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Nettoyeur de bassin automatique

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US-A- 4 193 156	US-A- 4 642 833

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Description

INTRODUCTION AND BACKGROUND

THIS invention relates to cleaners for submerged surfaces. More particularly it relates to suction operable automatic swimming pool cleaners.

Suction operable automatic swimming pool cleaners are known in the art. These machines comprise a body having a planar peripheral region defining an inlet and which region is releasably engageable with a surface to be cleaned. In use, the body is connected via an outlet to an inlet of a pump and filtration system of a swimming pool. In the body there is mounted means for intermittently varying the flow of water through the body, thereby to impart kinetic energy to the body causing the body to move automatically over the surface to be cleaned. As the body moves over the surface, debris is sucked up from the surface through said inlet. One such a cleaner, from which the present invention proceeds, in which the means for intermittently varying the flow of water through the body comprises a pivotal hammer valve is disclosed in US Patent 4,023,227. Another cleaner of the kind described is disclosed in US Patent 4,642,833. In this case the means for intermittently varying the flow of water through the body comprises a pinch valve arrangement. The patent DE-A-1.684.604 shows a suction part, connected by means of a hose to a suction device, comprising liquid guide means.

OBJECT OF THE INVENTION

It is an object of the present invention to provide alternate apparatus for cleaning a surface submerged in a liquid which the applicant believe will have improved operation.

SUMMARY OF THE INVENTION

According to the invention, there is provided apparatus for cleaning a surface submerged in a liquid as claimed in claim 1. This apparatus comprising a body defining a flow passage therethrough, the flow passage extending between a main inlet to the body defined in a peripheral region of the body and an outlet from the body, the peripheral region, in use, being releasably engageable with a surface to be cleaned and the outlet being connectable to a suction source; means located in the body for intermittently varying the flow of liquid through the body thereby to impart motion to the body; and liquid guide means for imparting whirling motion to liquid flowing through at least part of the body. This apparatus further comprising at least two inlets defined in asymmetric regions in opposed sidewalls of the body and located between said main inlet and said means to vary the flow of liquid through the body.

The means for intermittently varying the flow of liquid through the body is preferably located downstream

of the liquid guide means for imparting whirling motion to liquid flowing through at least part of the body.

The liquid guide means for imparting whirling motion to liquid flowing through at least part of the body may comprise a plurality of curvilinear projections provided in said peripheral region of the body and defining a plurality of curvilinear channels between them.

The plurality of curvilinear projections are preferably provided on a face of a footpad, which is removably mountable on the body in the peripheral region thereof.

The means for imparting whirling motion to liquid flowing through at least part of the body may alternatively or in addition comprise two further inlets defined in asymmetric regions in opposed sidewalls of the body between said main inlet and said outlet. The two further inlets may be offset relative to one another on a line which is substantially parallel to a general plane of the peripheral region. The two further inlets may have different sizes.

In one embodiment of the apparatus according to the invention the body comprises a head defining a chamber communicating with said main inlet and first and second exits from the head; first and second elongate drive tubes communicating with the first and second exits; and a coupling arrangement connected to said first and second tubes and which coupling arrangement defines said outlet from the body; and the means for intermittently varying the flow of liquid through the body comprises a pivotal valve located in the chamber and which valve, in use, pivots between a first position wherein it obstructs said first exit and a second position wherein it obstructs said second exit.

It has been found that it is advantageous to straighten the flow through the drive tubes and therefore at least one of said first and second elongate drive tubes may comprise at least one axially extending internal strake.

Also included within the scope of the present invention is a footpad for a cleaner for a surface submerged in a liquid comprising a disc-like body defining an opening for communicating with a main inlet of the cleaner; a plurality of curvilinear projections provided on one face of the disc-like body defining a plurality of curvilinear channels between them, the channels extending from a peripheral outer region of the body to the opening. At least one of the projections may be made of a resilient porous material.

BRIEF DESCRIPTION OF THE DIAGRAMS

The invention will now further be described, by way of example only, with reference to the accompanying diagrams wherein:

- figure 1 is a diagrammatic side view of a cleaner according to the invention for cleaning a surface submerged in a liquid;
- figure 2 is a diagrammatic view of a footpad of the cleaner, in the direction of arrow A in figure

figure 3 is a section on line III in figure 1;
 figure 4 is a transverse section through an elongate drive tube forming part of the cleaner;
 figure 5 is a diagrammatic enlarged view, partially sectioned, of the region identified as X in figure 1;
 figure 6 is a diagrammatic enlarged view, partially in section, of the region identified as Y in figure 5; and
 figure 7 is a diagrammatic enlarged view of the region identified as Z in figure 1.

DESCRIPTION OF PREFERRED EMBODIMENT OF THE INVENTION

A suction operable automatic swimming pool cleaner according to the invention is generally designated by the reference numeral 10 in figure 1.

The cleaner comprises a body 12 comprising a head 14, first and second elongate drive tubes 16, 18 extending from the head 14 and a coupling arrangement 20. The body defines a flow passage for water there-through extending between a main inlet 26 to the body and an outlet 41 from the body.

The head 14 has a planar peripheral region 22 provided by a flange 24. The main inlet 26 is defined in the peripheral region. Main inlet 26 communicates with a lower chamber 28 which is bounded by a baffle plate 29 defining a port 30 communicating with chamber 32, for pivotal hammer valve 34. Chamber 32 has first and second exits 36 and 38 communicating with the elongate drive tubes 16 and 18 respectively.

Coupling arrangement 20 comprises a swivel coupling 40 defining outlet 41 and which coupling, in use, is connectable via a flexible hose (not shown), to an inlet of a pump and filtration system (also not shown) of a swimming pool.

As best shown in figure 7, in chamber 32 and about each of exits 36 and 38 there is provided a valve seat 36.1 and 38.1 respectively. Valve 34 having opposed sealing faces 34.1 is mounted off-centre in chamber 32 and, in use, pivots under the influence of water flow through chamber 32, between a first position wherein it obstructs exit 36 and a second position wherein it obstructs exit 38.

As shown in figure 1, a footpad 42 is removably mountable on flange 24. As best shown in figure 2, the footpad 42 comprises a circular body 43 defining a central hole 44, which, in use, communicates with main inlet 26. On the bottom surface of footpad 42 which, in use, bears on the surface being cleaned, there are provided a plurality of curvilinear projections 46 defining a plurality of curvilinear channels 48 extending inwardly towards the hole 44 from the outer periphery of the footpad. At least some of the projections are made of a porous resilient material.

As shown in figures 1 and 3, in opposed sidewalls

14.1 of head 14 and in the region of lower chamber 28, there are defined two further inlets 50 and 52 which are offset relative to one another on a line which is parallel with the plane of the peripheral region 22.

In use, the apparatus assumes the attitude illustrated in figure 1 on a submerged horizontal surface to be cleaned. When suction is applied to the apparatus 10 by the said pump, water entraining debris enters the body via curvilinear channels 48, hole 44 and main inlet 26. The curvilinear channels impart a whirling motion to the water entering the body. Water is also admitted through offset further inlets 50 and 52, which also impart whirling motion to the water admitted.

The water flows through chamber 28, port 30 and chamber 32 towards outlet 41. As more fully described in US patent 4,023,227, water flowing past the valve 34 causes the valve to pivot between the said first and second positions, thereby alternately and repeatedly to obstruct flow through exits 36 and 38. This alternate and repeated obstruction of exits 36 and 38 causes kinetic energy in a body of water stopped as a result of such obstruction, to be transferred to the cleaner body, thereby to cause the cleaner automatically to move over the surface in the direction indicated by arrow B, shown in figure 1.

The projections 46 made of a resilient foam material act like suction pads and serve to improve traction of the footpad 42 on the surface being cleaned.

As illustrated in figure 4, each drive tube 16, 18 comprises a plurality of axially and radially inwardly extending internal strakes 53. These strakes serve to straighten the flow of water as it passes through the drive tubes 16, 18.

As is clear in figure 6, there is defined a clearance 53 between swivel coupling 40 and a bearing 54 which is a friction fit in the body of coupling arrangement 20. A washer 56 is supported on an inwardly directed flange 58 on the body below the lower end of the coupling 40 and is so shaped that water drawn into the coupling arrangement through the clearance 53 is directed along the inside wall of the coupling 40 in the same direction as the main water flow. This arrangement not only reduces vortices in flow in the region of the coupling arrangement 20, but also increases the flow towards the pump by as much as 5%.

The bumper arrangement 60 shown in figure 1 is made of a material having a specific gravity greater than that of water. This increased weight together with the leverage effect of being applied at a distance from the body 12, improves the ability of the cleaner 10 to turn off a sidewall (not shown) of a swimming pool (also not shown).

As shown in figure 1, the external fins 62 on the head 14 are slightly inclined relative to the plane of the peripheral region 22. These fins act like airfoils to press the cleaner 10 into closer contact with the surface being cleaned.

By adopting one or more of the features discussed

above, it has been found that there is an increase in the flow of water through the cleaner.

It will be appreciated that there are many variations in detail on the apparatus according to the invention without departing from the scope of the appended claims.

Claims

1. Apparatus for cleaning a surface submerged in a liquid, the apparatus comprising a body (12) defining a flow passage (28,32,16,18, and 20) there-through, the flow passage extending between a main inlet (26) to the body defined in a peripheral region (22) of the body and an outlet (41) from the body, the peripheral region, in use, being releasably engageable with a surface to be cleaned and the outlet being connectable to a suction source; and means (34) located in the body for intermittently varying the flow of liquid through the body thereby to impart motion to the body; characterized by the fact that it comprises means for imparting whirling motion to liquid flowing through at least part of the body comprising liquid guide means comprising at least two inlets (50,52) defined in asymmetric regions in opposed sidewalls (14.1) of the body.
2. Apparatus as claimed in claim 1 wherein the means (34) for intermittently varying the flow of liquid through the body is located downstream of the liquid guide means (50,52) for imparting whirling motion to liquid flowing through at least part of the body.
3. Apparatus as claimed in claim 1, characterized by the fact that the liquid guide means for imparting whirling motion to liquid flowing through at least part of the body comprises further a plurality of curvilinear projection (46) provided in said peripheral region of the body and defining a plurality of curvilinear channels (48) between them for guiding liquid through the main inlet (26).
4. Apparatus as claimed in claim 3, wherein the plurality of curvilinear projections (46) are provided on a face of a footpad (42), which is mountable on the body in the peripheral region thereof.
5. Apparatus as claimed in claim 4, wherein the footpad is removably mountable on a flange (24) in the peripheral region of the body.
6. Apparatus as claimed in claim 1, wherein the two inlets (50,52) have different sizes.
7. Apparatus as claimed in any one of the preceeding claims, wherein the body comprises a head (14) defining a chamber (32) communicating with said

main inlet (26) and first and second exits (36,38) from the head; first and second elongate drive tubes (16,18) communicating with the first and second exits; a coupling arrangement (20) connected to said first and second tubes and which coupling arrangement defines said outlet from the body; wherein the means for intermittently varying the flow of liquid through the body comprises a pivotal valve (34) located in the chamber and which valve, in use, pivots between a first position wherein it obstructs said first exit and a second position wherein it obstructs said second exit.

8. Apparatus as claimed in claim 7, wherein the head has external fins (62) thereon which are inclined relative to a general plane of said peripheral region.
9. Apparatus as claimed in claim 7 or claim 8 comprising a bumper assembly (60) arching out from the body, the bumper assembly being made of a material having a specific gravity greater than that of water.
10. Apparatus as claimed in any one of claims 7 to 9 wherein at least one of said first and second elongate drive tubes comprises at least one axially extending internal strake (53).
11. An apparatus as claimed in claim 3, characterized in that the projections (46) are curvilinear in configuration defining a plurality of curvilinear channels (48) between them, the channels extending from a peripheral outer region of the body to the opening and by the fact that said configurations are carried by a removable foodpad of the apparatus.
12. An apparatus as claimed in claim 11, wherein at least one of the projections is made of a resilient porous material.

Patentansprüche

1. Vorrichtung für das Reinigen von Flächen unter Flüssigkeiten, die einen Körper (12) umfasst, der einen Strömungsdurchlass (28, 32, 16, 18, 20) durch sich selbst definiert, wobei sich der Strömungsdurchlass von einer Haupteintrittsöffnung (26) in den Körper, die in einer Aussenzone (22) des Körpers definiert wird, bis zu einer Austrittsöffnung (41) aus dem Körper erstreckt, die Aussenzone im Gebrauch lösbar mit einer zu reinigenden Fläche gekoppelt und die Austrittsöffnung mit einer Sogquelle verbunden werden kann, und wobei die Vorrichtung im Körper befindliche Organe (34) zur zeitweiligen Veränderung der Flüssigkeitsströmung durch den Körper umfasst, wobei dem Körper Bewegung mitgeteilt wird; dadurch gekennzeichnet, dass die Vor-

richtung Organe umfasst, um der durch zumindest einen Teil des Körpers strömenden Flüssigkeit Wirbelbewegung zu erteilen, und Flüssigkeitsführungsorgane hat, die zumindest zwei Einlassöffnungen (50, 52) umfassen, die in asymmetrischen Zonen gegenüberliegender seitlicher Wandungen (14.1) des Körpers definiert sind.

2. Vorrichtung wie in Anspruch 1 beansprucht, worin die Organe (34) zur zeitweiligen Veränderung der Flüssigkeitsströmung durch den Körper stromabwärts von den Flüssigkeitsführungsorganen (50, 52) angeordnet sind, die der durch zumindest einen Teil des Körpers strömenden Flüssigkeit Wirbelbewegung erteilen.

3. Vorrichtung wie in Anspruch 1 beansprucht, dadurch gekennzeichnet, dass die Flüssigkeitsführungsorgane, die der durch zumindest einen Teil des Körpers strömenden Flüssigkeit Wirbelbewegung erteilen, ferner eine Vielzahl gekrümmter Vorsprünge (46) umfassen, die in der benannten Aussondezone des Körpers angelegt sind und eine Vielzahl gekrümmter Kanäle (48) zwischen sich definieren, um Flüssigkeit durch die Haupteintrittsöffnung (26) zu leiten.

4. Vorrichtung wie in Anspruch 3 beansprucht, worin die Vielzahl von gekrümmten Vorsprüngen (46) auf einer Stirnfläche eines Gleitfusses (42) angelegt ist, der abnehmbar an der Aussenpartie des Körpers angebracht werden kann.

5. Vorrichtung wie in Anspruch 4 beansprucht, worin der Gleitfuss abnehmbar auf einen Flansch (24) in der Aussenpartie des Körpers aufgesetzt werden kann.

6. Vorrichtung wie in Anspruch 1 beansprucht, worin die beiden Einlassöffnungen (50, 52) von unterschiedlicher Grösse sind.

7. Vorrichtung wie in einem der vorangehenden Ansprüche beansprucht, worin der Körper einen Kopf (14) umfasst, der eine Kammer (32) definiert, die mit der benannten Haupteintrittsöffnung (26) sowie mit einem ersten Ausgang (36) und einem zweiten Ausgang (38) aus dem Kopf in Verbindung steht, wobei ein erstes und ein zweites längliches Steuerrohr (16, 18) mit dem ersten bzw. zweiten Ausgang in Verbindung stehen, eine Kopplungsanordnung (20) mit dem benannten ersten und zweiten Rohr verbunden ist und die benannte Austrittsöffnung aus dem Körper definiert; und worin die Organe zur zeitweiligen Veränderung der Flüssigkeitsströmung durch den Körper ein Scharnierventil (34) umfassen, das in der Kammer sitzt und im Gebrauch zwischen einer ersten Stellung, in der es den benann-

ten ersten Ausgang versperrt, und einer zweiten Stellung, in der es den benannten zweiten Ausgang versperrt, hin- und herschwenkt.

8. Vorrichtung wie in Anspruch 7 beansprucht, worin auf dem Kopf Aussenrippen (62) sitzen, die gegen die allgemeine Ebene der benannten Randpartie geneigt sind.

9. Vorrichtung wie in Anspruch 7 oder Anspruch 8 beansprucht, mit einer vom Körper hervorgewölbten Pralleinheit (60), die aus einem Material hergestellt ist, dessen spezifisches Gewicht höher als das von Wasser ist.

10. Vorrichtung wie in einem beliebigen der Ansprüche 7 bis 9 beansprucht, worin von dem benannten ersten und zweiten länglichen Steuerrohr zumindest eines eine axial verlaufende innere Leitplatte (53) hat.

11. Vorrichtung wie in Anspruch 3 beansprucht, dadurch gekennzeichnet, dass die Vorsprünge (46) von gekrümmter Gestalt sind und eine Vielzahl gekrümmter Kanäle (48) zwischen sich definieren, die sich von einer Randzone aussen am Körper bis zu der Öffnung erstrecken, und dass die benannten Vorsprünge von einem abnehmbaren Gleitfuss der Vorrichtung gehalten werden.

12. Vorrichtung wie in Anspruch 11 beansprucht, worin zumindest einer der Vorsprünge aus einem elastischen, porösen Material hergestellt ist.

Revendications

1. Appareil pour nettoyer une surface submergée dans un liquide, l'appareil comprenant un corps (12) délimitant un passage d'écoulement (28, 32, 16, 18 et 20), le passage d'écoulement s'étendant entre une entrée principale (26) au corps délimitée dans une région périphérique (22) du corps et une sortie (41) du corps, la région périphérique, en service, pouvant s'engager d'une manière non permanente avec la surface à nettoyer et la sortie pouvant être reliée à une source d'aspiration; et un moyen (34) se trouvant dans le corps, pour faire varier, de manière intermittente, l'écoulement de liquide traversant le corps, afin d'imprimer un mouvement au corps; caractérisé par le fait qu'il comprend un moyen pour imprimer un mouvement tourbillonnaire au liquide traversant au moins une partie du corps, comprenant un moyen de guidage du liquide ayant au moins deux entrées (50, 52) aménagées dans des régions asymétriques dans les parois opposées (14.1) du corps.

2. Appareil comme revendiqué dans la revendication 1, où le moyen (34) pour faire varier de manière intermittente l'écoulement du liquide traversant le corps se trouve en aval du moyen de guidage du liquide (50, 52), pour imprimer un mouvement tourbillonnaire au liquide traversant au moins une partie du corps.
3. Appareil comme revendiqué dans la revendication 1, caractérisé par le fait que le moyen de guidage du liquide destiné à imprimer un mouvement tourbillonnaire au liquide traversant au moins une partie du corps comprend, en outre, une pluralité de saillies courbes (46) disposées dans ladite région périphérique du corps et délimitant une pluralité de canaux courbes (48) entre elles, pour guider le liquide par l'entrée principale (26).
4. Appareil comme revendiqué dans la revendication 3, où les saillies courbes (46) sont placées sur une face d'un patin (42) qui peut être monté sur le corps dans la région périphérique de celui-ci.
5. Appareil comme revendiqué dans la revendication 4, où le patin est monté d'une manière amovible sur une bride (24) dans la région périphérique du corps.
6. Appareil comme revendiqué dans la revendication 1, où les deux entrées (50, 52) ont des tailles différentes.
7. Appareil comme revendiqué dans une quelconque des revendications précédentes, où le corps comprend une tête (14) délimitant une chambre (32) communiquant avec ladite entrée principale (26) et des première et seconde sorties (36, 38) de la tête; des premier et second tubes de propulsion allongés (16, 18) communiquant avec des première et seconde sorties; un système de couplage (20) relié aux dits premier et second tubes, lequel système de couplage délimite ladite sortie du corps; où le moyen pour faire varier de manière intermittente l'écoulement du liquide traversant le corps comprend une valve pivotante (34) se trouvant dans la chambre, laquelle valve, en service, pivote entre une première position où elle obstrue ladite première sortie et une seconde position où elle obstrue ladite seconde sortie.
8. Appareil comme revendiqué dans la revendication 7, où la tête porte des nervures externes (62) qui sont inclinées par rapport à un plan général de ladite région périphérique.
9. Appareil comme revendiqué dans la revendication 7 ou la revendication 8, comprenant un système pare-chocs (60) formant un arc saillant depuis le corps, le système pare-chocs étant fait en un matériau ayant un poids volumique supérieur à celui de l'eau.
10. Appareil comme revendiqué dans une quelconque des revendications 7 à 9, où au moins un des premier et second tubes de propulsion allongés comprend au moins une nervure interne (53) s'étendant axialement.
11. Appareil comme revendiqué dans la revendication 3, caractérisé en ce que les saillies (46) ont une configuration courbe délimitant entre elles une pluralité de canaux courbes (48), les canaux s'étendant depuis une région périphérique externe du corps jusqu'à l'ouverture et par le fait que lesdites configurations sont portées par un patin amovible de l'appareil.
12. Appareil comme revendiqué dans la revendication 11, où au moins une des saillies est faite en un matériau poreux et élastique.

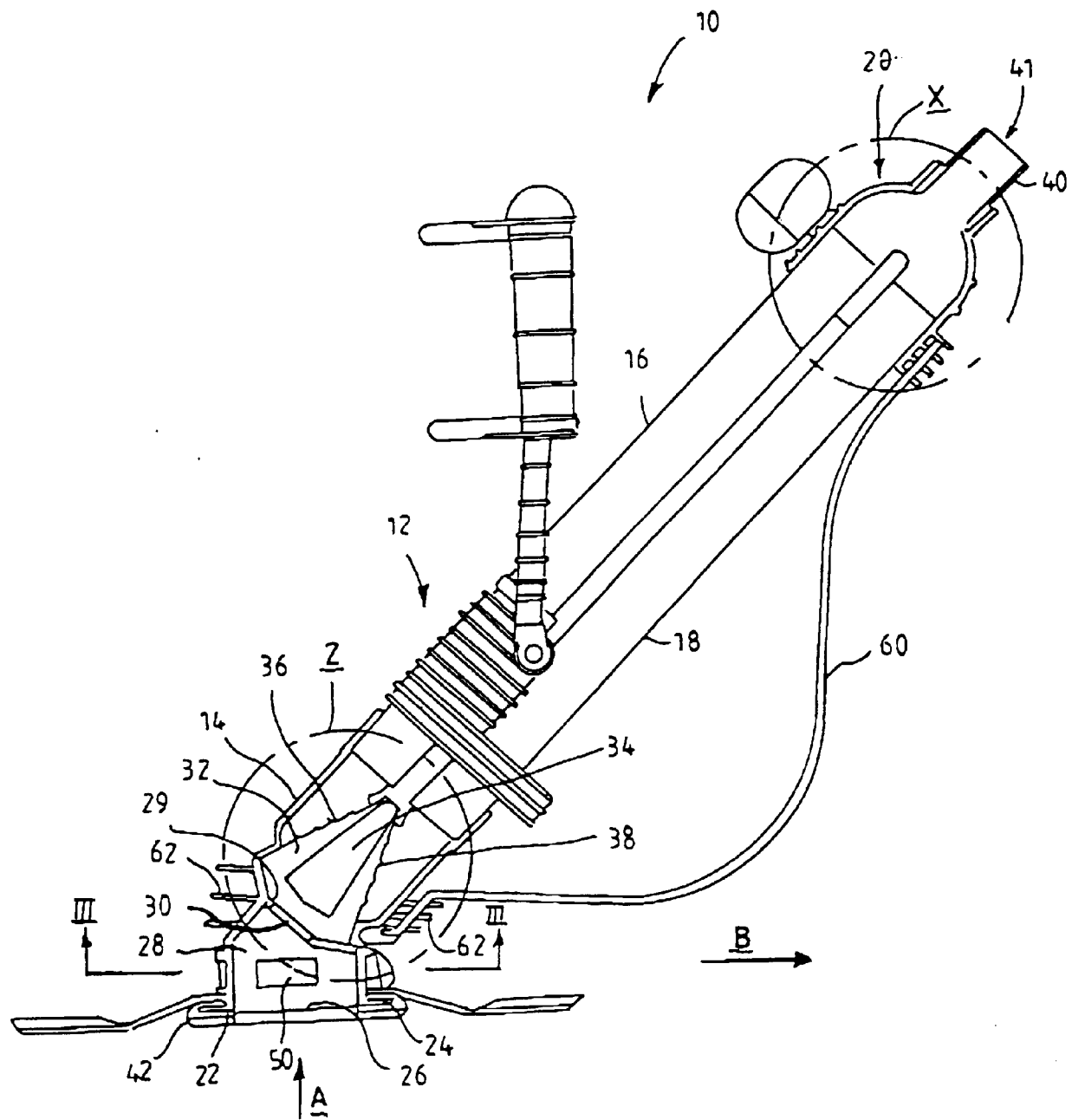


FIGURE 1

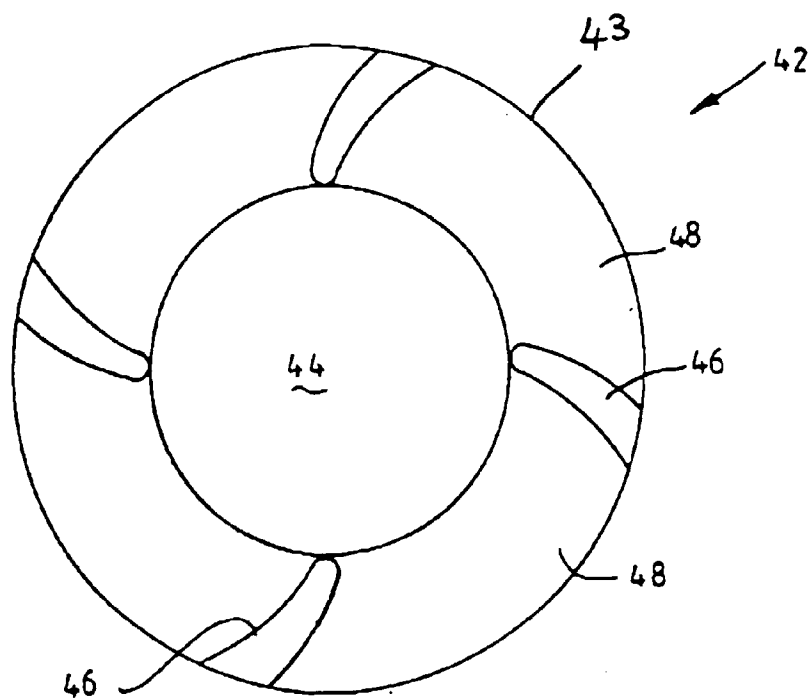


FIGURE 2

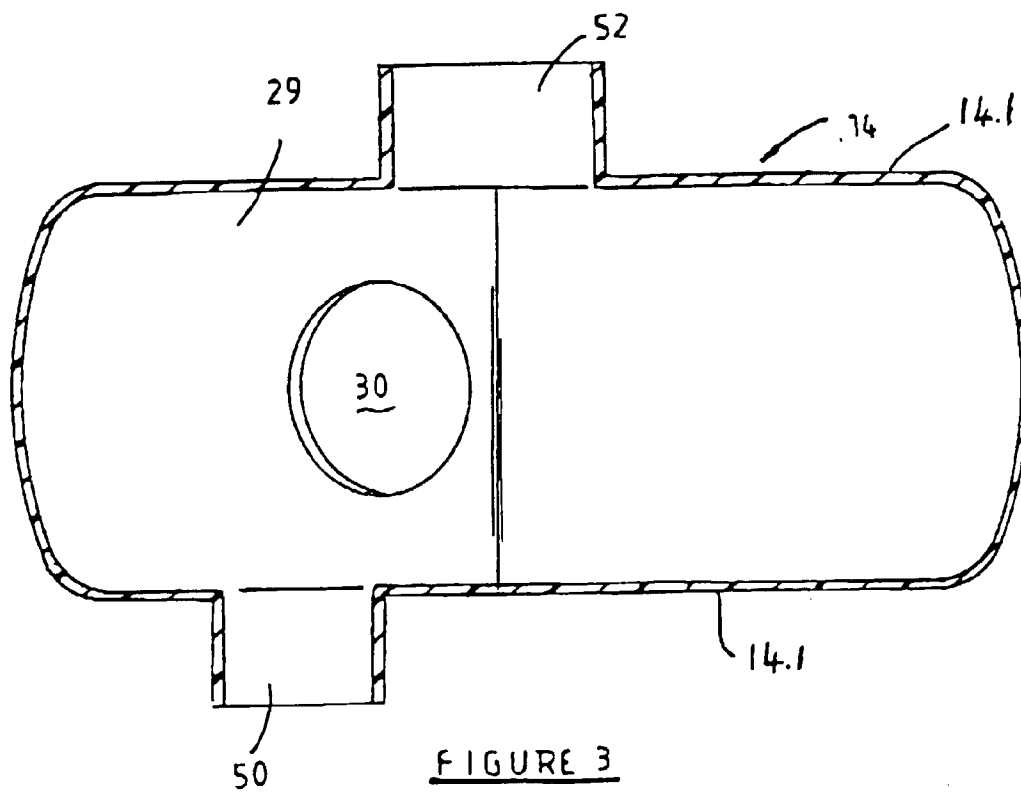


FIGURE 3

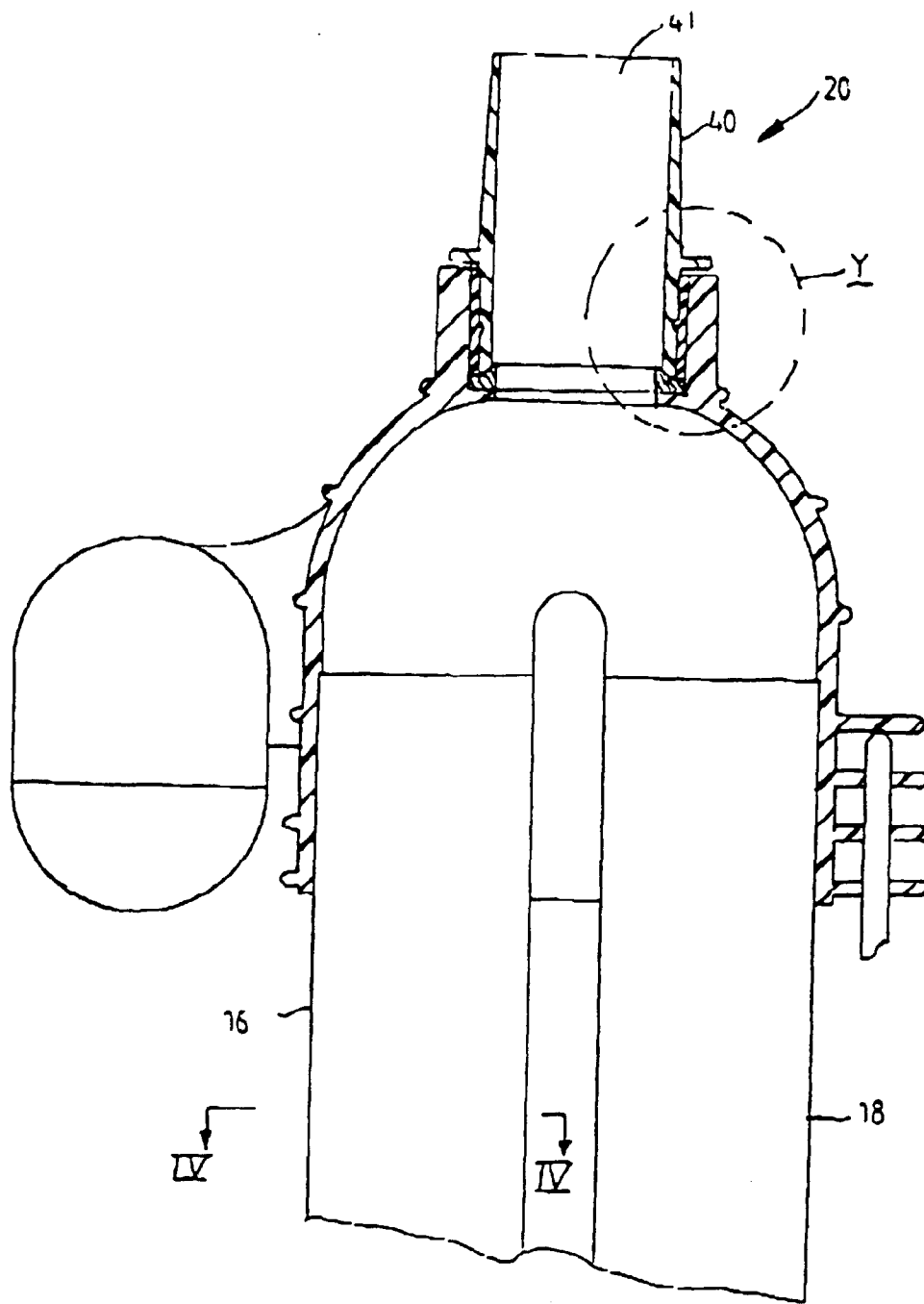


FIGURE 5

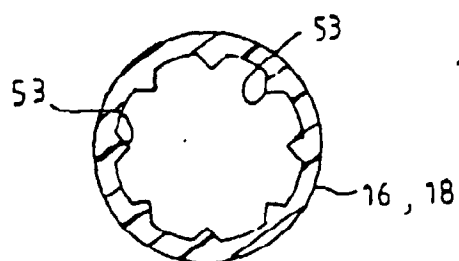


FIGURE 4

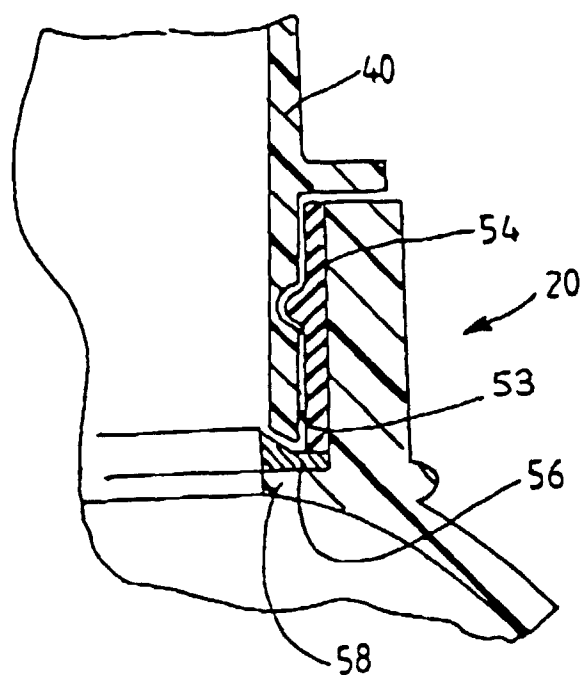


FIGURE 6

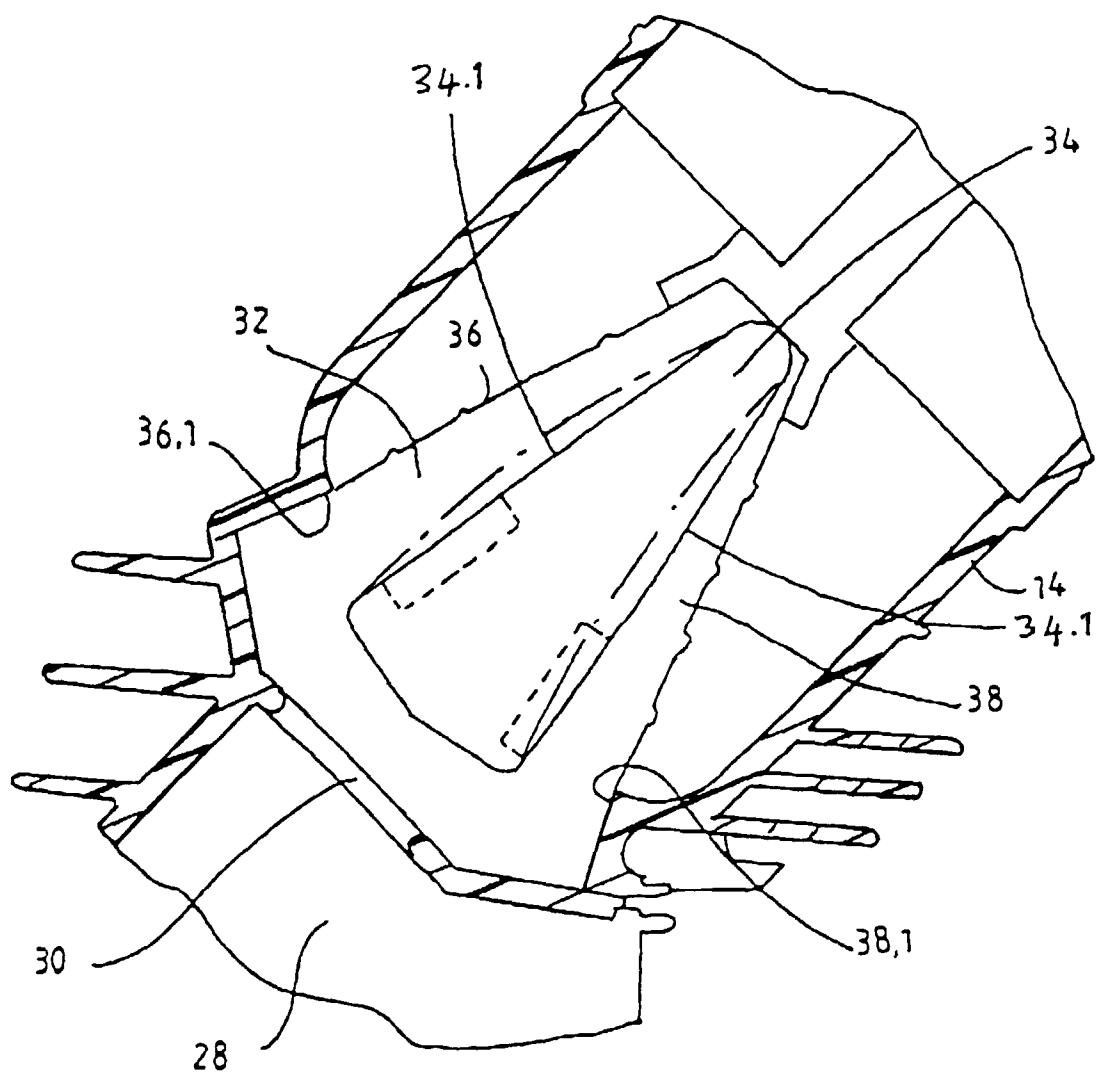


FIG. 7