

CLAIMS

1. A pump assembly for a dental cleaning appliance, the pump assembly comprising:
 - 5 a positive displacement pump comprising a fluid chamber having a fluid inlet connectable to a source of fluid, a fluid outlet, and a fluid displacement member;
a drive for actuating the pump to move the fluid displacement member relative to the fluid chamber along a first linear path to draw fluid into the fluid chamber through the fluid inlet;
 - 10 an energy storage device for converting kinetic energy generated during actuation of the pump by the drive into potential energy, and storing the potential energy;
a first coupling member connected to the pump and a second coupling member connected to the drive, the coupling members coupling together to enable the drive to
15 actuate the pump to draw fluid into the fluid chamber, and
decoupling means for decoupling the coupling members to enable the energy storage device to use stored potential energy to actuate the pump in reverse to urge a burst of fluid from the fluid chamber through the fluid outlet;
 - wherein the drive is configured to move the second coupling member
20 reciprocally along a second linear path which is co-axially aligned with the first linear path.
2. A pump assembly according to claim 1, comprising a connecting rod which connects the first coupling member to the fluid displacement member.
- 25 3. A pump assembly according to claim 2, wherein the fluid displacement member and the first coupling member are located at opposite ends of the connecting rod.
4. A pump assembly according to any preceding claim, wherein the drive
30 comprises a motor, a linear actuator connected to the motor and the second coupling

member, and a control circuit for driving the motor to move the second coupling member relative to the fluid chamber.

5. A pump assembly according to any preceding claim, wherein the fluid
5 displacement member is moveable from a first position to a second position to draw fluid into the fluid chamber through the fluid inlet

6. A pump assembly according to claim 5, wherein the decoupling means
10 comprises a stop for inhibiting movement of the fluid displacement member beyond the second position.

7. A pump assembly according to claim 6, wherein, in an operational mode, the
drive is configured to (a) move the second coupling member in a first direction to
engage the first coupling member and so connect the pump to the drive, (b)
15 subsequently move the second coupling member in a second direction, opposite to the first direction, to move the fluid displacement member to the second position, and (c) continue to move the second coupling member in the second direction to decouple the coupling members and so release the pump from the drive, whereupon the fluid displacement member moves towards the first position, under the action of the energy
20 storage device, to urge a burst of fluid through the fluid outlet.

8. A pump assembly according to claim 6 or claim 7, wherein the stop is connected to the fluid chamber.

25 9. A pump assembly according to any of claims 6 to 8, wherein the stop is provided by a wall of a housing of the pump.

10. A pump assembly according to any of claims 6 to 9, comprising a drive plate which moves with the fluid displacement member as the fluid displacement member is
30 moved from a third position, which is intermediate the first position and second position, towards the second position, and wherein the stop is arranged to engage the

drive plate to inhibit movement of the fluid displacement member beyond the second position.

11. A pump assembly according to claim 10, wherein the energy storage device
5 comprises a spring which engages the drive plate.

12. A pump assembly according to claim 10 or claim 11, comprising a second stop
for preventing the drive plate from engaging the fluid displacement member when the
fluid displacement member is located between the first position and the third position.
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13. A pump assembly according to claim 12, wherein the second stop is connected
to the fluid chamber.

14. A pump assembly according to claim 12 or claim 13, wherein the second stop is
15 provided by a wall of a housing of the pump.

15. A pump assembly according to any of claims 11 to 14, wherein the drive is
selectively operable in a purge mode, in which it is configured to reciprocally move the
fluid displacement member between the first position and the third position to draw a
20 volume of fluid through the fluid inlet and subsequently urge that volume of working
fluid through the fluid outlet.

16. A pump assembly according to any of claims 6 to 15, wherein the decoupling
means comprises a moveable stop which is moveable between a stowed position and a
25 deployed position for inhibiting movement of the fluid displacement member beyond an
intermediate position located between the first position and the second position.

17. A pump assembly according to claim 16, comprising a spring for urging the
moveable stop towards the stowed position and an actuator for selectively moving the
30 moveable stop, against the force of the spring, towards the deployed position.

18. A pump assembly according to claim 17, wherein the drive is arranged to move the actuator from a first actuator position, for allowing the spring to urge the moveable stop towards the stowed position, to a second actuator position for moving the moveable stop towards the deployed position.

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19. A dental cleaning appliance comprising:

a handle;

a fluid reservoir for storing a working fluid; and

a fluid delivery system for receiving working fluid from the fluid reservoir, and

10 for delivering a burst of working fluid to the teeth of a user;

wherein the fluid delivery system comprises a pump assembly according to any preceding claim.