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(71) Applicant: **BAYLY DESIGN ASSOCIATES PTY. LTD.**
73 Whitehorse Road
Balwyn Victoria 3103(AU)

(72) Inventor: **Oretti, John Ernest**
25 Heyington Avenue
Doncaster Victoria 3108(AU)

(74) Representative: **Gordon, Michael Vincent et al**
GILL JENNINGS & EVERY 53-64 Chancery Lane
London WC2A 1HN(GB)

(54) Cleaning brushes.

(57) A cleaning brush 1 includes a body 2 which houses fluid operated drive means 21 for rotating a brush head or heads 8 rotatably mounted on the body. The connection between the drive means 21 and the brush heads 8 is preferably a positive drive connection and is preferably a gear motor. Where there are two brush heads 8 they are preferably rotatable on parallel axes of rotation 13 and rotate in opposite directions in use. The body 2 may include a storage chamber 55 for storing cleaning agent and the passage of fluid through the cleaning brush may then cause cleaning agent to be drawn from said storage chamber 55. Preferably there is an air gap 50 between an exhaust 36 from the drive means 21 and an outlet 50 from the storage compartment so that air and not contaminated fluid will be drawn back to the drive means 21 in the event of reverse syphonage.

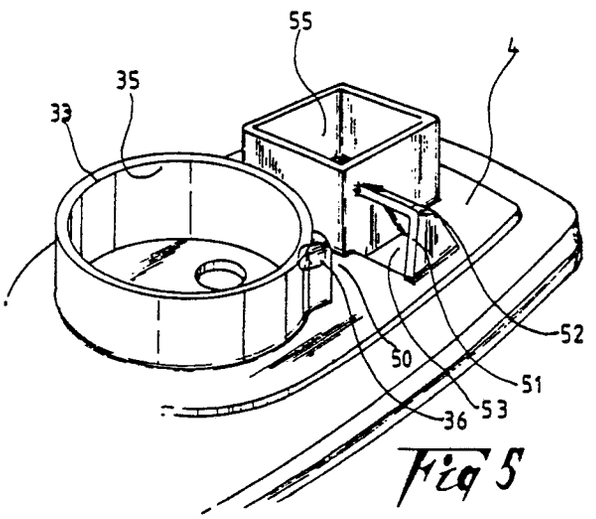

Fig 5

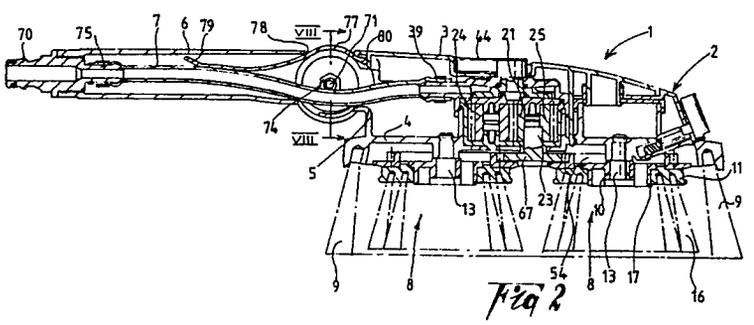

Fig 2

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CLEANING BRUSHES

This invention is concerned with cleaning brushes of the kind which are connectable to a source of water under pressure. In one particular form, the invention is applicable to such brushes which have means for storing and dispensing a detergent or other cleaning agent. It will be convenient to hereinafter describe the invention with particular reference to the latter type of brush, but the invention has other applications.

Cleaning brushes of the foregoing kind commonly have a movable head which carries the bristles or other brush elements. That head may be arranged to rotate or vibrate as a consequence of passage of water through the brush. Rotating head brushes generally involve the use of a pelton wheel or the like to translate the movement of the water into brush rotation, but such drive means is unable to generate sufficient torque to cope with all circumstances of use. As a result, the brush head may stop rotating, or at least turn at a slow speed, when it is pressed against a surface to be cleaned. Vibrating head brushes are also inefficient because at least some if not all of the vibratory movement is transferred to the body of the brush when the head is pressed against a surface to be cleaned.

Conventional brushes which have a facility for dispensing a cleaning agent suffer a further problem. It is usual for the cleaning agent to be introduced directly into the stream of water flowing into or through the brush. If the water is supplied from a mains source, there is always the possibility of reverse syphonage occurring and in that event it is possible that the cleaning agent will be drawn into the main supply. Such a result can impose a serious danger to health and is currently the subject of criticism by various water control authorities.

It is an object of the present invention to provide a cleaning brush of the movable head kind which includes a relatively positive drive means for the head so that effective cleaning can be achieved under various conditions of use. It is an object of the invention in a preferred form to provide such a brush which includes a water delivery system and a cleaning agent dispensing means arranged to avoid or at least minimise the danger of reverse syphonage as referred to above.

A brush according to the invention is characterised in that the movable head is driven by a water powered gear motor through a positive drive connection. In a preferred form, that brush is further characterised in that the water supply to the cleaning head and any other area of the brush contaminated by cleaning agent is separated from the contaminated area by an air gap. The arrangement is such that in the event of reverse syphonage air will be drawn back into the water supply conduit rather than cleaning agent or water contaminated by such an agent.

An embodiment of the invention is described below by way of example, reference being made to the accompanying drawings. It will however be appreciated that the particularity of the drawings is in no way intended to limit the invention to the specific embodiment depicted in the drawings.

In the drawings:

Figure 1 shows a plan view of a brush according to the invention.

Figure 2 shows a cross-sectional side view of the brush along line II - II of Figure 1.

Figure 3 shows an enlarged cross-sectional side view of the drive motor for the brush shown in Figure 2;

Figure 4 shows an exploded perspective view of the drive motor for the brush;

Figure 5 shows a perspective view of the base of the brush;

Figure 6 shows an enlarged cross-sectional side view of the forward portion of the brush;

Figure 7 shows a plan view of the gear train for driving the brush; and

Figure 8 shows a cross-sectional end view along line VIII-VIII of Figure 2.

The cleaning brush 1 shown in the drawings includes a hollow main body 2 which may be moulded from a plastics material. In the arrangement shown, that body has an upper wall 3, a lower wall 4, and surrounding side walls 5. The body shown is of substantially rectangular peripheral shape but other shapes could be adopted. An elongate handle 6 extends from a side wall at one end of the body 2, and that handle 6 serves to carry a water supply conduit 7, as hereinafter described.

Two rotatable brush heads 8 are mounted on the lower wall 4 of the body 2 and in the preferred form of the invention a fixed brush section 9 surrounds the movable brush heads 8. According to the arrangement shown, the two movable brush heads 8 are each rotatably mounted on the body lower wall 4 adjacent a respective end of the body 2. Each movable head 8 is preferably formed of two parts - a carrier 10 and a replaceable part 11. The carrier 10 includes a circular disc-like section 12 and an axle section 13 which projects axially from the disc section 12 and is rotatably mounted in the lower wall 4 of the brush body 2. A circular hub 14 projects axially from the side of the disc section 12 opposite to that from which the axle 13 projects.

The replaceable part may include an annular

section 15 formed of a plastics material, for example, or other relatively rigid material, and at least one series of bristles 16 supported by and projecting from an outer edge portion of that section 15. The term "bristles" is to be understood as embracing any fibre-like material, which may be a natural or synthetic material and which is suitable for use as the surface cleaning (engaging) components of a brush. Preferably, there are two circular series of bristles 16 with one arranged inside and concentric to the other. It is also preferred that the bristles 16 generally slope at a slight angle radially outwardly in a direction away from the annular section 15. The annular section 15 is preferably removably attached to the disc section 12 of the carrier 10 by snap engagement over the hub 14 of that section. An outwardly directed lug 17 formed on the hub 14 may secure the annular section 15 to the hub 14.

It is preferred that the connection between the hub 14 and annular sections 15 is such that they are positively retained against relative rotation. That may be achieved by providing at least one driving lug on the annular section 15 which engages within a corresponding hole or recess (not shown) provided in the hub 14. Optionally the lug 17 which locks the annular section 15 to the hub 14 can serve to fix the two components against relative rotation. Obviously, the locations of the lug and hole or recess could be reversed.

The fixed brush section 9 may include an array of bristles, as previously defined, attached around the periphery of the body lower wall 4 and projecting therefrom so as to form a substantially continuous skirt about the movable heads 8. The bristles which define the fixed brush section 9 may be angled in the same manner as the bristles 16 of the movable heads 8, and they may project for a slight distance beyond the terminal ends 20 of the movable head bristles 16.

Drive means 21 for the movable heads 8 includes a gear motor 22 which, in the embodiment shown, is located within the hollow body 2 of the brush 1. That motor 22 can be of any conventional construction and has a drive shaft 23 which projects through the body lower wall 4.

The drive motor 22 of this embodiment is shown clearly in Figures 3 and 4. The drive motor 22 comprises a pair of gear members 24 and 25 which are in meshing engagement with each other. The drive shaft 23 is fixed to rotate with gear member 25. The gear members 24 and 25 are housed within a gear motor housing 26, the body 27 of which is contoured to conform to the configuration of the meshed gears. A cover plate 28 is provided for sealing with the upper edge 29 of the drive motor housing 26. The cover plate 28 has an inlet aperture 30 passing therethrough and water will be introduced into the drive motor 22 through this inlet aperture 30 to drive the motor. The inlet aperture 30 may be closed off by a valve plate 31 as will be more fully described herebelow.

The housing 26 has an outlet 32 on the side thereof remote from the inlet aperture 30 and water which has passed between the gear members 24 and 25 will exhaust through this outlet 32.

The lower wall 4 of the body 2 defines an upstanding cup shaped wall 33 which is shaped to receive the gear motor housing 26. This cup shaped wall 33 is clearly seen in Figure 5. With the gear motor housing 26 in position within the cup shaped wall 33 a cavity is defined between the outer surface 34 of the housing 26 and the inner surface 35 of the cup shaped wall 33 below the outlet 32 from the housing 26. An outlet passage 36 through the cup shaped wall 33 provides an outlet from this cavity.

Operation of the heads 8 is effected by passing water under pressure through the drive motor 22. It is preferred that the water inlet to the motor 22 is valve controlled in a manner such as to permit regulation of the speed of rotation of the movable heads 8.

The inlet to the gear motor 22, as previously mentioned, is controlled by a valve which in the embodiment shown comprises a valve plate 31. A cover member 37 is located within the body 2 and is ultra-sonically sealed to the cup shaped wall 33 defining a chamber 38 above the drive motor 22. Water is preferably introduced into that chamber 38 through a tubular member 39 which projects laterally outwards from a side wall of the cover member 37 in a direction towards the aforementioned handle 6. The valve means for controlling passage of water from the chamber 38 to the gear motor 22 includes a valve plate 31 which is rotatable about an axis 40 extending transverse to the body upper wall 3. That valve plate 31 is arranged to control the size of the inlet aperture 30 through the cover plate 28 through which water passes from the chamber 38 to the gear motor, and the size of that opening varies according to the rotational position of the plate 31. An upstanding lug 41 on the cover plate 28 locates in an arcuate slot 42 formed in the valve plate 31. This limits the rotational arc of the cover plate to about 30°.

Rotation of the valve plate 31 may be effected through a spindle 43 which is attached to or formed integral with the valve plate 31, and which projects through the body upper wall 3. A suitable hand engageable lever 44 shown in Figure 2 is secured to that spindle 43 external of the body 2 so as to be accessible for hand manipulation. In the embodiment shown, that lever 44 is located within a recess 45 in the external surface of the upper wall 3 so as to be protected against inadvertent engagement during use of the brush 1.

Two O-ring seals 46 located on either side of the valve plate 31 seal areas of the plate 31 on the upper 47 and lower surfaces 48 thereof from influence of water pressure. The upper surface 47 of the cover plate is of slightly greater area than the lower surface 48 thereof. Thus, water under pressure in the chamber 38 will exert a net downward force on the valve plate 31. The lower surface of the valve plate 31 and the upper surface 49 of the cover plate 28 are both smooth and thus, this net downward force on the valve plate 31 serves to urge the valve plate 31 against the cover plate 28 to thereby form a seal between the two plates, closing off the inlet aperture 30 when the valve plate 31 is in its closed position.

The outlet 36 through the cup shaped wall 33 serves as a nozzle to direct exhaust water in a direction substantially parallel to the lower plate 4. This water in use travels as a jet across an air gap 50 and into a cowl 51 formed integrally with the lower wall 4. A sloping surface 52 on the cowl 51 directs the jet through an opening 53 in the lower wall into a cavity 54 between the under surfaces of the lower wall 4 and the upper surface of the forward brush disc section 12. This cavity 54 is clearly seen in Figure 6 of the drawings.

Thus, as a result of this air gap 50, in the event of reverse syphonage, there is sufficient separation between the motor outlet and the area contaminated with cleaning agent to ensure that air and not cleaning agent, or cleaning agent contaminated water, will be drawn back through the motor 22 to the water supply conduit.

A chamber 55 for containing a liquid or other cleaning agent is preferably provided within the brush body 2 at the end portion thereof remote from the handle 6. A removable plug-like cover 56 may be provided to enable selective access to that chamber 55 for filling purposes. Preferably, the cleaning agent chamber 55 is located directly over the forward movable brush head 8 and an outlet 57 from the chamber is arranged to dispense cleaning agent directly, or substantially so, onto or into that head 8. In the arrangement shown in Figure 6, a portion of a lower wall 59 of the cleaning agent chamber 55 lies in closely spaced relationship to the upper surface of the adjacent brush head 8, and a passage 60 extending into and through that lower wall portion 59 forms the chamber outlet 57. The clearance between the opposed surfaces of that wall portion 59 and the brush head 8 is preferably kept to a minimum for a reason hereinafter made clear.

The opening 53 through the lower wall 4 and the outlet 57 from the cleaning agent chamber 55 both lead into the cavity 54 between the forward brush head 8 and the lower wall 4. The brush heads 8 both have at least one flow passage 61 through the hub 14 and, in the case of the forward brush head, this passage provides an outlet from the cavity 54. In use, pressure within this cavity 54 is relatively high as a result of exhaust water entering directly into the cavity 54 from the cowl 51. A lower pressure area will however be adjacent the entrance to the flow passage 61. As the brush head 8 rotates, the reduced pressure area adjacent the flow passage 61 will cause a suction effect and hence cleaning agent to be drawn from the outlet 57 each time the flow passage 61 is brought into registry with the outlet 57. When the outlet 57 and flow passage 61 are not in registry, however, the relatively high pressure which otherwise exists within the cavity 54 inhibits movement of cleaning agent out of the outlet 57.

The outlet passage 60 of the cleaning agent chamber 55 is preferably valve controlled so as to be capable of being completely closed-off or fully or partially opened. In the embodiment shown, a valve 62 includes a rod-like member 63 which projects into that outlet passage 60 and has a recess 64 therein which can be brought into partial or full registry with that outlet passage 60. The rod-like member 63 is rotatable to effect that registry and for that purpose may project through an end wall 5 of the brush body 2 and have a manually engageable handle or knob 65 attached thereto. That handle or knob 65 is accessible at the outside of the brush body.

A valve 62 as referred to above enables control over the quantity of cleaning agent being dispensed from the chamber 55. The rate at which that cleaning agent is being dispensed is controlled by the speed at which the brush heads 8 rotate, and that arises because of the intermittent suction effect which is described above. The speed of rotation of the brush heads 8 is in turn controlled by the adjustable valve 31 of the water inlet chamber 38.

It is preferred that the drive shaft 23 is connected to each movable head 8 through a gear train 66 as shown in Figure 7 so as to achieve a positive drive connection between the motor 22 and those heads 8. A drive pinion 67 is secured to or formed integral with the end of the shaft 23 which projects below the body lower wall 4. A driven gear 68 which meshes with that drive pinion 67 may be secured to or formed integral with the disc section 12 of each movable head 8.

According to a preferred construction, the water supply system to the gear motor 22 includes the handle 6 and the aforementioned tubular member 39 which projects from the water inlet chamber 38. For that purpose, the handle 6 is tubular and has male connection means 70 at its outer end for connection to a supply conduit. It is preferred that the handle is adjustable relative to the brush body

so that its angular disposition can be altered to suit user requirements. The handle may be therefore connected to the brush body through a pivotal joint 71 which enables relative movement of the handle 6 about an axis 72 extending generally transverse to the rotational axes of the rotatable brush heads 8.

It is preferred that adjustable clamping or locking means is provided to enable selective use of the handle 6 adjustment facility. In the embodiment shown in Figure 8 that means includes cooperable ratchet plates 73 and a clamp nut 74 which is adjustable to hold those plates 73 in engagement and thereby prevent handle adjustment, or alternatively allow separation of those plates and thereby permit handle adjustment.

The aforementioned tubular member 39 is preferably connected to a similar member 75 at the outer end portion of the handle 6 through the flexible tube 7. That tube 7 passes through the interior of the handle 6 and also through the pivotal joint 71 so as to bend or flex in accordance with changes in the handle disposition.

In the arrangement shown, a flexible guard plate 77 extends over at least one side of the pivotal joint 71 so as to close a space of variable size between the handle 6 and the brush body 2. An end edge 78 of the handle at that joint 71 slides over the plate 77 during adjustment of the handle position. Opposite end portions 79 and 80 of the plate can be located within the handle and the brush body respectively so as to retain the plate 77 against separation from the assembly.

A snap-type male connector 70 at the outer end of the handle permits releasable connection with a supply conduit such as a garden hose. If desired, a rigid handle extension (not shown) may be provided to permit the length of the handle to be increased to suit requirements. That extension can be snap engaged with the aforementioned connector 70 and may have a similar connector at its outer end.

Many of the components of the brush described can be manufactured from plastics materials, and that includes the drive motor and its internal components.

A brush 1 as described has the advantage of positive drive of the movable brush heads 8. The torque applied to those heads by the drive motor will increase automatically as resistance to that rotation increases. A further and important advantage is the manner in which water is delivered to the rotating heads 8, and particularly the part of the brush contaminated by cleaning agent, since that avoids the danger of the cleaning agent being drawn into an associated mains supply as a consequence of reverse syphonage.

Claims

1. A cleaning brush including a body, at least one brush head rotatably mounted on said body, a fluid operated drive motor mounted on said body, characterised in that said drive motor is connected to said brush head through a positive drive connection whereby said brush head is caused to rotate in response to operation of said motor, and wherein said drive motor comprises a gear motor.

2. A cleaning brush as claimed in claim 1 wherein the gear motor includes a hollow housing, at least two gear members rotatably mounted in said housing and being in meshing engagement so that each rotates in response to rotation of the other, a fluid inlet formed through a wall of said housing, and a fluid outlet formed through a wall of said housing, whereby said gear members rotate in response to passage of fluid through said housing by way of said inlet and outlet.

3. A cleaning brush as claimed in claim 1 or 2 wherein said drive motor is connected to said brush head through gear means.

4. A cleaning brush as claimed in claim 3 wherein said gear means includes a drive pinion which is connected to said motor so as to rotate in response to operation of said motor, and a driven gear which is in cooperative meshing engagement with said drive pinion and is connected to said brush head to rotate therewith.

5. A cleaning brush as claimed in claim 4 wherein two said brush heads are provided, a respective said driven gear is connected to each said brush head, and said drive pinion is in cooperative meshing engagement with each said driven gear.

6. A cleaning brush as claimed in one of claims 2 to 5 wherein manually adjustable valve means is provided on said body and is operable to control the rate of flow of fluid through said hollow housing and thereby regulate the speed of rotation on the or each said brush head.

7. A cleaning brush as claimed in claim 5, wherein the valve means comprises a plate valve including a plate rotatable on an axis of rotation between open and closed positions, the plate having a hole therethrough offset from the axis of rotation said plate being rotatable to bring said hole into alignment with an inlet to the drive motor to define said open position.

8. A cleaning brush as claimed in claim 7 wherein said plate has an upper surface and a lower surface, both said surfaces being acted on by fluid pressure of the operating fluid in use, said upper surface having a greater surface area exposed to said fluid pressure than said lower surface so that, in use, a net downward force is placed on said plate by said operating fluid to thereby close said valve in said closed position.

9. A cleaning brush including a body, characterised in that the cleaning brush includes two brush heads mounted on said body and each being arranged for rotation relative thereto about an axis which is substantially parallel to the axis of rotation of the other said brush head, a fluid operated drive motor, and means drivably connecting said motor to said brush heads so that said brush heads rotate in opposite directions in response to operation of said motor.

10. A cleaning brush as claimed in claim 9 wherein the rotatable brush heads are connected to the drive motor through a drive train.

11. A cleaning brush as claimed in claim 10 wherein the drive train comprises a pinion gear driven by the drive motor, the pinion gear being in meshed engagement with ring gears coaxially engaged with the brushes.

12. A cleaning brush including a body, at least one brush head rotatably mounted on said body, a fluid operated drive motor, a fluid outlet through which fluid passing through said motor is exhausted, drive means connecting said brush head and said motor such that the brush head rotates in response to operation of said motor, characterised in that the cleaning brush includes a storage chamber for a cleaning agent, a chamber outlet through which said agent can be dispensed, and means providing an air gap between the two said outlets so as to minimise possible ingress of said agent into said motor.

13. A cleaning brush as claimed in claim 12 wherein said outlet from said drive motor terminates in a nozzle directed towards a cowl fixed to the body, said cowl shaped to direct fluid exhausting through said nozzle to the brush head, said air gap being defined between said nozzle and said cowl.

14. A cleaning brush comprising a body having at least one brush head rotatably mounted thereto, a fluid operated drive motor for rotating the brush head, characterised in that the cleaning brush includes a storage chamber in the body for storing cleaning agent, the chamber having a dispensing outlet for dispensing cleaning agent to the brush head or heads, and a means which is operative to sequentially open and close the outlet in response to rotation of the brush head.

15. A cleaning brush as claimed in claim 14 wherein said means comprises a gap between said body and said brush head, a fluid exhaust from said drive motor being directed into said gap, said brush head having a disc shaped upper surface having an outlet port therethrough, said storage chamber having an outlet for directing cleaning fluid into said gap, said outlet port and said storage chamber outlet being arranged so that they are brought into alignment at least once per revolution of said brush head, thereby causing cleaning agent to the drawn through said outlet port.

16. A cleaning brush as claimed in claim 15 wherein said outlet from said storage chamber has a control means associated therewith for regulating flow of cleaning agent through said outlet.

17. A cleaning brush as claimed in any preceding claim wherein the body has a handle connected thereto said handle being connected to the body through a pivotal connection, locking means being provided for locking the handle to the body in different positions of angular adjustment.

18. A cleaning brush as claimed in any preceding claim wherein the or each brush head includes a bristle supporting component and a hub, said bristle supporting component being removable from said hub.

19. A cleaning brush as claimed in claim 18 wherein said bristle supporting component includes an annular support adapted to engage with the hub to rotate with the hub in use.

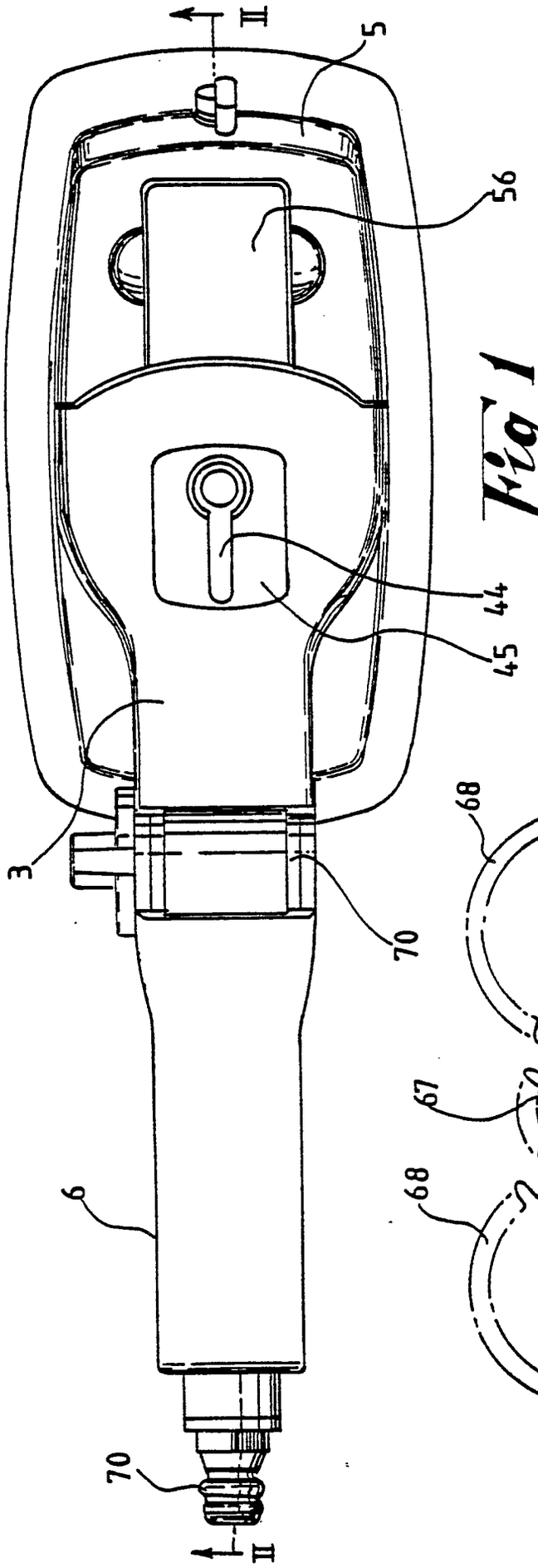

Fig 1

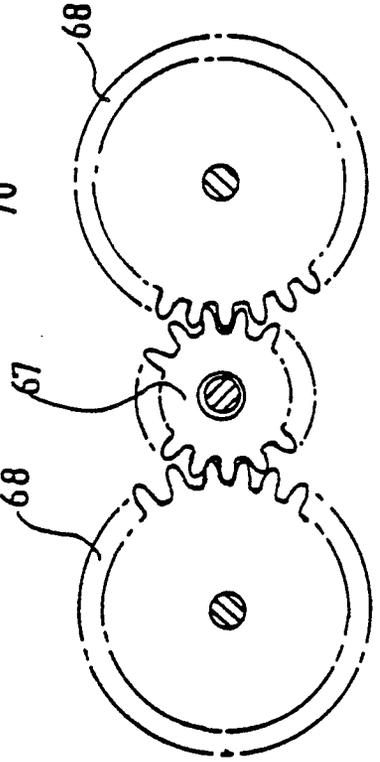

Fig 7

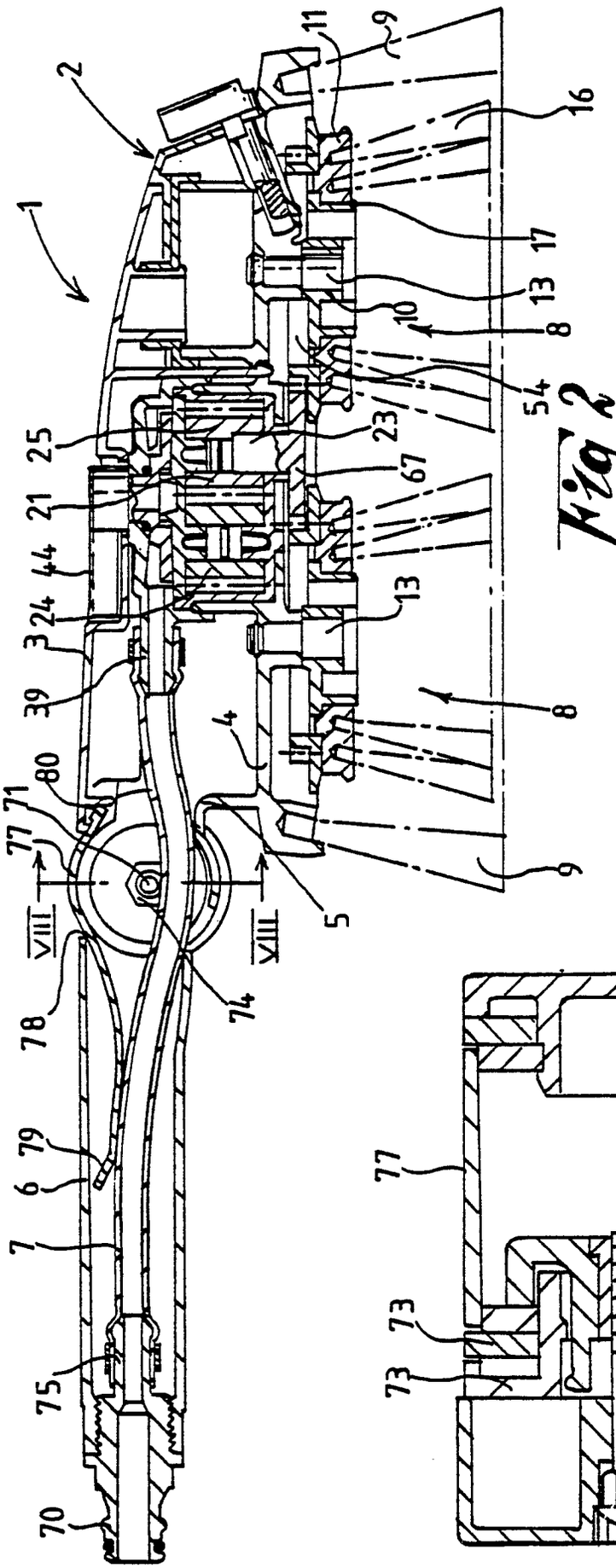
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Fig 2

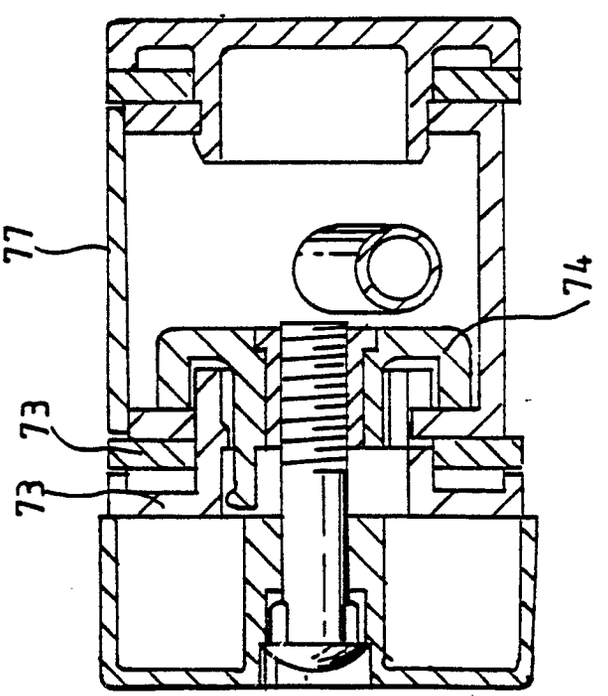
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Fig 8

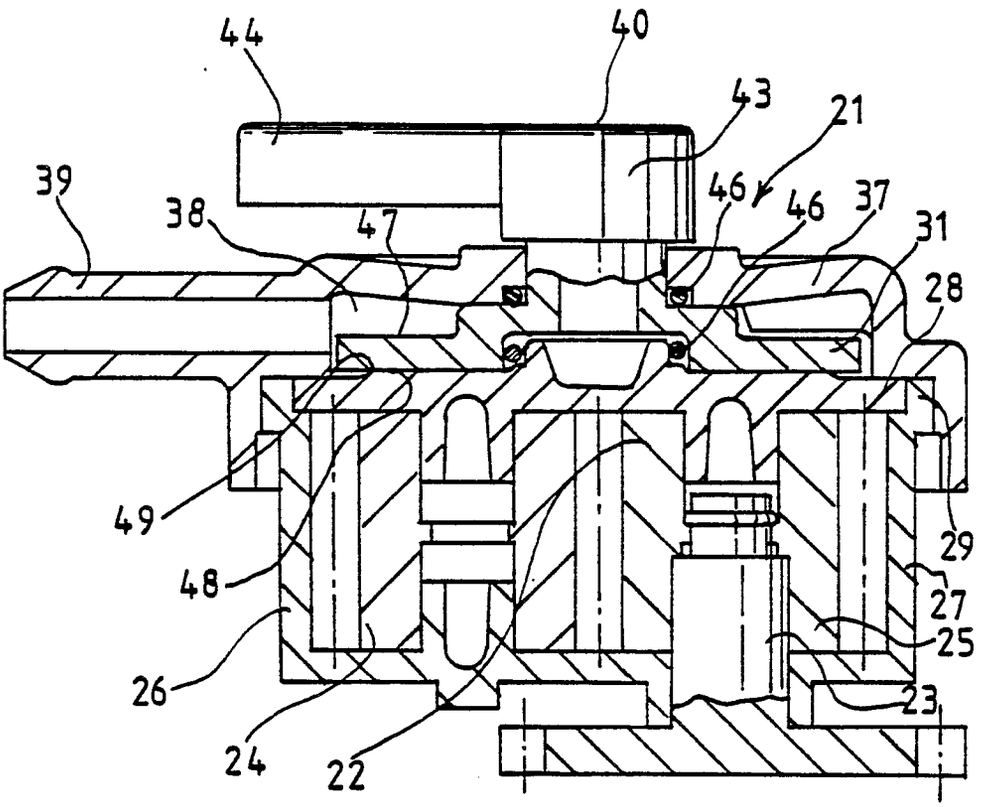

Fig 3

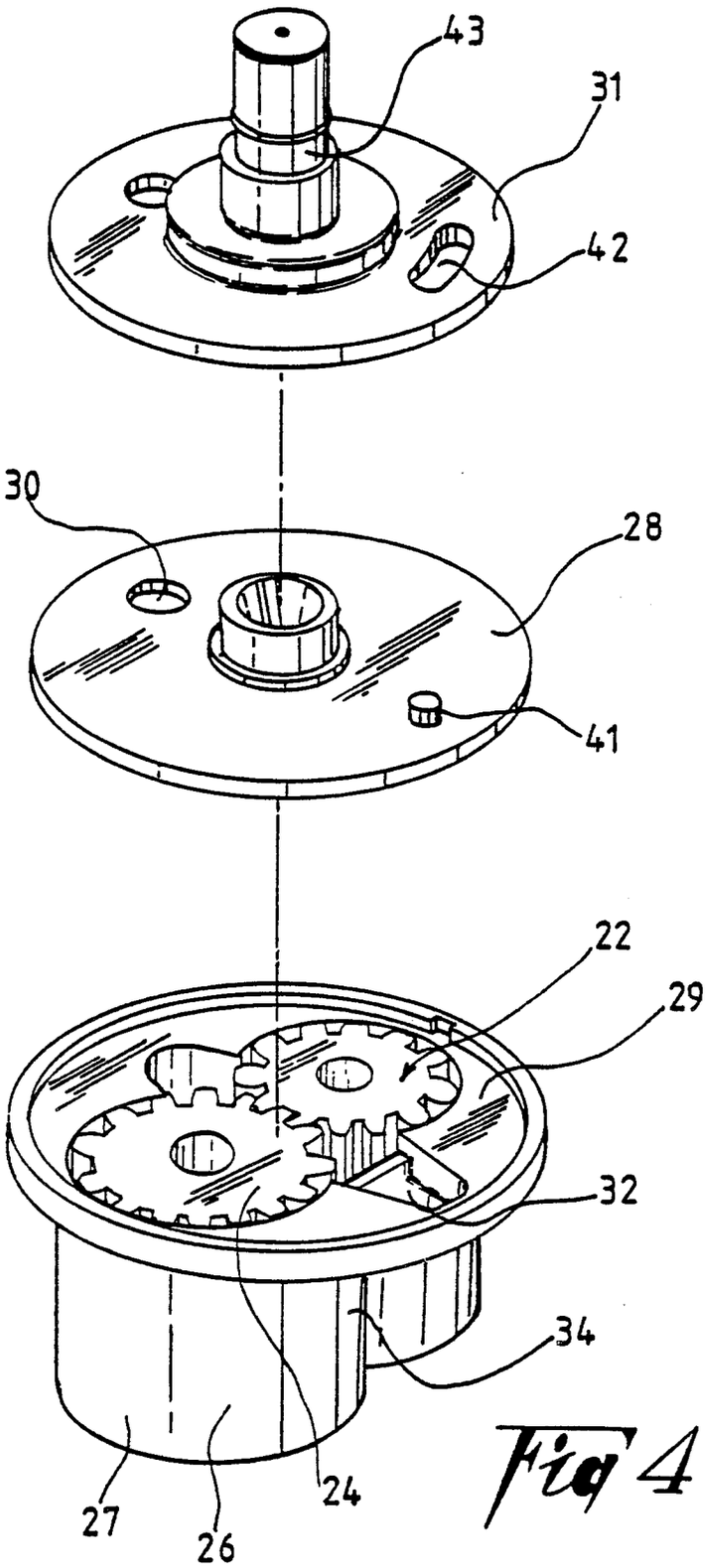

Fig 4

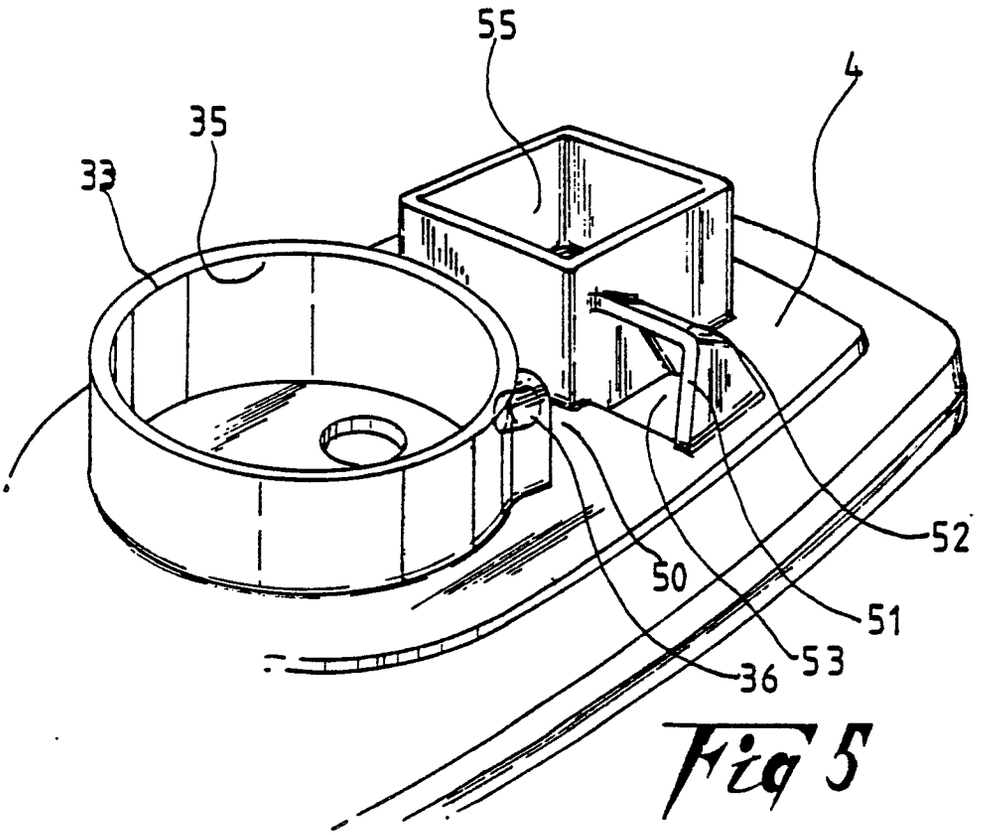
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Fig 5

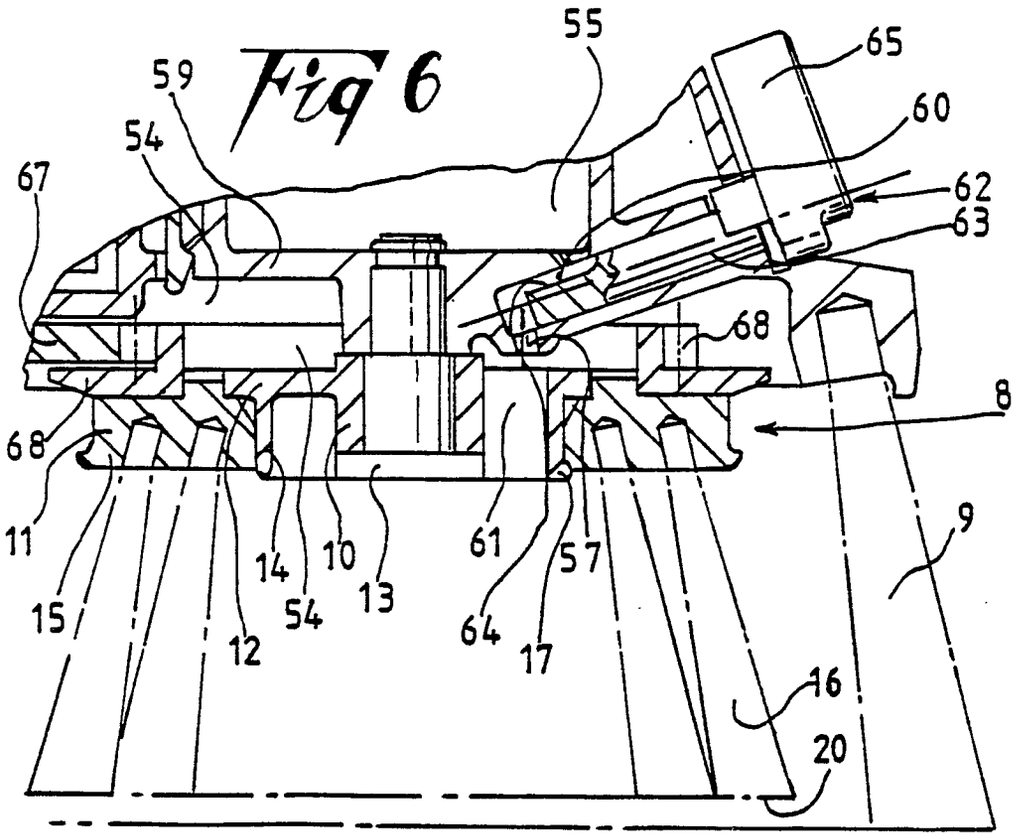
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Fig 6