

PRINTING MEDIUM RESERVOIR, RESERVOIR INLET AND FLUSHING SYSTEM

Technical field

The present disclosure relates to a reservoir for containing a printing medium, an inlet to such a reservoir, and a system for flushing a printing medium from such a reservoir and from a printing assembly more generally. The present disclosure is particularly applicable, but not limited to, the field of nanoimprinting technology.

Background

While the present disclosure will be cast largely in the context of nanoimprinting, it will be appreciated that the teaching herein can be similarly applied to printing processes other than nano-imprinting.

Clogging of printheads and the delivery of incorrect or contaminated printing media to a substrate (e.g. a nanoimprint mould) can irreparably damage the substrate. These issues are particularly significant in nanoimprinting processes because contaminating particulates and missing print lines are large as compared to the nano- or micron scaled patterns being printed.

Moreover, inks, resins and other printing media are often very expensive. For stable pressure controlled dispensing of fluid inks, a substantial amount of ink or resin in the reservoir is necessary. Often this base amount cannot be used to complete exhaustion. At the end of a printing process it is typically difficult or impossible to recover unused printing media. Further, recovered printing medium can often be contaminated by the receptacle in which it was held whilst being used.

It is therefore desirable that a printing machine, or a component or components thereof, be created to mitigate or remove one or more of the problems associated with existing printing technologies. Particularly when several different resins or inks need to be used for test or production processes. Each exchange of ink or resin would be extremely wasteful if recovery is not possible due to the minimum volume required in the reservoir for stable printing.

Summary

According to a first aspect, the present disclosure provides a reservoir for use in a printing process, comprising:

- a printing medium receptacle for containing a printing medium, an internal surface
- 5 comprising a printing medium contact surface that, in use, contacts a printing medium;
- one or more printhead outlets for delivering the printing medium to one or more
- printheads, the one or more printhead outlets being in fluid communication with the receptacle at
- the base region of the receptacle; and
- an inlet for receiving the printing medium,
- 10 wherein the printing medium contact surface is substantially smooth.

According to a second aspect, the present disclosure further provides an inlet for a printing medium reservoir for use in a printing process, comprising:

- a stem for delivering printing medium into a receptacle of the printing medium reservoir;
- 15 and
- a filter attached to an end of the stem, the receptacle being disposed, in use, at an opposite
- end of the stem to the filter,
- wherein, when in use, the printing medium is filtered by the filter before being delivered, through
- the stem, into the receptacle.

- 20 According to a third aspect, the present disclosure provides a reservoir according to the first aspect,
- wherein the inlet is an inlet according to the second aspect.

According to a fourth aspect, the present disclosure provides a flushing system for cleaning a printing medium from a printer assembly comprising a printing medium receptacle and one or more

- 25 printheads that receive printing medium from the receptacle, comprising:
- a cleaning solution reservoir connected with the printing medium receptacle, for delivering
- cleaning solution to the receptacle; and
- a cleaning solution collection member for collecting used cleaning solution from the one or more
- printheads,
- 30 wherein the collection member is movable between a collection position, in which it is positioned to
- collect cleaning solution from the one or more printheads, and a stowed position permitting
- unobstructed usage of the printheads for a printing operation.

According to a fifth aspect, the present disclosure provides a printer assembly comprising a reservoir according to the first or third aspects.

- 5 According to a sixth aspect, the present disclosure provides a printer assembly comprising a flushing system according to the fourth aspect.

According to a seventh aspect, the present disclosure provides a printer assembly for a printing machine, comprising:

- 10 a frame for supporting a printing medium reservoir on the printing machine; and
a movable connection for movably connecting the frame to a body of the printing machine such that, in use, the frame is movable relative to the body between a first position in which the printing medium reservoir is supported in a printing position, and a second position in which the printing medium reservoir is tilted so that printing medium contained in the reservoir drains to one end of
15 the reservoir.

According to an eighth aspect, the present disclosure provides a nanoimprinting machine comprising a reservoir according to the first aspect.

- According to a ninth aspect, the present disclosure provides a nanoimprinting machine comprising a
20 printer assembly according any one of the fifth to seventh aspects.

Brief description of the drawings

FIG. 1 shows a nanoimprinting machine comprising various components and systems in accordance with present teachings, with the printer assembly frame in a horizontal position;

FIG. 2 is a close-up view of the printer assembly of the machine of FIG. 1;

- 25 FIG. 3 is a view of the printer assembly and flushing system of the machine of FIG. 1 with a movable section of the flushing system in a stowed position;

FIG. 4 is a view of the printer assembly and flushing system of FIG. 3 with a movable section of the flushing system in a collection position;

FIG. 5 is a side view of the printer assembly with the frame thereof in a tilted position so as to tilt the printing medium reservoir supported by the frame; and

- 5 FIG. 6 shows the flow of cleaning solution through the printhead outlets of the reservoir, into the printheads, into the movable section of the flushing system and from the movable section to the fixed section of the flushing system.

Detailed description

10 A nanoimprinting machine 100, as shown in FIG. 1, is used for forming nano-scale patterns on a substrate (not shown). The machine 100 comprises a machine body 102, a nanoimprinting roll or drum 104 and a motor 106 for driving the drum 104. The machine 100 further comprises a printer assembly 108.

The printer assembly 108 delivers a printing medium to a nanoimprinting mould. The printer assembly 108 includes a printing medium reservoir 110, reservoir inlet 112, printheads 114 and
15 connections 146 (see FIG. 2) for connecting to a flushing system 116. The reservoir 110, inlet 112, printheads 114 and at least part of the flushing drainage system 116 are supported by a frame 118.

The printing medium reservoir, as shown in FIG. 2, includes a printing medium receptacle 120 for containing a printing medium (not shown), five printhead outlets (two of which are shown and labelled with numeral 122) for delivering the printing medium to two printheads 123, and an inlet
20 124 for receiving the printing medium. The printheads 123 overlap in the width direction so as to dispense a continuous line of resin across the desired print width.

The printing medium receptacle 120 has an internal surface defined by a base region 126 and a top region 128. The printhead outlets 122 are in fluid communication with the receptacle 120 (i.e. permitting the passage of fluid from one to the other) at the base region 126. Therefore, in use, the
25 base region 126 can generally be defined as the part of the receptacle 120 through which the

printing medium is drawn into the printheads and thus is the part of the receptacle 120 upon which the printing medium rests.

In the present case the receptacle is substantially cylindrical in a longitudinal direction (i.e. left to right of page) and the base region 126 and top region 128 are roughly defined as being half cylinders that meet or merge tangentially. This tangential merge ensures there is no sharp transition or clear edge defined in the base region 126. It will be appreciated that the delineation between the base region 126 and top region 128 can be arbitrarily selected in the present embodiment. However, in general, the outlets 122 will meet the receptacle 120 at the base region 126. Similarly, resin or ink will, in general, be introduced into the receptacle 120 at the top region 128. The present configuration ensures that the resin or ink only contacts smooth internal walls of the receptacle 120. In other words, all reservoir contact surfaces – being surfaces that, in use, come into contact with printing media – are smooth or substantially smooth: in this context, the terms “smooth” and “substantially smooth” refer to the contact surfaces including no sharp transitions such as grooves, pits, sharp corners or edges. This reduces the likelihood that resin or ink will remain in corners of the receptacle.

The ends 130 of the receptacle 120 also merge or meet the base region 126 and top region 128 tangentially to those regions 126, 128. To this end, the ends 130 have a radius applied around the periphery. The ends 130 are otherwise flat.

Similarly, a radius has been applied to the inlet 124 where the inlet 124 meets the receptacle 120.

This ensures an internal wall of the inlet 124 meets or merges with the receptacle 120 (the top region 128 of the receptacle 120 in this instance) on a tangent. A radius has also been applied to the outlets 122 where the outlets 122 meet the receptacle 120. Again, this ensures an internal wall of each outlet 122 meets or merges with the receptacle 120 (the base region 126 of the receptacle 120 in this instance) on a tangent.

By forming these tangential lines or intersection between parts of the reservoir 110 sharp edges and transitions can be removed from parts of the reservoir 110 that will be contacted by the printing medium when in use. As such, the printing medium is less likely to gather and set in the reservoir 110 when compared with reservoirs having sharp internal edges. The reservoir 110 is therefore easier to clean and there is a much lower risk that residue of a previous printing medium will remain in the reservoir 110 to contaminate a different medium subsequently loaded into the reservoir 110.

The foregoing description suggests the base region 126, top region 128, inlet 124 and outlets 122 are separate components that are brought together to form the reservoir 110. However, the reservoir 110 may alternatively be one integrally formed body. Similarly, the base region 126 and top region 128 may be integrally formed, with the outlets 122 and inlet 124 subsequently attached. Regardless
5 of how the reservoir 110 is constructed, the internal surfaces of the reservoir 110 should be seamless – i.e. joins should appear to form a continuity between the surfaces they are joining.

To reduce the number of particles that are deposited on a substrate, filters may be installed in the printhead outlets 122. However, this allows particles to generate in the printing medium receptacle 120 itself. Thus when unused printing medium is collected it is already contaminated with particles.
10 With collected printing medium is introduced into a drum or reservoir it will contaminate the other printing medium in that drum or reservoir.

To reduce particulate generation, an internal surface of the reservoir 110 comprises a non-shedding or low particle-generating material. In the present case the reservoir 110 is formed from glass. It will be appreciated that the reservoir 110 may be formed from any appropriate material, including a
15 metal. In the case of a metal, or other shedding material, the reservoir 110 may be formed with an outer layer of the material in question, and an internal layer comprising a non-shedding or low particle-generating coating such as epoxy or glass.

Since the reservoir 110 is formed from glass a user will be able to see when the receptacle 120 is clean and empty after collection of unused printing medium or after cleaning. The reservoir 110, or
20 at least the receptacle 120, may similarly be formed from any appropriate transparent material to achieve visibility of the contents of the receptacle 120.

Another means for particle generation in existing reservoirs is moving parts. It will be understood, however, that the present reservoir 110 has a fixed shape and configuration (i.e. arrangement of parts). As a result, all parts of the reservoir 110 remain in fixed relative position during use. There
25 are therefore no particles generated through relative movement of parts of the reservoir 110.

While the reservoir 110 may be formed from a non-shedding or low particle generation material, it can be more difficult to achieve the same properties in downstream components of a printer. For example, in traditional inkjet dispensing assemblies the printhead outlets of the reservoir are connected to filters that remove particles, and the filters are connected to the printheads. The

disadvantage of placing filters only before each printhead entry port is as follows: 1) one filter per printhead is needed; 2) filters are prone to clogging and, due to the random nature of clogging, the entrances to different printheads can experience different resistance to resin dispensing, resulting in non-uniform dispensing; and 3) filters require regular replacement and filters placed between the reservoir and printheads are difficult to replace. This means that particles can be generated in the conduits leading between the receptacle and printheads, although most of those particles will be filtered out of the printing medium.

In traditional printers it is seen as necessary for the filters to be downstream of the reservoir so as to capture particles that may be introduced by particle-contaminated printing media, and also by particles generated in the receptacle. However, the present reservoir 110 removes the latter source of particles by forming the reservoir 110 from a non-shedding, low particle generating material. To remove the former source of particles, the inlet 124 has been reconfigured when compared with traditional reservoir printing medium reservoir inlets. In particular, the inlet 124 includes a stem 132, for delivering printing medium into the receptacle 120 of the printing medium reservoir 110, and a clean filter will be placed in position 134 (shown in broken lines in FIG. 1) removably attached to the opposite end of the stem 132. As a result of the inlet 124 being so configured, printing medium is filtered by the filter in 134 before being delivered, through the stem 132, into the receptacle 120.

The stem 132 is shown capped by a seal or cap 135 to prevent contaminant ingress after filling of the receptacle 120. It will be understood that the seal or cap 135 will be removed for filling purposes, a filter will be attached to the inlet 112 at position 134 through which printing medium will be filtered and enters into the receptacle 120 particle free. After filling, the filter 134 will be detached from the inlet 112 and the seal or cap 135 will be replaced on the stem 132 to seal the receptacle 120 against contaminant ingress through the stem 132.

In an alternative embodiment, the inlet 112 may include the filter 134. The filter 134 may be cleaned when flushing using the flushing system 116 or by pouring a cleaning fluid through the filter 134.

The filter 134 may be disposable or reusable.

This arrangement means that no, or very few, particles are allowed to enter the reservoir in the first place, and subsequently very few or no particles are generated inside the printing assembly 108. This reduces the likelihood of clogging of the printheads 123, which therefore reduces the regularity with

which printheads 123 need to be maintained or replaced. In addition, the number of filters is potentially reduced from one per printhead 123 to a single filter 134 in the inlet 124. Moreover, the filter 134 is very accessible, whereas filters in the printhead supply lines of traditional printers are considerably more difficult to access and exchange.

- 5 A further surprising benefit of this pre-receptacle printing medium filtration is that the printhead outlets 122 can be directly connected (i.e. with very short conduits or without any intervening components such as, for example, filters) to respective printheads 123. This reduces the amount of conduit through which the printing medium must travel during use, and thus further reduces the amount of particles generated within the printer assembly and reduces the volume of unrecoverable
10 print material.

This reduction in particle generation may substantially improve the reliability of nanoimprinting processes with which the reservoir 110 can be used.

- Printing media, particularly for nanoimprinting processes, can be very expensive. It is therefore desirable to collect unused printing media after completion of a printing job. To facilitate collection
15 of excess printing media, the reservoir 110 includes a printing medium outlet 136 through which excess printing medium can be drained (i.e. from the receptacle 120) after completion of a printing process.

- At an end of the printing medium outlet 136 is a collection point 138 from which the unused printing media can be collected. A valve 140 is installed in the printing medium outlet 136. This valve can be
20 closed to prevent printing media from draining through the outlet 136 during a printing job.

- The reservoir 110 further includes a receptacle cleaning bypass line 142 for draining cleaning solution from the reservoir 110 to a collection member 144 (as best seen in FIG.s 3 and 4). The bypass line 142 bypasses the printheads, enabling the receptacle 120 to be flushed free of resin before the printheads 123 are flushed. To this end the valve 140 is a 3-way valve providing for
25 preventing flow through both outlets 138, 142, or selectively enabling fluid to flow through one or both outlets 138, 142.

To admit cleaning solution into the reservoir 110, the reservoir 110 further includes one or more cleaning solution inlets 146. A radius may be applied to these inlets in a similar manner to the inlets and outlets as described above. In some circumstances, one of the inlets 146 may be connected to a pressure source (e.g. pneumatic piston arrangement 148) by which the receptacle 120 can be pressurised (positively or negatively). The receptacle 120 can be pressurised while either cleaning solution, resin, ink or other printing media is contained therein. Positively pressurising the receptacle 120 will push the printing media and cleaning solution from the receptacle 120. This can hasten the process of flushing the receptacle 120. By negatively pressurising the receptacle 120, gas can be drawn out and away from printing media and the printing media can be held in the receptacle 120, against gravity. In other words, rather than placing a valve in each printhead outlet 122 in order to prevent printing media from flowing through the printheads 123 while the printheads 123 are not in use, a negative pressure can be maintained in the receptacle 120 so that the printing media do not descend through the outlets 122. Thus the pressure in the receptacle 120 can be optimised for flushing and for optimal dispensing of printing media (e.g. depending of the volume, mass and viscosity of the printing media in the receptacle 120).

The reservoir 110 is shown as having five printhead outlets 122, two of which are visible in FIG. 2. However, the reservoir may be similarly configured to have only one outlet 122 or, alternatively to have any number of outlets 122. In particular, the reservoir 110 is designed to have a predetermined length (in the direction of arrow X in FIG. 2) and number of printhead outlets 122 depending on a desired print width. A print width is the width of the substrate (not shown), attached to drum 104 (see FIG. 1), to which a print of pattern is to be applied. The term “predetermined”, in this context, is intended to mean that the reservoir can be designed to have any desired length but, once fabricated, has a fixed length. In this sense, the reservoir 110 is scalable to suit a desired printing application and print width.

In addition, printheads 123 can be operated independently so the effective print width can be less than the maximum possible width in which all printheads 123 are in operation. This enables the same reservoir 110 and printhead 123 configuration to be used with multiple print widths up to a maximum width corresponding to the predetermined length of the printhead assembly.

To clean printing medium from the reservoir 110 the printer assembly must be flushed. The flushing system 116 is provided for this purpose, namely to clean a printing medium from the printer assembly 108. The flushing system 116, as shown in FIG. 3, includes a cleaning solution reservoir (not

shown, but will typically comprise a solvent or solution container fluidly connected by one or more fluid conduits to the printing medium receptacle 120, in a manner that will be apparent to the skilled person in light of the present teachings) connected with the printing medium receptacle 120, for delivering cleaning solution to the receptacle 120, and a cleaning solution collection member 144 for
 5 collecting used cleaning solution from the printheads 123.

In FIG. 3 the collection member 144 is shown in the stowed position. This permits unobstructed usage of the printheads 123 for a printing operation. However, the collection member 144 is movable between the stowed position and a collection position, as shown in FIG. 4, in which it is positioned to collect cleaning solution from the printheads 123.

10 The collection member 144 has a movable section 150 and a fixed section 152. The movable section 150 is movable between the collection position shown in FIG. 4 and stowed position shown in FIG. 3 such that, when the movable section 150 is in the collection position, cleaning solution collected by the movable section 150 can be transferred to the fixed section 152. This ensures that used cleaning
 15 solution does not spill from the movable section 150 during subsequent retraction of the movable section 150 to the stowed position. Moreover, to ensure smooth movement of the movable section 150, the fixed section 152 includes a rail 160 to which the movable section 150 is mounted. The rail 160 guides movement of the movable section 150 between the stowed and collection positions in a known manner.

The movable section 150 is in the form of a rectangular tray. The movable section 150 includes a
 20 drainage channel 154 and conduit 156. The drainage channel 154 extends along the movable section 150 so that used cleaning solution collected anywhere along the movable member 150 drains into the channel 154. From the channel 154, the used cleaning solution flows to the conduit 156. To provide control over the used cleaning solution, the conduit 156 includes a valve 158 that can be opened, to permit cleaning solution to flow through the conduit 156, or closed, to prevent cleaning
 25 solution from flowing through the conduit 156.

In addition to rail 160, the fixed section 152 includes a used cleaning solution collection channel 162. The collection channel 162 collects used cleaning solution from the outlet 156 of the movable section 150. The used cleaning solution is transferred from the channel 162 to an outlet 164. The outlet 164 includes a valve 166 that enables a user to controllably empty the used cleaning solution
 30 from the channel 162.

It will be appreciated that any configuration of valves 158, 166 may be employed to control the collection and transfer of cleaning solution. For example, where large volumes of cleaning solution is used (e.g. for large print widths or when removing residue from more viscous print media) both valves 158, 166 may be opened simultaneously to permit continuous flow of used cleaning solution from the movable section 150 to the fixed section 152 and onward from the fixed section 152 (e.g. to a drain or to a fluid waste receptacle). Moreover, when the movable section 152 is stowed the valve 166 will typically be closed to ensure it does not drip when means to collect fluid waste (e.g. a fluid waste receptacle positioned beneath outlet 164) are unavailable.

When moving the movable section 150 between the stowed and collection positions, the collected solution outlet 158 travels along the channel 162. This ensures that any drips that fall from the outlet 158 during stowing of the movable section 150 are still collected by the channel 162. Moreover, this enables a movable section 150 and fixed section 152 of a fixed length to accommodate various print widths. For longer print widths the movable section 150 will move further along the channel 162 during movement to the collection position, and for shorter print width the movable section 150 will move a shorter distance.

The flushing system 116 further includes a pressure source for applying pressure to the cleaning solution reservoir. The pressure source thereby pushes cleaning solution from the reservoir, along a conduit and into the receptacle 120. The pressure source may comprise any appropriate pressure source, such as a small compressor or piston and cylinder arrangement (e.g. including computer operated pneumatic cylinder 148 as shown in FIG. 1).

The cleaning solution reservoir is in fixed position relative to the printer assembly 108. This means that a computer software program can be used to operate and control the pressure source when it is desirable to flush the printer assembly 108. In use, the computer software program will activate the pressure source (e.g. pneumatic cylinder 148) which will generate a suction force to draw cleaning solution along a conduit between the reservoir and the receptacle 120. The computer software program may either be terminated manually, or may terminate automatically after a predetermined period of time.

In an alternative embodiment, the cleaning solution reservoir may be hermetically sealed and the pressure source may pressurise the cleaning solution reservoir to drive cleaning solution from the cleaning solution reservoir, along a conduit and into the receptacle 120.

Prior to cleaning the system for introduction of a new or different ink or resin, it is desirable to collect unused printing medium from the reservoir 110. To facilitate this collection process, the printer assembly 108 includes a frame 118 (see FIG. 1) for supporting a printing medium reservoir 110 on the printing machine 100. In the present case, the frame 118 is also configured to support the printheads 123 in fixed position relative to the reservoir 110.

The printer assembly 108 further includes a movable connection 170 for movably connecting the frame 118 to a body of the printing machine 100. In use, the frame 118 is movable relative to the body between a first position (as shown in FIG. 1) in which the printing medium reservoir 110 is supported in a printing position, and a second position (as shown in FIG. 5) in which the printing medium reservoir 110 is tilted. By tilting the printing medium reservoir 110, the unused printing medium remaining in the reservoir 110 drains to the end of the reservoir 110 in which the outlet 136 is located.

To operate the tilting function, a handle or knob 172 is provided on a side of the housing 174 of the printer assembly 108 that houses the printhead control boards (not shown). The handle or knob 172 may directly tilt the reservoir 110. However, in the present embodiment the handle or knob 172 activates a series of levers and hinges (not shown) that use mechanical advantage, in a manner that will be apparent to the skilled person, to tilt the reservoir 110.

In the present embodiment, the movable connection 170 is a hinge. Since the printheads 123 are delicate and impact loading of the printer assembly 108 is undesirable in any case, the hinge 170 comprises an internal mechanical resistance (not shown, but known in the art of hinges) to control a speed of movement of the frame 118 between the horizontal position shown in FIG. 1 and the tilted position shown in FIG. 5.

While it is not essential, in all circumstances, to collect leftover resin before flushing by the flushing system 116, it is often desirable to do so. Collecting resin for reuse saves on resin costs. Collecting resin from the receptacle 120 also reduces the amount of viscous residue forced through the printheads during flushing, thereby reducing clogging of printheads.

In normal use of the nanoimprinting machine 100 of the present disclosure, for jobs requiring a different printing medium than the previous job or where an extended period of downtime for the nanoimprinting machine is envisaged, the following will, in general, occur:

- at the end of a series of prints using a particular resin;
- the reservoir 110 will be tilted as shown in FIG. 5 (e.g. by tilting the printer assembly 108) – this causes unused printing medium to drain to one of the reservoir 110 and drain through outlet 136;
- 5 - the unused printing medium is collected for reuse;
- the reservoir 110 is return to the horizontal position (as shown in FIG. 1);
- the movable section 150 is moved into the collection position;
- the switch 168 is activated to operate the pressure source (not shown);
- cleaning solution is pushed, by the pressure source, through the cleaning solution inlet 146
- 10 to clean (e.g. dissolve) printing medium residue from the receptacle 120;
- cleaning solution is pushed through the printhead outlets 122 into the printheads 123 to clean the outlets 122 and printheads 123 (see arrows Y in FIG. 6);
- cleaning solution is also pushed through the printing medium outlet 136 to ensure no printing medium remains in the outlet to contaminate printing media collected from
- 15 subsequent print jobs;
- excess cleaning solution is flushed from the reservoir through the bypass 142; and
- the movable section is retracted to the stowed position.

All cleaning solution is collected by the movable member 150. To this end, not only does the movable member 150 extend beneath the printheads to capture cleaning solution ejected from the printheads, but the movable member 150 also extends beneath the bypass line 142. The movable member 150 may also extend even further so as to be positioned beneath the outlet 138. Thus the movable member 150 collects all used cleaning solution, delivers that used cleaning solution to the fixed section (see arrow Z in FIG. 6) and is then stowed.

CLAIMS

1. A reservoir for use in a printing process, comprising:
a printing medium receptacle for containing a printing medium, an internal surface
5 comprising a printing medium contact surface that, in use, contacts a printing medium;
one or more printhead outlets for delivering the printing medium to one or more
printheads, the one or more printhead outlets being in fluid communication with the receptacle at
the base region of the receptacle; and
an inlet for receiving the printing medium,
10 wherein the printing medium contact surface is substantially smooth.
2. A reservoir according to claim 1, wherein the receptacle is substantially cylindrical in a
longitudinal direction.
- 15 3. A reservoir according to claim 1 or 2, wherein the receptacle is seamless.
4. A reservoir according to any preceding claim, wherein an internal surface of the reservoir
comprises a non-shedding or low particle-generating material.
- 20 5. A reservoir according to claim 4, wherein the receptacle is formed from a transparent
material.
6. A reservoir according to claim 4, wherein the receptacle comprises an outer layer and an
internal layer, the internal layer comprising a non-shedding or low particle-generating coating.
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7. A reservoir according to any preceding claim, having fixed shape and configuration such that,
in use, all parts of the reservoir remain in fixed relative position.
8. A reservoir according to any preceding claim, wherein the one or more printhead outlets are
30 directly connected, in use, to respective ones of the one or more printheads.
9. A reservoir according to any preceding claim, further comprising a printing medium outlet
through which excess printing medium can be drained after completion of a printing process.

10. A reservoir according to any preceding claim, further comprising a reservoir cleaning bypass line for draining cleaning solution from the reservoir to a collection member.

5 11. A reservoir according to any preceding claim, wherein the reservoir is designed to have a predetermined length and number of printhead outlets depending on a desired print width.

12. A reservoir according to any preceding claim, for use in a nanoimprinting process.

10 13. An inlet for a printing medium reservoir for use in a printing process, comprising:

a stem for delivering printing medium into a receptacle of the printing medium reservoir;
and

a filter attached to an end of the stem, the receptacle being disposed, in use, at an opposite end of the stem to the filter,

15 wherein, when in use, the printing medium is filtered by the filter before being delivered, through the stem, into the receptacle.

14. A reservoir according to any one of claims 1 to 12, wherein the inlet is an inlet according to claim 13.

20 15. A reservoir according to claim 14, wherein all filtration of the printing medium occurs before printing medium is introduced into the receptacle.

16. A flushing system for cleaning a printing medium from a printer assembly comprising a printing medium receptacle and one or more printheads that receive printing medium from the
25 receptacle, comprising:

a cleaning solution reservoir connected with the printing medium receptacle, for delivering cleaning solution to the receptacle; and

a cleaning solution collection member for collecting used cleaning solution from the one or more printheads,

30 wherein the collection member is movable between a collection position, in which it is positioned to collect cleaning solution from the one or more printheads, and a stowed position permitting unobstructed usage of the printheads for a printing operation.

17. A flushing system according to claim 16, wherein the collection member comprises a movable section and a fixed section, the movable section being movable between the collection position and stowed position, such that when the movable section is in the collection position cleaning solution collected by the movable section can be transferred to the fixed section.

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18. A flushing system according to claim 17, wherein the fixed section comprises a used cleaning solution collection channel and the movable section comprises a collected solution outlet through which used cleaning solution drains to the collection channel.

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19. A flushing system according to claim 18, wherein the collected solution outlet travels along the channel during movement of the movable section between the collection position and stowed position.

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20. A flushing system according to any one of claims 16 to 19, further comprising a pressure source for applying pressure to the cleaning solution reservoir, the pressure source being arranged to push cleaning solution from the reservoir and into the receptacle.

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21. A flushing system according to any one of claims 16 to 20, wherein the cleaning solution reservoir is fixed to the printer assembly.

22. A printer assembly comprising a reservoir according to any one of claims 1 to 12, 14 and 15.

23. A printer assembly comprising a flushing system according to any one of claims 16 to 21.

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24. A printer assembly for a printing machine, comprising:

a frame for supporting a printing medium reservoir on the printing machine; and

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a movable connection for movably connecting the frame to a body of the printing machine such that, in use, the frame is movable relative to the body between a first position in which the printing medium reservoir is supported in a printing position, and a second position in which the printing medium reservoir is tilted so that printing medium contained in the reservoir drains to one end of the reservoir.

25. A printer assembly according to claim 24, wherein the movable connection is a hinge.

26. A printer assembly according to claim 24 or 25, wherein the frame is configured to further support one or more printheads in fixed position relative to the reservoir.

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27. A printer assembly according to any one of claims 24 to 26, wherein the hinge comprises a mechanical resistance to control a speed of movement of the frame between the first position and second position.

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28. A printer assembly according to any one of claims 22 to 26, for use in a nanoimprinting process.

29. A nanoimprinting machine comprising a reservoir according to any one of claims 1 to 12, 14 and 15.

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30. A nanoimprinting machine comprising a printer assembly according to any one of claims 22 to 28.