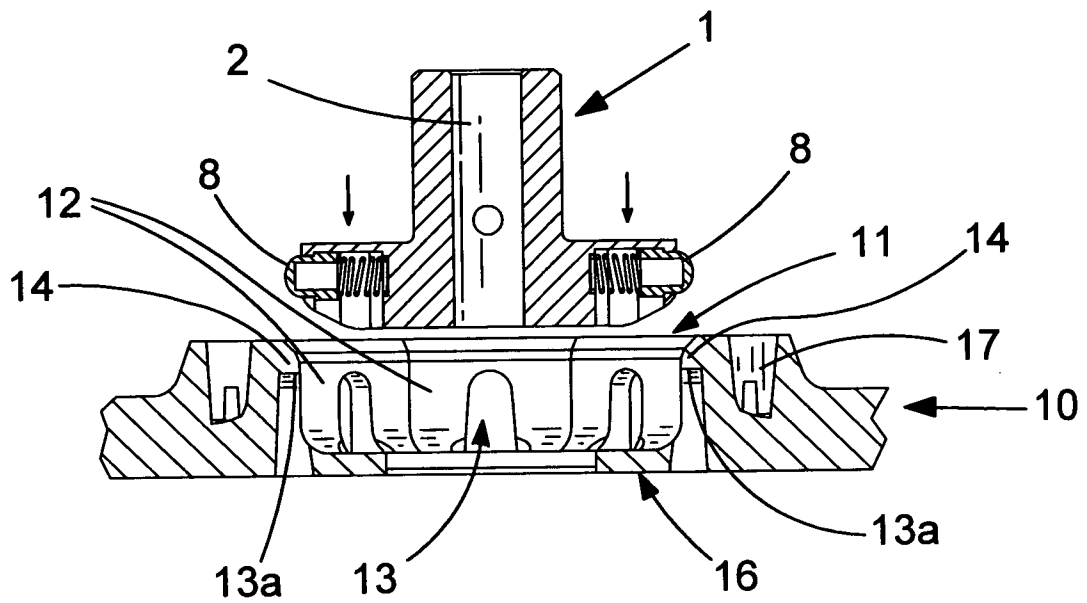


FIG. 4

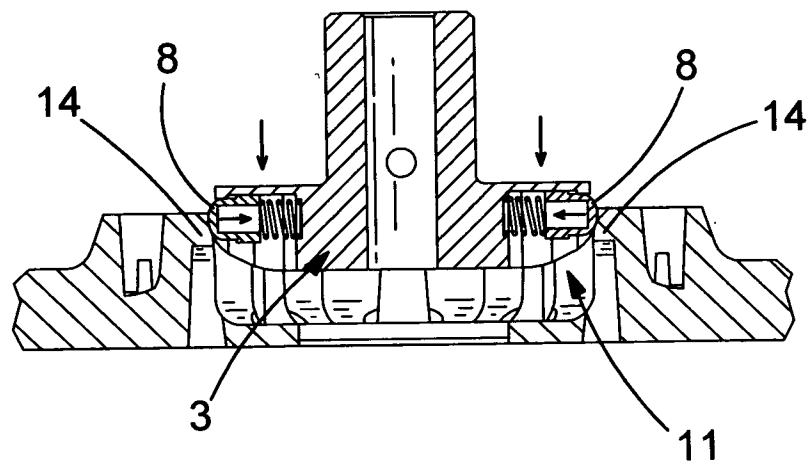


FIG. 5

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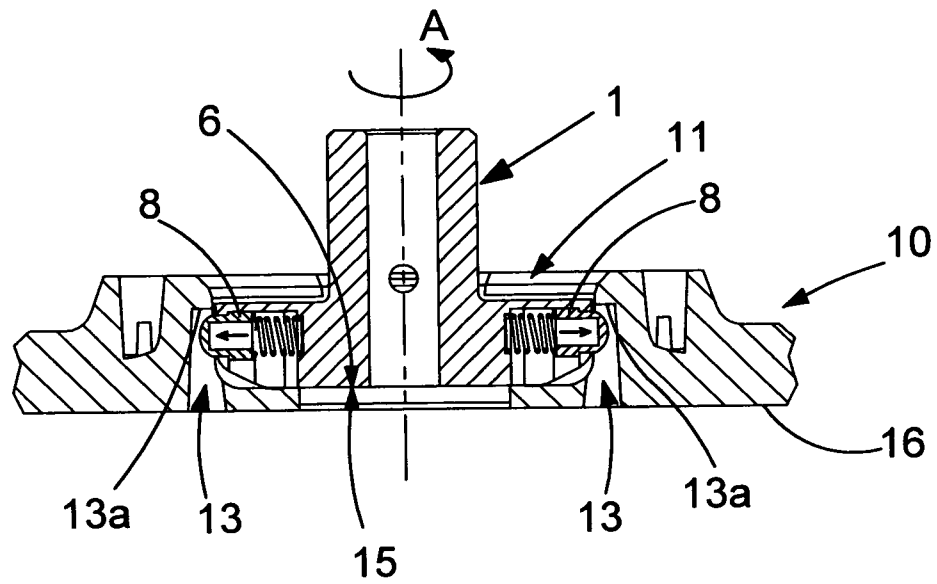


FIG. 6

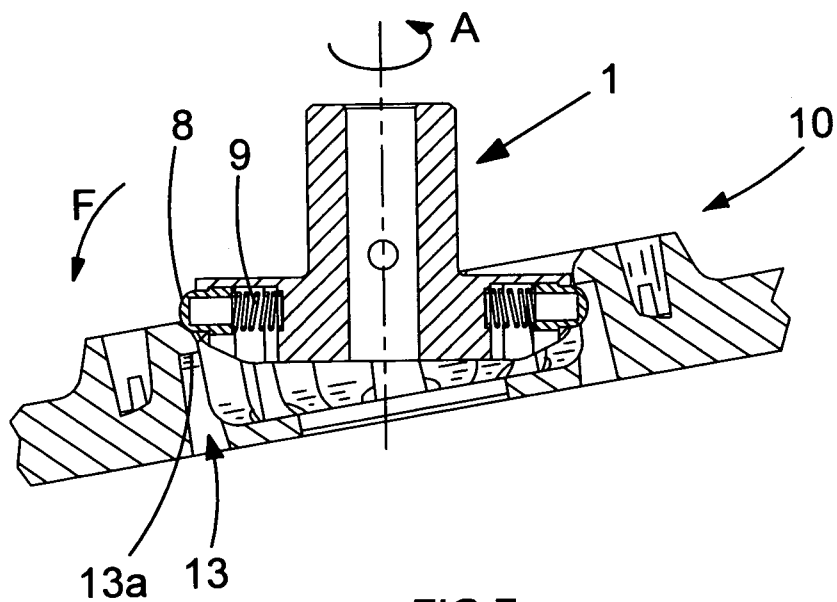


FIG. 7

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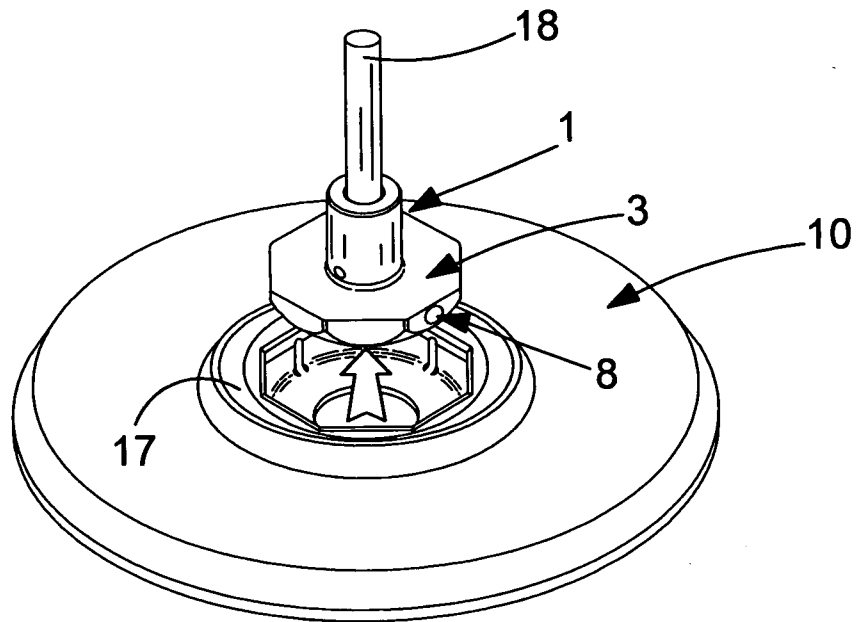


FIG. 8

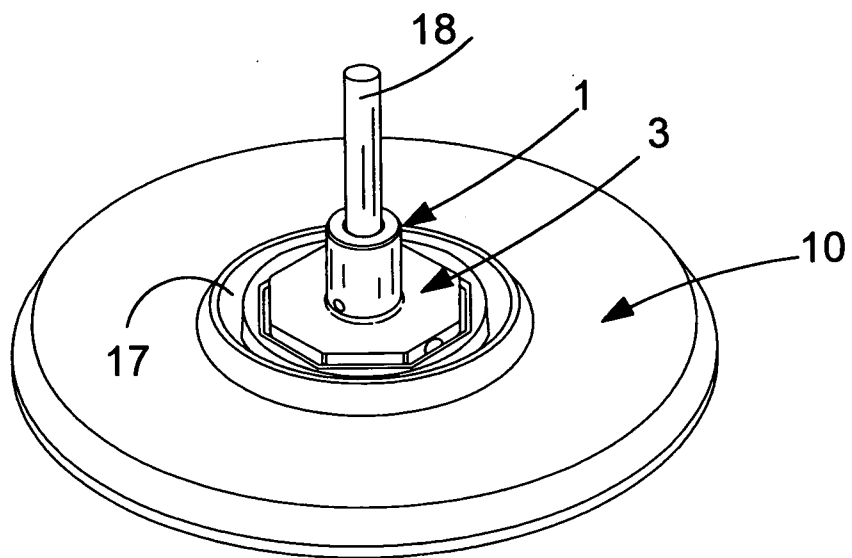
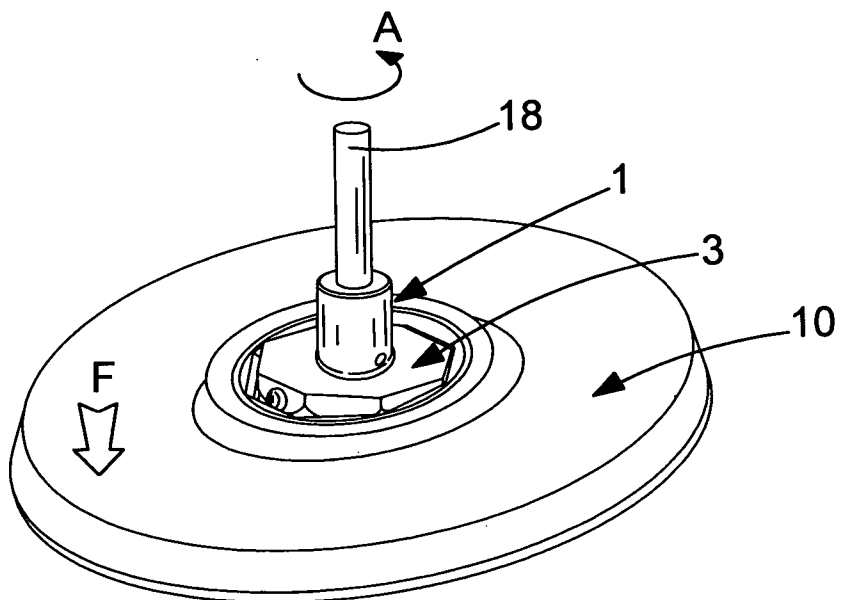
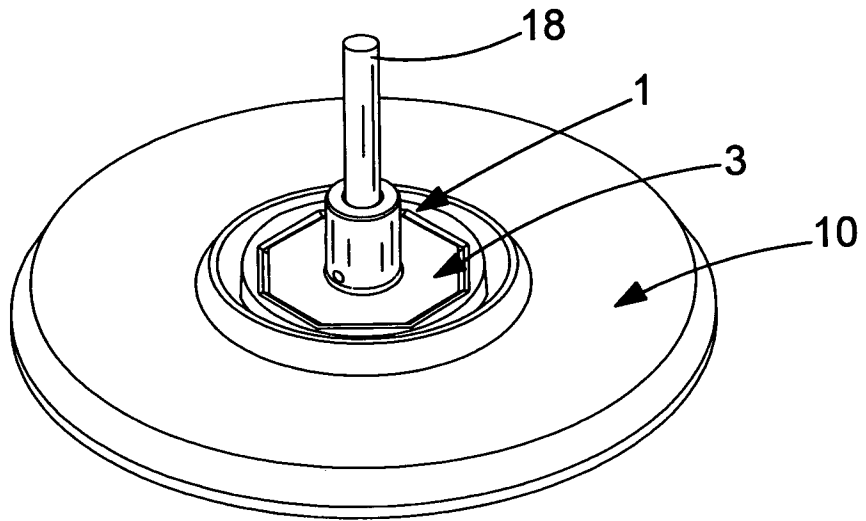
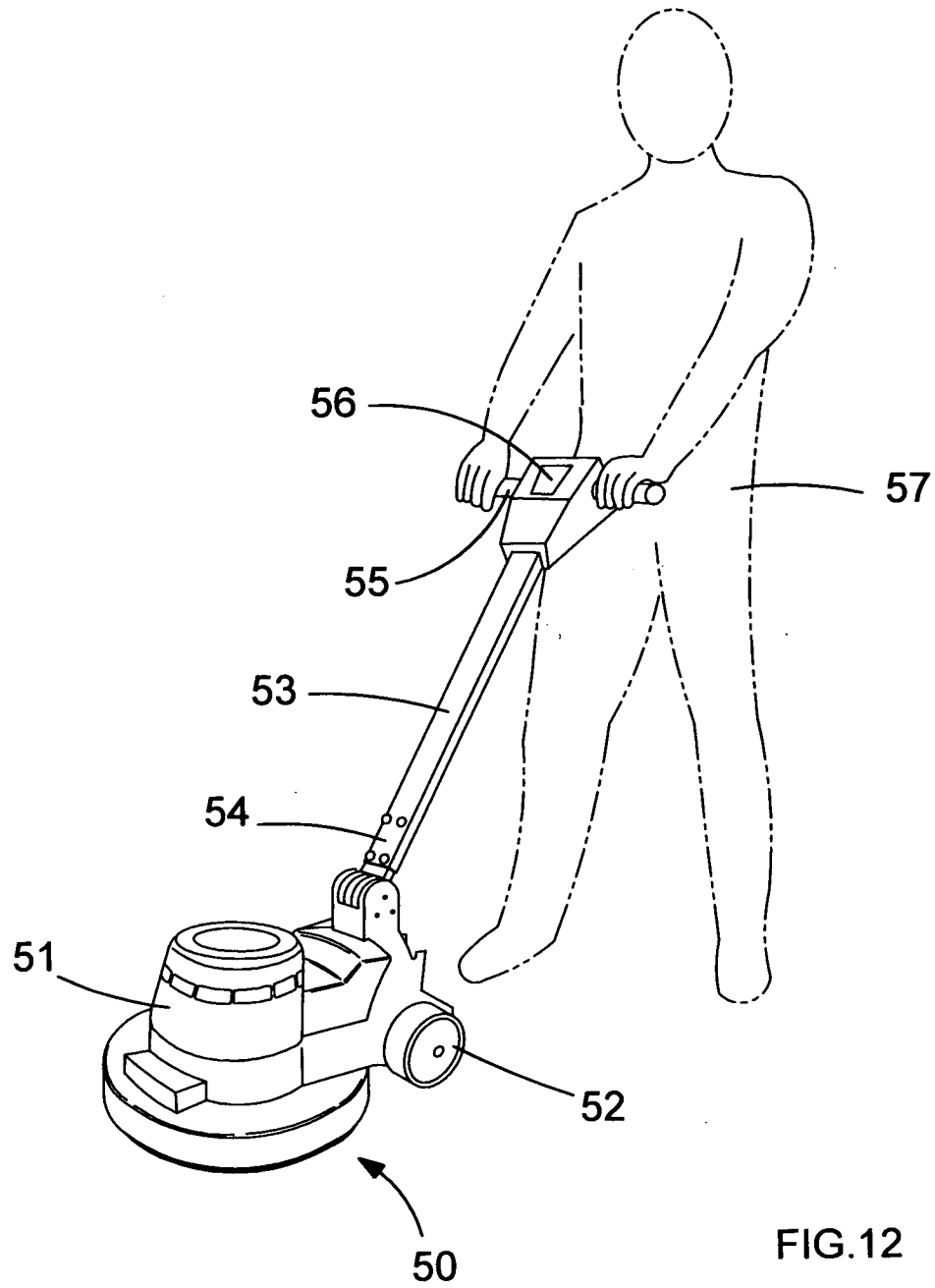


FIG. 9

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INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2008/002852

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L11/164 A47L11/40 F16D1/108

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 F16D

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 421 053 A (CHODAK KEITH W [US]) 6 June 1995 (1995-06-06) column 2, line 15 - column 5, line 6 -----	23,24
A	GB 1 210 667 A (HOOVER LTD) 28 October 1970 (1970-10-28) page 1, line 78 - page 3, line 28 -----	1-24
A	US 5 243 727 A (TANAKA OSAMU [JP] ET AL) 14 September 1993 (1993-09-14) column 1, line 45 - column 2, line 4 -----	1-24
A	US 4 866 804 A (MASBRUCH RICHARD D [US] ET AL) 19 September 1989 (1989-09-19) column 1, lines 14-66 ----- -/-	1-24

☒ 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 document 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.

G document member of the same patent family

Date of the actual completion of the international search

17 November 2008

Date of mailing of the international search report

12/12/2008

Name and mailing address of the ISA/

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Authorized officer

Martin Gonzalez, G

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2008/002852

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 487 892 A (VORWERK CO INTERHOLDING [DE]) 3 June 1992 (1992-06-03) column 1, line 23 - column 2, line 52 -----	1-24
A	US 3 082 451 A (SMITHSON CHARLES B) 26 March 1963 (1963-03-26) column 1, line 52 -----	1-24
A	JP 08 280592 A (AMANO CORP) 29 October 1996 (1996-10-29) abstract; figures 1-10 -----	1-24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2008/002852

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.: 25, 26, 27
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:
see FURTHER INFORMATION sheet PCT/ISA/210
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:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable 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 reportcovers 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.:

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

Continuation of Box II.2

Claims Nos.: 25, 26, 27

Contrary to Rule 6.2(a) PCT, claims 25,26,27 contain general references to the description and drawings for the definition of the claimed subject-matter. The references to the description and drawings used in said claims are vague and unclear and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT.

It is particularly burdensome for a skilled person to establish the subject-matter for which protection is sought with claims 25,26,27 of the application. The non-compliance with the substantive provisions is to such an extent, that no meaningful search can be carried out for claims 25,26,27 (Article 17(2)(b) PCT).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2008/002852

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