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In Pro Per

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA

THOMAS V. LOPEZ, Plaintiff, v. FLUIDRA USA LLC; ZODIAC POOL SYSTEMS LLC; COVER-POOLS INCORPORATED. Defendants.	Case No. '21CV0044 WQHMDD COMPLAINT FOR PATENT INFRINGEMENT, DEMAND FOR JURY TRIAL

1. Thomas V. Lopez ("Lopez" or "Plaintiff"), hereby brings this action for patent infringement against Fluidra USA LLC ("Fluidra"), Zodiac Pool Systems LLC ("Zodiac") and Cover-Pools Incorporated ("Cover-Pools") alleging infringement of the following validly issued patents (the "Patents-in-Suit"):U.S. Patent No. 9,625,041, titled "Wearless multi-port water distribution valve" (the '041); and U.S. Patent No. 10,641,401, titled "Wearless multi-port water distribution valve assembly with bottom inlet" (the '401). Patents attached hereto as Exhibit A.

NATURE OF THE ACTION

2. This is an action for patents infringement arising under the United States Patent Act 35 U.S.C. §§ 1 et seq., including 35 U.S.C. § 271.

PARTIES

3. Plaintiff Thomas V. Lopez is an individual residing in the City Phoenix, within the

County of Maricopa, in the State of Arizona.

4. On information and belief, Defendant Fluidra USA LLC is a company established in Florida and has a regular place of business in California at 2882 Whiptail Loop # 100, Carlsbad, CA 92010. Defendant may be served via its registered agent: Cogency Global Inc., located at 115 N. Calhoun St., Suite 4, Tallahassee, FL 32301.

5. On information and belief, Defendant Zodiac Pool Systems LLC is company established in Delaware with principal office at 2882 Whiptail Loop # 100, Carlsbad, CA 92010. Defendant may be served via its registered agent: Corporation Service Company, located at 251 Little Falls Dr, Wilmington, DE 19807.

6. On information and belief, Defendant Cover-Pools Incorporated is a company incorporated in Utah and has a regular and established place of business in California at 2882 Whiptail Loop # 100, Carlsbad, CA 92010. Defendant may be served via its registered agent: Corporation Service Company, located at 15 West South Temple, Suite 600, Salt Lake City, UT 84101.

JURISDICTION AND VENUE

7. This lawsuit is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 101 et seq. The Court has subject-matter jurisdiction pursuant to 28 U.S.C. §§ 1331, 1332, 1338(a), and 1367.

8. The Court has personal jurisdiction over Defendants for the following reasons: (1) Defendants are present within or has minimum contacts within the State of California and Southern District of California; (2) Defendants have purposefully availed themself of the privileges of conducting business in the State of California and in this district; (3) Defendants have sought protection and benefit from the laws of the State of California; (4) Defendants regularly conduct

business within the State of California and within this district, and Plaintiff's cause of action arises directly from Defendants' business contacts and other activities in the State of California and in this district; and (5) Defendants have a regular and established place of business in the State of California and in this district.

9. Defendants, directly and/or through intermediaries, ship, distribute, use, offer for sale, sell, and/or advertise products and services in the United States, the State of California, and the Southern District of California including but not limited to the products which contain the infringing Patents-in-Suit's elements as detailed below. Upon information and belief, Defendants have committed patent infringement in the State of California and in this district; Defendants solicit and have solicited customers in the State of California and in this district; and Defendants have paying customers who are residents of the State of California and this district and who each use and have used the Defendants' products and services in the State of California and in this district.

10. Venue is proper in the Southern District of California pursuant to 28 U.S.C. §§ 1400(b). Defendants have a regular and established place of business in this district, Defendants have transacted business in this district, and Defendants have directly and/or indirectly committed acts of patent infringement in this district.

PATENTS-IN-SUIT

11. Plaintiff incorporates the above paragraphs herein by reference.

The '041 Patent

12. On April 18, 2017, United States Patent No. 9,625,041 was duly and legally issued by the United States Patent and Trademark Office. The '041 Patent is titled "Wearless multi-port water distribution valve".

13. Lopez is the assignee of all right, title and interest in the '041 patent, including all rights to enforce and prosecute actions for infringement and to collect damages for all relevant times against infringers of the '041 Patent. Accordingly, Lopez possesses the exclusive right and standing to prosecute the present action for infringement of the '041 Patent by Defendants.

14. The application leading to the '041 patent was filed on August 5, 2015.

15. The present invention relates to Swimming pools, and more particularly to valves for use with pool pump assemblies in Swimming pools having in-floor cleaning Systems.

16. There are many ways to clean a pool, but pool owners are continually looking for easier ways to do so. Pools can be cleaned by hand, such as by brushing the pool Surface with a brush fit on the end of a long pole. This causes debris and material collected on the pool surface to be lifted off the Surface; when the pool pump and filter assembly is operated in conjunction with this practice, water and debris together are drawn through the pool pump into a filter which filters and collects much of the debris, thereby removing it from the pool and rendering the pool cleaner. Brushing can be laborious and time-consuming, however. (Ex. A, the '041 at 1:13-23.) Automatic pool vacuums were developed to reduce the work of pool owners. Pool vacuums operate in number of different ways, but most creep along the pool Surface and Suck, or disturb and then Suck, debris and material collected on the pool Surface up a hose into the operating pump and filter assembly. Vacuums can be difficult to operate, however. They must be calibrated to provide sufficient suction, they must be maintained, they are Vulnerable to jamming from large debris, and they can provide a random cleaning pattern that may be inadequate. (Ex. A, the '041 at 1:24-33.) In-floor cleaning heads were developed as an automated, low-oversight way to keep a pool Surface clean. In-floor cleaning heads are outlets that are permanently installed in the Swimming pool structure. The heads recede into the pool structure when not in use, and pop up

when operating. Although there are a great number of kinds of pop-up heads, most operate with the basic functionality of directing a stream of water across a portion of the pool Surface to clean that portion of the pool surface. Some heads rotate to direct that stream across different portions of the pool surface. Typically, the heads are installed in a number of locations across a pool Surface, and often clusters of heads are grouped together in "lines, with each line including heads that receive water independently of the heads in other lines. This independent operation of lines requires a way to provide a flow of water to each line independently, and swimming pool distribution valves were developed. Swimming pool distribution valves generally have an inlet, a plurality of outlets, and some internal mechanism for directing the flow of water from the inlet to each of the outlets independently. (Ex. A, the '041 at 1:34-54.)

17. At the time the '041 was filed, many Swimming pool distribution valves were susceptible to wear and can require difficult replacement. (Ex. A, the '041 at 1:54-57.). The inventions disclosed in the '041 addressed such problems and were not well-understood, routine, or conventional. To achieve the foregoing objects and in accordance with the purpose of the present invention, the '041 describes an improved water distribution valve.

The '401 Patent

18. On May 5, 2020, United States Patent No. 10,641,401 was duly and legally issued by the United States Patent and Trademark Office. The '401 Patent is titled "Wearless multi-port water distribution valve assembly with bottom inlet".

19. Lopez is the assignee of all right, title and interest in the '401 patent, including all rights to enforce and prosecute actions for infringement and to collect damages for all relevant times against infringers of the '401 Patent. Accordingly, Lopez possesses the exclusive right and standing to prosecute the present action for infringement of the '401 Patent by Defendants.

20. The application leading to the '401 patent was filed on February 26, 2016.

21. The present invention relates generally to Swimming pools, and more particularly to valves for use with pool pump assemblies in Swimming pools having in-floor cleaning Systems.

22. The '401 patent resolves issues related to water distribution valve. (Ex. A, the '401 at 1:55-2:3.).

23. The claims of the Patents-in-Suit do not merely recite the elements of a familiar inventions. Instead, the claims recite one or more inventive concepts that resolve the problems related to water distribution valve.

ACCUSED PRODUCTS

24. Defendants make, use, offer for sale and sell in the U.S. products, systems, and/or services that infringe the Patents-in-Suit, including, but not limited to their REVOLUTION™ 6-PORT VALVE (the "Accused Products" or "Accused Instrumentality").

DEFENDANTS' KNOWLEDGE ABOUT PLAINTIFF'S PATENTS

25. Defendants are well aware of Plaintiff's patents and have continued its unauthorized infringing activity despite this knowledge. The patents discussions with Defendants commenced on or about April 2015. On April 15, 2015 the representative of the Defendant Zodiac Barry Greenwald sent a letter to the Plaintiff saying that Zodiac was interested in Plaintiff's products and ideas and that they looked forward to the next step. Ultimately, on August 26, 2015 the President of Cover-Pools Todd Cramer informed the Plaintiff that defendants declined Plaintiff's offer.

26. Later, defendants presented "a new valve" called REVOLUTION™ 6-PORT VALVE that incorporates elements of Patents-in-Suit.

COUNT I

(Infringement of U.S. Patents Nos. 9,625,041 and 10,641,401)

27. Plaintiff incorporates the above paragraphs herein by reference.

28. U.S. Patents Nos. 9,625,041 and 10,641,401 are valid, enforceable, and were duly and legally issued by the United States Patent and Trademark Office ("USPTO"). U.S. Patents Nos. 9,625,041 and 10,641,401 are presumed valid and enforceable. See 35 U.S.C. § 282.

29. Plaintiff is the owner of U.S. Patents Nos. 9,625,041 and 10,641,401 and possesses all rights of recovery under the Patents-in-Suit, including the exclusive right enforce patents and pursue lawsuits against infringers.

30. Without a license or permission from Plaintiff, Defendants have infringed and continues to infringe on one or more claims of U.S. Patents Nos. 9,625,041 and 10,641,401 by importing, making, using, offering for sale, or selling products and devices that embody the patented invention in violation of 35 U.S.C. § 271.

Direct Infringement – 35 U.S.C. § 271(a)

31. Plaintiff incorporates the above paragraphs herein by reference, the same as if set forth herein.

32. Without a license or permission from Plaintiff, Defendants have infringed and continues to directly infringe on one or more claims of U.S. Patents Nos. 9,625,041 and 10,641,401 by importing, making, using, offering for sale, or selling products and devices that embody the patented invention in violation of 35 U.S.C. § 271.

33. Defendants' infringement is based upon literal infringement or infringement under the doctrine of equivalents, or both.

34. Defendants' acts of making, using, importing, selling, and/or offering for sale infringing products and services have been without the permission, consent, authorization, or

license of the Plaintiff.

35. Defendants' infringement includes, but is not limited to, the manufacture, use, sale, importation and/or offer for sale of Accused Products.

36. As a result of Defendants' unlawful activities, Plaintiff has suffered and will continue to suffer irreparable harm for which there is no adequate remedy at law. Plaintiff and Defendants both compete in the swimming pools space. Defendants' continued infringement of the Asserted Patents causes harm to Plaintiff in the form of price erosion, loss of goodwill, damage to reputation, loss of business opportunities, inadequacy of money damages, and direct and indirect competition.

Induced Infringement – 35 U.S.C. § 271(b)

37. Defendants had pre-suit knowledge of the Patents-in-Suit as at least as early as April 2015 when Defendants received a proposal from Plaintiff with details of the Patents-in-Suit. See Ex B. Defendants' post-suit knowledge is inferred from filing of this complaint. See *In re Bill of Lading Transmission & Processing Sys. Patent Litig.*, 681 F.3d 1323, 1345 (Fed. Cir. 2012) (finding that defendant's post-suit knowledge can be inferred from filing of the suit). Alternatively, to the extent Defendants' claims it was not aware of the Patents-in-Suit despite the above examples, Defendants were willfully blind as to the existence of the Patents-in-Suit.

38. Defendants took active steps to induce infringement, such as advertising an infringing use, which supports a finding of an intention. See *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 932 (2005) ("[I]t may be presumed from distribution of an article in commerce that the distributor intended the article to be used to infringe another's patent, and so may justly be held liable for that infringement").

39. Defendants' acts of inducement include, without limitation: providing the

Infringing Products to their customers and other third parties and intending them to use the Infringing Products with swimming poos and other infrastructure that enable and/or make use of these products; providing information, advertising, and instructions for these products through its own and third-party websites (see, e.g https://caretakersystem.com/revolution-6-port-valve/); encouraging customers and other third parties to communicate directly with Defendants representatives about the Infringing Products for purposes of technical assistance, troubleshooting, as well as sales and marketing; encouraging customers and other third parties to use the Infringing Products by providing instructions on how to use the Infringing Products (e.g., https://caretakersystem.com/wp-content/uploads/2019/05/H0656800-CSI-REVOLUTION-6-PORT-VALVE-BROCHURE-t.pdf , and https://caretakersystem.com/wp-content/uploads/2019/09/T0073500-6-PORT-INSTALLATION-MAINTENANCE-GUIDE.pdf). See Ex C.

40. The allegations herein support a finding that Defendants induced infringement of the Patents-in-Suit. See *Power Integrations v. Fairchild Semiconductor*, 843 F.3d 1315, 1335 (Fed. Cir. 2016) ("[W]e have affirmed induced infringement verdicts based on circumstantial evidence of inducement [e.g., advertisements, user manuals] directed to a class of direct infringers [e.g., customers, end users] without requiring hard proof that any individual third-party direct infringer was actually persuaded to infringe by that material.")

Contributory Infringement – 35 U.S.C. § 271(c)

41. On information and belief, Defendants contributorily infringes on the Patents-in-Suit. Defendants had pre-suit knowledge of the Patent-in-Suit as explained above. Defendants' post-suit knowledge is inferred from filing of this complaint. See *In re Bill of Lading Transmission & Processing Sys. Patent Litig.*, 681 F.3d 1323, 1345 (Fed. Cir. 2012) (finding that defendant's

post-suit knowledge can be inferred from filing of the suit). Alternatively, to the extent Defendant's claims it was not aware of the Patent-in-Suit despite the above examples, Defendants were willfully blind as to the existence of the Patents-in-Suit. Defendants knew or should have known that third parties, such as its customers, would infringe the Patents-in-Suit.

42. On information and belief, Defendants implementation of the accused functionality has no substantial non-infringing uses. See, e.g., *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1321 (Fed. Cir. 2009) (holding that the "substantial non-infringing use" element of a contributory infringement claim applies to an infringing feature or component, and that an "infringing feature" of a product does not escape liability simply because the product as a whole has other non-infringing uses).

Willful Infringement

43. On information and belief, Defendants had pre-suit knowledge of the Patent-in-Suit as explained above. Defendants' post-suit knowledge is inferred from filing of this complaint. See *In re Bill of Lading Transmission & Processing Sys. Patent Litig.*, 681 F.3d 1323, 1345 (Fed. Cir. 2012) (finding that defendant's post-suit knowledge can be inferred from filing of the suit). Alternatively, to the extent Defendants' claims it was not aware of the Patents-in-Suit despite the above examples, Defendants were willfully blind as to the existence of the Patents-in-Suit.

44. Despite knowing that it was infringing the Patents-in-Suit, Defendants made no effort to license Plaintiff's technology. Defendants have made no effort to design their products or services around the Patents-in-Suit. These actions demonstrate Defendants' blatant and egregious disregard for Plaintiff's patents rights.

45. Despite their knowledge of the Patents-in-Suit, Defendants have sold and continue to sell the Accused Products in complete and reckless disregard of Plaintiff's patents rights. As

such, Defendants have acted recklessly and continues to willfully, wantonly, and deliberately engage in acts of infringement of the Patents-in-Suit, justifying an award to Plaintiff of increased damages under 35 U.S.C. § 284, and attorneys' fees and costs incurred under 35 U.S.C. § 285.

Plaintiff Suffered Damages

46. Defendants' acts of infringement of the Patents-in-Suit have caused damage to Plaintiff, and Plaintiff is entitled to recover from Defendants the damages sustained as a result of Defendants' wrongful acts in an amount subject to proof at trial pursuant to 35 U.S.C. § 271. Defendants' infringement of Plaintiff's exclusive rights under the Patents-in-Suit will continue to damage Plaintiff causing it irreparable harm for which there is no adequate remedy at law, warranting an injunction from the Court.

REQUEST FOR RELIEF

Plaintiff incorporates each of the allegations in the paragraphs above and respectfully asks the Court to:

(a) Enter a judgment that Defendants have directly infringed one or more claims of each of the Patents-in-Suit either literally and/or under the doctrine of equivalents;

(b) Enter a judgment that Defendants account for and pay to Plaintiff all damages to and costs incurred by Plaintiff because of Defendants' infringing activities and other conduct complained of herein, and an accounting of all infringements and damages not presented at trial;

(c) Enter a judgment that Plaintiff be granted pre-judgment and post-judgment interest on the damages caused by Defendants' infringing activities and other conduct complained of herein;

(d) Award Plaintiff all other relief that the Court may deem just and proper.

Dated: January 6, 2021

Respectfully submitted,

By _____
Thomas V. Lopez

Exhibit A

US009625041B1

(12) United States Patent
Lopez

(10) Patent No.: US 9,625,041 B1
(45) Date of Patent: Apr. 18, 2017

(54) **WEARLESS MULTI-PORT WATER DISTRIBUTION VALVE**

(71) Applicant: **Pool Patch LLC**, Phoenix, AZ (US)

(72) Inventor: **Thomas V. Lopez**, Phoenix, AZ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/819,338**

(22) Filed: **Aug. 5, 2015**

(51) **Int. Cl.**

F16K 11/02	(2006.01)
F16K 11/074	(2006.01)
F16K 11/06	(2006.01)
E04H 4/12	(2006.01)
E04H 4/16	(2006.01)

(52) **U.S. Cl.**
CPC ***F16K 11/06*** (2013.01); ***E04H 4/12*** (2013.01); ***E04H 4/16*** (2013.01); *Y10T 137/269* (2015.04); *Y10T 137/86501* (2015.04); *Y10T 137/86517* (2015.04)

(58) **Field of Classification Search**
CPC F16K 11/06; F16K 11/072; F16K 11/074; Y10T 137/269; Y10T 137/86445; Y10T 137/86517; Y10T 137/86533; Y10T 137/86911; Y10T 137/86501
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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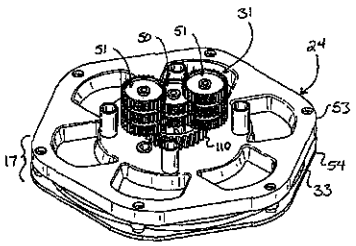
* cited by examiner

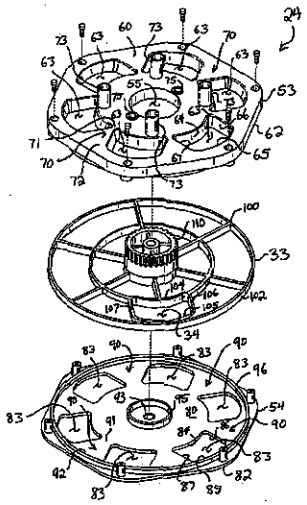
Primary Examiner — John K Fristoe, Jr.
Assistant Examiner — Seth W Mackay-Smith
(74) *Attorney, Agent, or Firm* — Thomas W. Galvani, P.C.; Thomas W. Galvani

(57) **ABSTRACT**

A wearless water distribution valve directs a flow of water through a swimming pool cleaning system and includes a housing having an inlet, outlets, and an inner surface bounding and defining an interior coupled in fluid communication with the inlet and the outlets. The valve further includes a disc having a port, and being mounted for rotation in the housing for movement among a plurality of positions, each position of the disc characterized by the port being aligned with a respective one of the outlets. The valve further includes a drive assembly carried by the housing and operably coupled to impart rotation to the disc. In response to application of the flow of water into the housing, actuation of the drive assembly imparts rotation to the disc through the plurality of positions. The disc is disposed in spaced relation away from the inner surface of the housing.

17 Claims, 7 Drawing Sheets





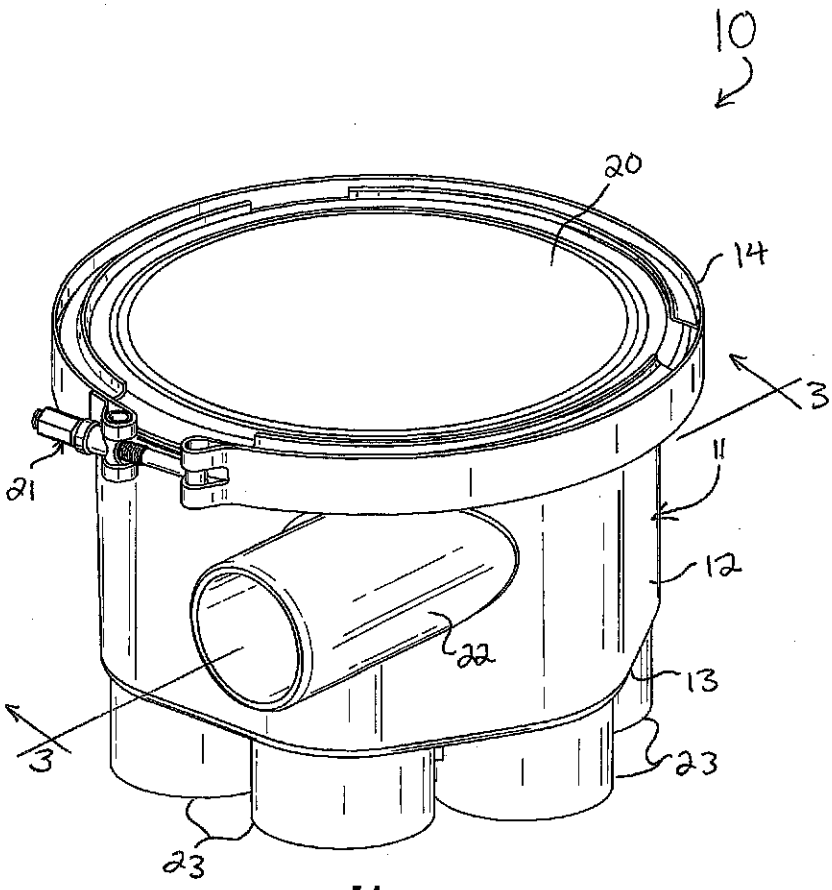


FIG. 1A

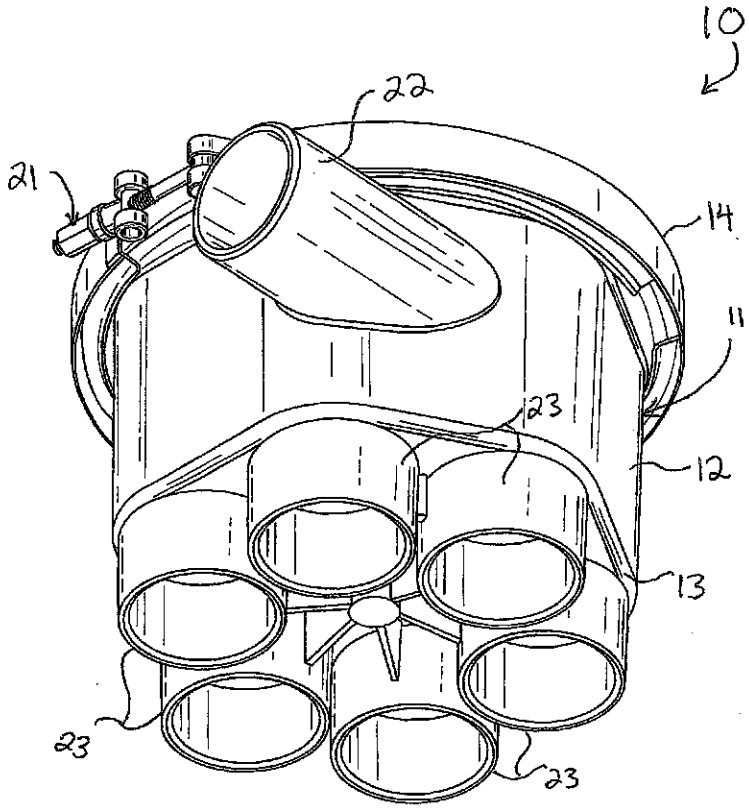


FIG. 1B

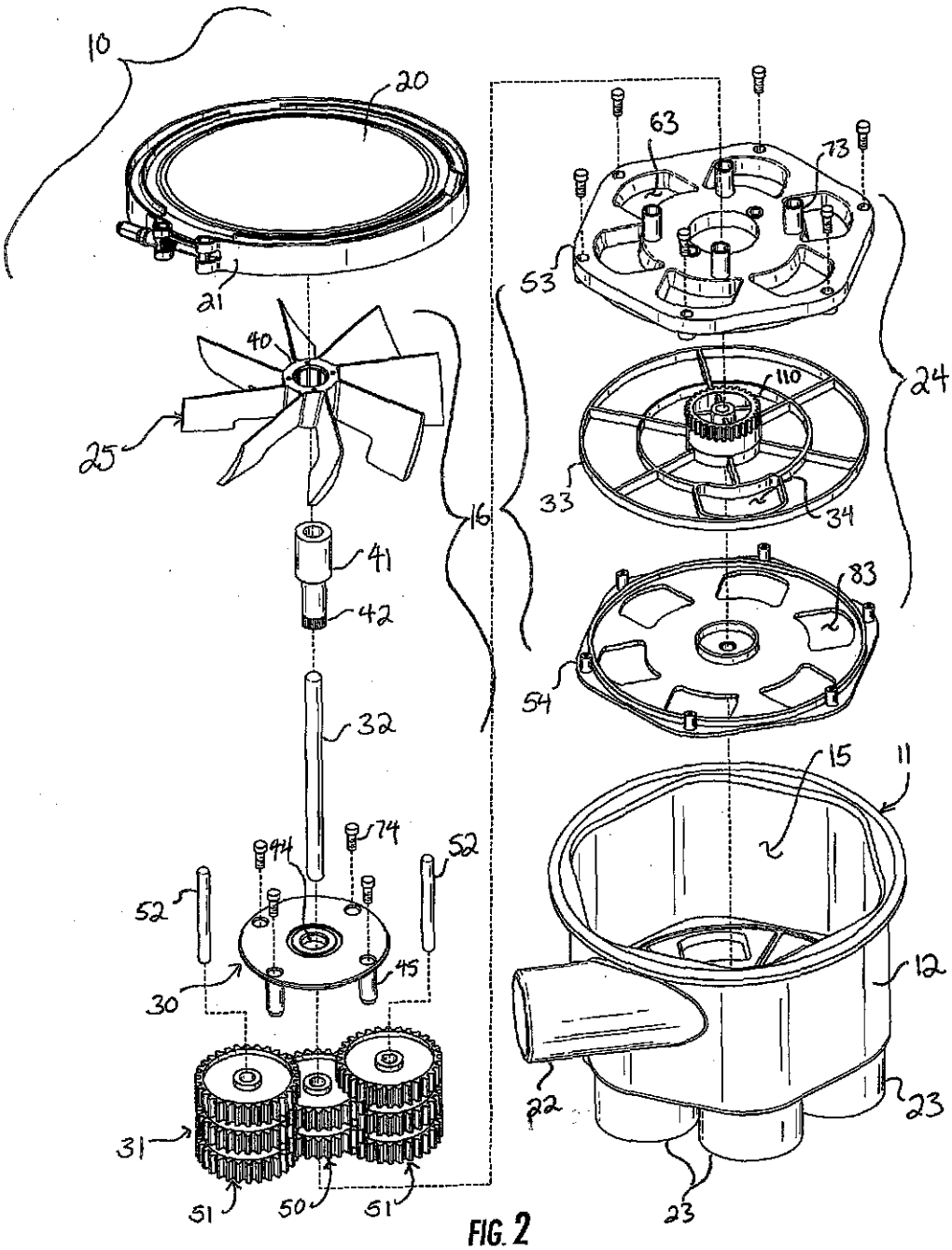

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FIG. 2

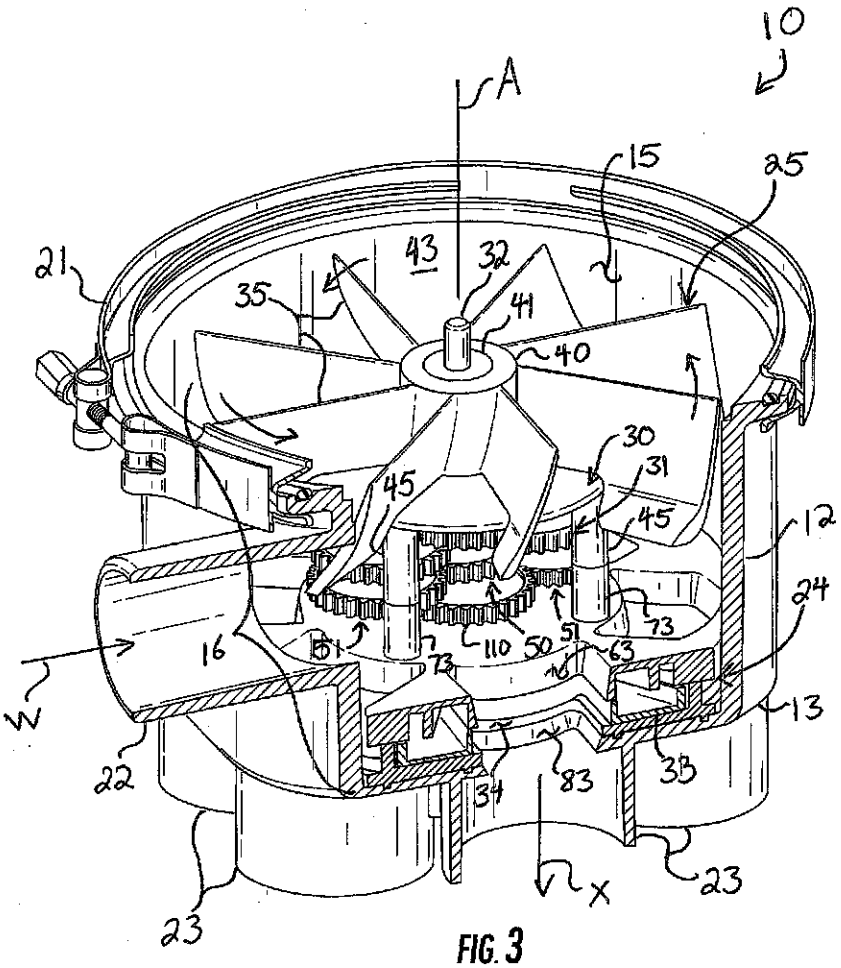
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FIG. 3

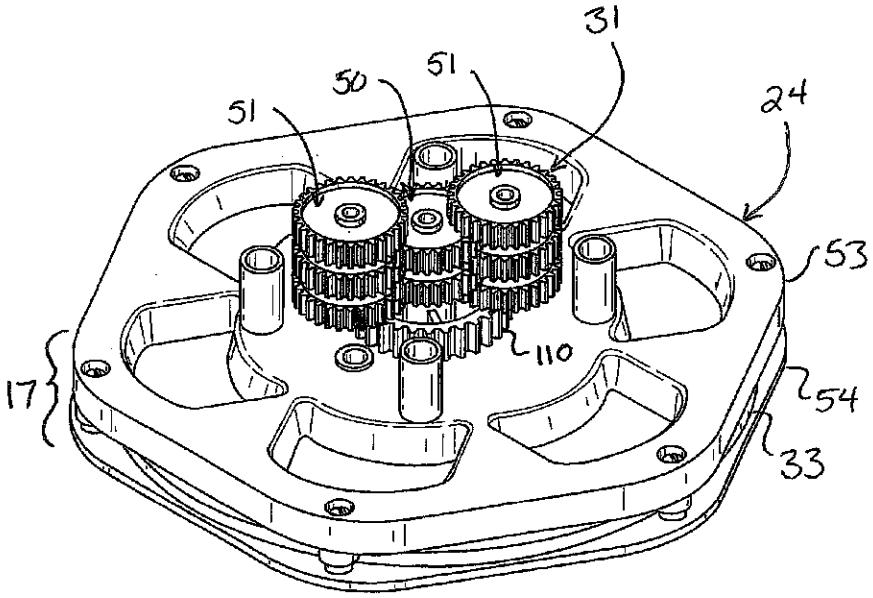

FIG. 4

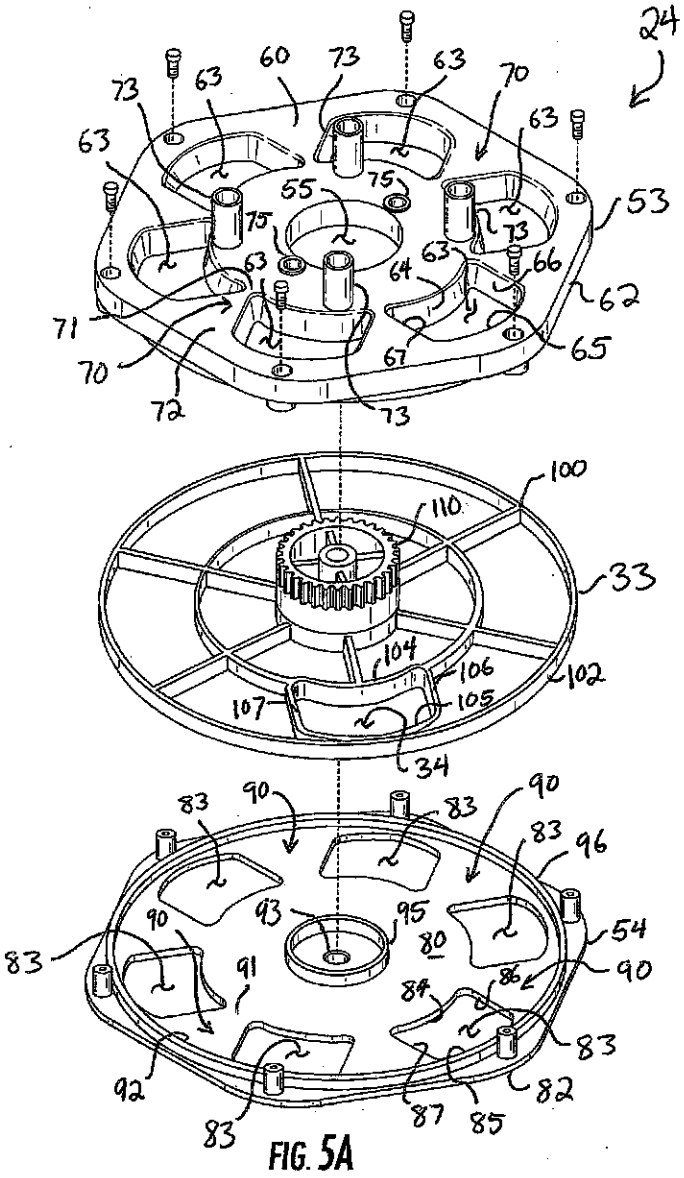
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FIG. 5A

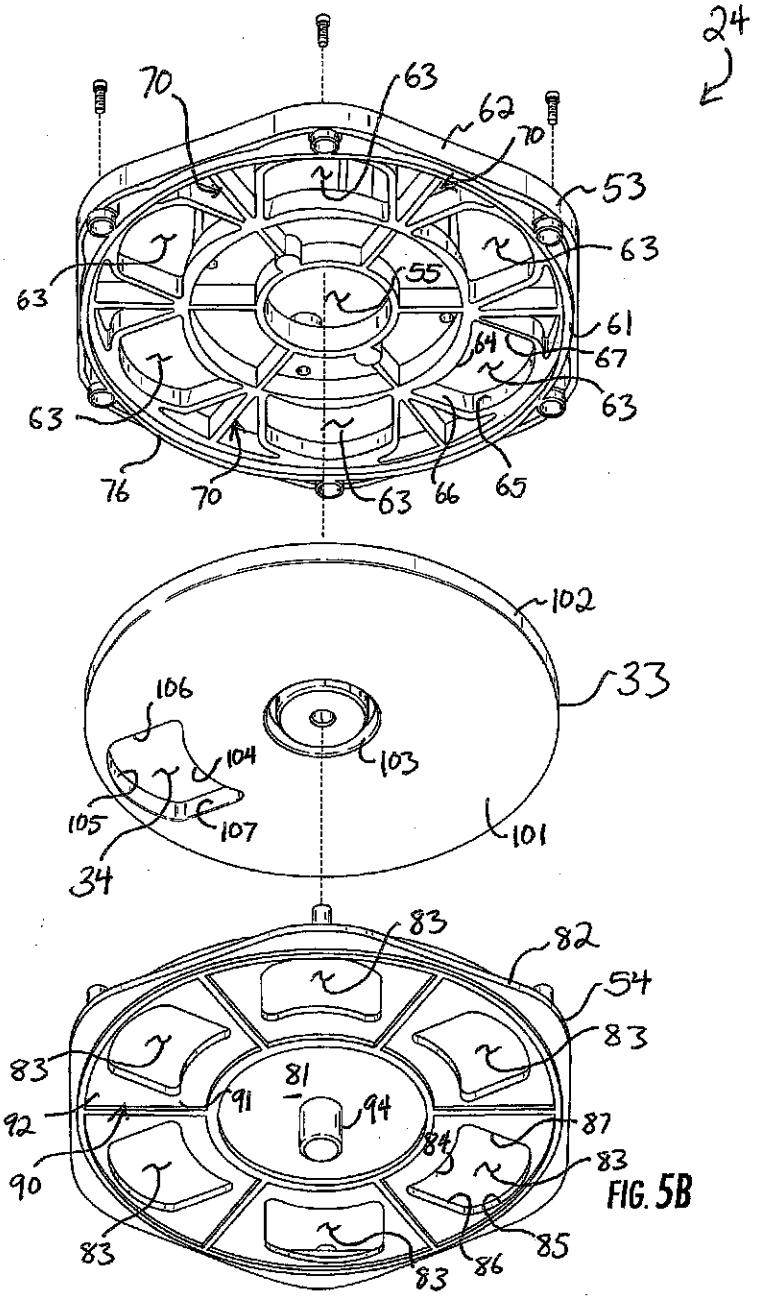
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FIG. 5B

WEARLESS MULTI-PORT WATER DISTRIBUTION VALVE

FIELD OF THE INVENTION

The present invention relates generally to swimming pools, and more particularly to valves for use with pool pump assemblies in swimming pools having in-floor cleaning systems.

BACKGROUND OF THE INVENTION

There are many ways to clean a pool, and pool owners are continually looking for easier ways to do so. Pools can be cleaned by hand, such as by brushing the pool surface with a brush fit on the end of a long pole. This causes debris and material collected on the pool surface to be lifted off the surface; when the pool pump and filter assembly is operated in conjunction with this practice, water and debris together are drawn through the pool pump into a filter which filters and collects much of the debris, thereby removing it from the pool and rendering the pool cleaner. Brushing can be laborious and time-consuming, however.

Automatic pool vacuums were developed to reduce the work of pool owners. Pool vacuums operate in a number of different ways, but most creep along the pool surface and suck, or disturb and then suck, debris and material collected on the pool surface up a hose into the operating pump and filter assembly. Vacuums can be difficult to operate, however. They must be calibrated to provide sufficient suction, they must be maintained, they are vulnerable to jamming from large debris, and they can provide a random cleaning pattern that may be inadequate.

In-floor cleaning heads were developed as an automated, low-oversight way to keep a pool surface clean. In-floor cleaning heads are outlets that are permanently installed in the swimming pool structure. The heads recede into the pool structure when not in use, and pop up when operating. Although there are a great number of kinds of pop-up heads, most operate with the basic functionality of directing a stream of water across a portion of the pool surface to clean that portion of the pool surface. Some heads rotate to direct that stream across different portions of the pool surface. Typically, the heads are installed in a number of locations across a pool surface, and often clusters of heads are grouped together in "lines," with each line including heads that receive water independently of the heads in other lines. This independent operation of lines requires a way to provide a flow of water to each line independently, and so swimming pool distribution valves were developed.

Swimming pool distribution valves generally have an inlet, a plurality of outlets, and some internal mechanism for directing the flow of water from the inlet to each of the outlets independently. However, many swimming pool distribution valves are susceptible to wear, which requires laborious maintenance or difficult replacement. An improved water distribution valve is needed.

SUMMARY OF THE INVENTION

A wearless water distribution valve directs a flow of water through a swimming pool cleaning system and includes a housing having an inlet, outlets, and an inner surface bounding and defining an interior coupled in fluid communication with the inlet and the outlets. The valve further includes a disc having a port, and being mounted for rotation in the housing for movement among a plurality of positions, each position of the disc characterized by the port being aligned with a respective one of the outlets. The valve further includes a drive assembly carried by the housing and operably coupled to impart rotation to the disc. In response to application of the flow of water into the housing, actuation of the drive assembly imparts rotation to the disc through the plurality of positions. The disc is disposed in spaced relation away from the inner surface of the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIGS. **1**A and **1**B are top and bottom perspective views of a wearless multi-port water distribution valve, respectively;

FIG. **2** is an exploded top perspective view of the valve of FIG. **1**A;

FIG. **3** is a top perspective, section view of the valve of FIG. **1**A taken along the line **3-3** in FIG. **1**A;

FIG. **4** is a top perspective view showing, in isolation, a cartridge and reduction cassette carried in the valve of FIG. **1**A; and

FIGS. **5**A and **5**B are exploded, top and bottom perspective views, respectively, of the cartridge of FIG. **4**.

DETAILED DESCRIPTION

Reference now is made to the drawings, in which the same reference characters are used throughout the different figures to designate the same elements. FIGS. **1**A and **1**B are top and bottom perspectives of a wearless multi-port water distribution valve **10** for directing a flow of water from a pump in a swimming pool cleaning assembly among several conduits of a piping assembly, each of which leads to a line of in-floor cleaning heads installed in the swimming pool. The valve **10** is useful for sequentially communicating water to each in-floor cleaning head to clean the pool surface of dirt, debris, growth, and other material without succumbing to internal wear, and without causing wear to any parts which permanently fixed to the pool structure or the pump assembly. In this way, maintenance of the valve **10** does not eventually require laborious replacement of the valve, which typically involves cutting the conduits to remove a worn valve, obtaining a new valve, and plumbing the new valve into the cut conduits.

The valve **10** includes a generally symmetric housing **11** having a sidewall **12** extending between a bottom **13** and a lip defining a top **14** of the housing **11**. The housing **11** bounds and defines an interior **15**, shown in FIG. **2**, and a lid **20** covers and encloses the interior **15** at the top **14**. The lid **20** is releasably secured on the housing **11** with a clamp ring **21**.

Referring still to FIGS. **1**A and **1**B, a lateral inlet **22** is formed in the sidewall **12** in fluid communication with the interior **15**, and six downwardly extending outlets **23** are formed in the bottom **13** of the housing **11**, also in fluid communication with the interior **15**. Each of the inlet **22** and outlets **23** are cylindrical ports sized to interface and engage easily with conventional swimming pool plumbing conduits, which are typically arranged in a circumferentially-spaced apart, radial arrangement. The pump of the swimming pool cleaning assembly pumps water through the inlet **22** into the interior **15** and then sequentially out each of the outlets **23** to each of the in-floor cleaning heads installed in the swimming pool.

Referring now to FIG. **2**, the housing **11** and the lid **20** cooperate with a distribution assembly **16** carried in the interior **15** to sequentially and cyclically communicate water

from the inlet **22** to each of the outlets **23** so that the surface of the swimming pool is cleaned. The housing **11**, which in operation is plumbed to the conduits leading to the cleaning heads, carries a cartridge **24** which separates moving parts of the valve **10** from interaction with the housing **11** so as to prevent wear to the housing **11**. The distribution assembly **16** sequentially and cyclically communicates water from the inlet to the outlets **23** include the cartridge **24**, but also includes an impeller **25**, a table **30**, and a reduction cassette **31**, each mounted around a central axle **32**. The cartridge **24**, also mounted around the central axle **32**, carries a disc **33** which is mounted for rotation, and does rotate entirely within the cartridge **24** so as not to engage the sidewall **12** of the housing **11** or rub against the sidewall **12** of the housing **11**. The disc **33** includes a single port **34** which extends entirely through the disc **33** to selectively allow water to pass through the disc **33** from the inlet **22** to the outlets **23**, as will be explained in detail herein. As the disc **33** rotates within the cartridge **24**, the port **34** sequentially moves into alignment with each of the outlets **23**, so as to allow water from the interior **15** out the respective outlet **23**. The cartridge **24** and the disc **33** define an operational assembly **17** within the distribution assembly to render the valve **10** operable to distribute water.

Turning now to FIG. **3**, which is a section view of the valve **10** taken along the line **3-3** in FIG. **1A**, the arrangement of the distribution assembly **16** of the valve **10** is shown. The lid **20** has been removed for clarity of the illustration. The impeller **25** is proximate to the top **14**, generally parallel with respect to the inlet **22**. The impeller **25** includes a plurality of canted blades **35** formed integrally to and extending radially outward from a hub **40** fixed on a drive fitting **41**. The drive fitting **41** is mounted for free rotation on the axle **32**, so that the impeller **25** is mounted for free rotation on the axle **32**. The drive fitting **41** is more clearly shown in FIG. **2**, where it can be seen that the drive fitting **41** includes an enlarged top portion, to which the hub **40** of the impeller **25** is secured, and a lower, monolithically-formed drive gear **42**. The drive gear **42** is coupled in meshing engagement with the reduction cassette **31**. The impeller **25** thus rotates on the axle **32** to drive the reduction cassette **31**.

Returning to FIG. **3**, application of water through the inlet **22** along line W causes the impeller **25** to rotate in a counter-clockwise manner, as indicated with rotational arrows in FIG. **3**, thereby imparting rotation to each gear of the reduction cassette **31**. The axle **32** is aligned along an axis A, and for purposes of orientation, various terms used herein will be used in reference to the axis A, such as "horizontal," which means extending generally perpendicular to the axis A, "vertical," which means extending generally parallel to the axis A, "radial," which means extending horizontally outward from or inward to the axis A, and "circumferential," which means extending in a horizontal arc defined by the axis A.

In the preferred embodiment shown throughout the drawings, the impeller **25** includes eight blades **35**, but one having ordinary skill in the art will readily appreciate that a fewer or greater number of blades **35** may be used so long as performance of the valve **10** is comparable. The blades **35** each have a length in the radial direction which is shorter than the shortest radial distance between the axis A and the sidewall **12**, such that the blades **35** can rotate without impact, wear, rubbing, or other interference with an inner surface **43** of the sidewall **12**, thereby ensuring the continuous, uninterrupted rotation or the impeller **25** as well as the prevention of wear to the inner surface **43** of the sidewall **12**. The inner surface **43** of the sidewall **12** is generally hexagonal.

Still referring to FIG. **3**, the impeller **25** is disposed above the table **30**. The table **30** has a diameter less than the diameter of the impeller **25**; the table **30** is approximately one-half as wide as the impeller **25** and approximately one-third as wide as the housing **11**. The table **30** prevents the impeller **25** from moving downward on the axle **32** and also contains the reduction cassette **31** in vertical movement. The table **30** is formed with a coaxial bore **44** (seen in FIG. **2**) through which the drive fitting **41** extends on the axle **32** to engage with the reduction cassette **31**. The table **30** also includes four posts **45** which are supported by the cartridge **24** below and space the table **30** above the cartridge **24**. Within the space between the table **30** and the cartridge **24**, the reduction cassette **31** operates to convert the relatively fast rotation of the impeller **25** into relatively slow rotation of the disc **33** within the cartridge **24**.

The reduction cassette **31** includes a vertically-stacked set of central gears **50** meshingly engaged with two vertically-stacked sets of offset gears **51**. Each of the central and offset gears **50** and **51** includes an upper large gear integrally formed to a lower small gear, such that the large gears of the central gears **50** engage with the small gears of the offset gears **51**, and the small gears of the central gears **50** engage with the large gears of the offset gears **51**. The central gears **50** are mounted for free rotation on the axle **32**, and the offset gears **51** are mounted for free rotation on shafts (seen in FIG. **2**) which are fit into and contained from vertical movement by the table **30** and the cartridge **24**. The impeller **25**, the drive fitting **41**, and the reduction cassette **31** are thus elements of a drive assembly carried by the housing **11** and operably coupled to the disc **33** in the cartridge **24** so as to impart rotation to the disc **33** within the cartridge **24** in response to application of water through the valve **10** and consequential actuation of the drive assembly. The central gears **50** and the offset gears **54** are mounted just above the cartridge **24** on the axle **32** and the shafts **52**, respectively, which are secured in place. The reduction cassette **31** is thereby contained vertically between the table **30** and the cartridge **24**.

Turning to FIGS. **4**, **5A**, and **5B**, the cartridge **24** is shown in detail. In FIG. **4**, the cartridge **24** is shown together with the reduction cassette **31** mounted atop the cartridge **24**. The cartridge **24**, and the reduction cassette **31**, are removable from the housing **11** and may be replaced if either wears out. Neither wears against nor engages with the housing **11** in a manner in which the housing **11** itself is worn, so that the housing **11** need not be replaced. The cartridge **24** and the reduction cassette **31** are applicable to the housing **11** to render the valve **10** operable.

The cartridge **24** includes a top plate **53**, an opposed bottom plate **54**, and the disc **33** interposed therebetween. The reduction cassette **31** is mounted on top of the top plate **53**. Turning to FIGS. **5A** and **5B**, the top plate **53** includes an upper surface **60**, an opposed lower surface **61**, a perimeter edge **62**, and a large central bore **55**. The top plate **53** is generally hexagonal prismatic, such that the perimeter edge **62** includes six sides which correspond in dimension to the hexagonal inner surface **43** of the sidewall **12** of the housing **11** into which the top plate **53** is snug fit as part of the cartridge **24**. The snug fit between the top plate **53** and the inner surface **43** of the sidewall **12** prevents water from flowing from the inlet **22** to the outlets **23** around the cartridge **24**. The top plate **53** has a relatively thin profile. The top plate **53** includes six apertures **63**. The apertures **63**

are identical in every way other than location, and so only one aperture **63** will be described and referenced herein specifically, with the understanding that the description is equally applicable to the other apertures **63** unless otherwise noted. Additionally, not every aperture **63** will be marked with reference characters, for the sake of clarity of the drawings.

The aperture **63** is generally rectangular and extends vertically entirely through the top plate **53**. The aperture **63** is disposed between the perimeter edge **62** and the central bore **55**. The aperture **63** has an inner edge **64**, an opposed outer edge **65**, and opposed parallel sides **66** and **67**. The inner edge **64** and the outer edge **65** are each curved such that the inner edge **64** forms a convex edge of the aperture **63** and the outer edge **65** forms a concave edge of the aperture **63**. The sides **66** and **67** are parallel and arranged nearly radially with respect to the axis A. The sides **66** and **67** are tangential to the central bore **55** of the top plate **53** and are generally transverse to the inner and outer edges **64** and **65**.

As stated above, each of the apertures **63** is identical in structure. In location, the apertures **63** are spaced apart circumferentially about the central bore **55**, each separated by a solid wedge **70**. Each wedge **70** is formed integrally and monolithically as part of the top plate **53**. The wedges **70** are identical in every way other than location, and so only one wedge **70** will be described and referenced herein specifically, with the understanding that the description is equally applicable to the other wedges **70** unless otherwise noted. Additionally, not every wedge **70** will be marked with reference characters for the sake of clarity of the drawings. The wedge **70** has an inner end **71** and an outer end **72**. The inner end **71** is proximate to the central bore **55** and is defined between the inner edges **64** of two adjacent apertures **63**. The outer end **72** is proximate to the perimeter edge **62** and is defined between the outer edges **65** of the same two adjacent apertures **63**. The inner end **71** is narrower than the outer end **72**, such that the wedge **70** expands in width from the inner end **71** to the outer end **72**. The inner end **71** is approximately one-sixth the circumferential width of the inner edge **64** of one of the apertures **63**. The outer end **72** is approximately two-thirds the circumferential width of the outer edge **65** of one of the apertures **63**. Thus, the horizontal area of the wedge **70** is approximately one-third the horizontal area of one of the apertures **63**.

The top plate **53** includes four posts **73** which snap into and engage with the four posts **45** on the underside of the table **30** via fasteners **74**, as seen in FIGS. **2** and **3**. The top plate **53** is also formed with two sockets **75** into which the shafts **52** are seated. The top plate **53** further includes a circumferential lip **76** depending from the lower surface **61**. The lip **76** contains the disc **33** at the top plate **53**.

Referring primarily to FIGS. **5A** and **5B** still, the bottom plate **54** includes an upper surface **80**, an opposed lower surface **81**, and a perimeter edge **82** extending around the bottom plate **54** between the upper and lower surfaces **80** and **81**. The bottom plate **54** is generally hexagonal prismatic, such that the perimeter edge **82** includes six sides which correspond in dimension to the hexagonal inner surface **43** of the sidewall **12** of the housing **11** into which the bottom plate **54** is snug fit as part of the cartridge **24**. The snug fit between the bottom plate **54** and the inner surface **43** of the sidewall **12** prevents water from flowing from the inlet **22** to the outlets **23** around the cartridge **24**. The bottom plate **54** includes a depending lip **83** formed on the lower surface **81** thereof, which lip **83** fits into a groove in the bottom **13** of the housing **11** to further lock the cartridge **24** in place and prevent water from flowing around the underside of the cartridge **24**. The bottom plate **54** has a relatively thin profile.

The bottom plate **54** includes six apertures **83**. The apertures **83** are identical in every way other than location, and so only one aperture **83** will be described and referenced herein specifically, with the understanding that the description is equally applicable to the other apertures **83** unless otherwise noted. Additionally, not every aperture **83** will be marked with reference characters, for the sake of clarity of the drawings. The aperture **83** is generally rectangular and extends vertically entirely through the bottom plate **54**. The aperture **83** has an inner edge **84**, an opposed outer edge **85**, and opposed parallel sides **86** and **87**. The inner edge **84** and the outer edge **85** are each curved such that the inner edge **84** forms a convex edge of the aperture **83** and the outer edge **85** forms a concave edge of the aperture **83**. The sides **86** and **87** are parallel and arranged nearly radially with respect to the axis A. The sides **86** and **87** are generally transverse to the inner and outer edges **84** and **85**.

As stated above, each of the apertures **83** is identical in structure. In location, the apertures **83** are spaced apart circumferentially about bottom plate **54**, each separated by a solid wedge **90**. Each wedge **90** is formed integrally and monolithically as part of the bottom plate **54**. The wedges **90** are identical in every way other than location, and so only one wedge **90** will be described and referenced herein specifically, with the understanding that the description is equally applicable to the other wedges **90** unless otherwise noted. Additionally, not every wedge **90** will be marked with reference characters for the sake of clarity of the drawings. The wedge **90** has an inner end **91** and an outer end **92**. The inner end **91** is proximate to the geometric center of the bottom plate **54** and is defined between the inner edges **84** of two adjacent apertures **83**. The outer end **92** is proximate to the perimeter edge **62** and is defined between the outer edges **85** of the same two adjacent apertures **83**. The inner end **91** is narrower than the outer end **92**, such that the wedge **90** expands in width from the inner end **91** to the outer end **92**. The inner end **91** is approximately one-sixth the circumferential width of the inner edge **84** of one of the apertures **83**. The outer end **92** is approximately two-thirds the circumferential width of the outer edge **85** of one of the apertures **83**. Thus, the horizontal area of the wedge **90** is approximately one third the horizontal area of one of the apertures **83**.

The bottom plate **54** includes several posts through which fasteners are applied so as couple the bottom plate **54** to the top plate **53**. The bottom plate **54** also includes a socket **93** located centrally on the upper surface **80** of the bottom plate **54** which extends into the bottom plate **54** from the upper surface **80** and is sized to receive the axle **32**. Opposed from the socket **93**, the bottom plate **54** has a post **94** extending downwardly from center of the lower surface **81**, which fits into and is seated in the bottom **13** of the housing **11**. When applied to the bottom **13** of the housing **11**, each of the apertures **83** is aligned with one of outlets **23** in the housing **11**. The bottom plate **54** includes an upstanding guide lip **95** extending upwardly from the upper face **80** proximate to the socket **93**; the guide lip **95** maintains rotational alignment of the disc **33**, as will be explained. The bottom plate **54** also includes an upstanding circumferential lip **96** which contains the disc **33**, in cooperation with the lip **76** formed on the lower surface **61** of the top plate **53**.

Disposed between the top and bottom plates **53** and **54** in the cartridge **24** is the disc **33**. The disc **33** is mounted in the cartridge **24** for rotation about the axle **32** in response to

actuation of the drive assembly. As described above, relatively fast rotation of the impeller **25** imparts rotation to the central and offset gears **50** and **51** of the reduction cassette **31**, which imparts reduced and relatively slow rotation to the disc **33**, which moves the port **34** sequentially into and out of alignment with each of the apertures **63** and in the top and bottom plates **53** and **54**, so as to sequentially open and close each of the outlets **23**. In this manner, the disc **33** controls the opening and closing of the outlets **23**, thereby directing the flow of water through the valve **10** from the inlet **22** to each of the outlets **23**.

The disc **33** includes an upper surface **100**, a lower surface **101**, and a peripheral edge **102** extending continuously around the disc **33** between the upper and lower surfaces **100** and **101**. The disc **33** is circular and has a thin profile. The peripheral edge **102** of the disc **33** corresponds to the lip **76** on the lower surface **61** of the top plate **53** and the outer lip **96** on the upper surface **81** of the bottom plate **54**. The disc **33** includes the port **34**, and in the preferred embodiment shown throughout the drawings, there is only one port **34**. The port **34** is formed entirely through the disc **33** from the upper surface **100** through to the lower surface **101**. The port **34** corresponds in shape to the apertures **63** and **83** and is generally rectangular. The port **34** has an inner edge **104**, an opposed outer edge **105**, and opposed parallel sides **106** and **107**. The inner edge **104** and the outer edge **105** are each curved such that the inner edge **104** forms a convex edge of the port **34** and the outer edge **105** forms a concave edge of the port **34**. The sides **106** and **107** are parallel and arranged nearly radially with respect to the axis A. The sides **106** and **107** are generally transverse to the inner and outer edges **104** and **105**.

The disc **33** has an elevated gear **110** coaxial to the axis A and preferably formed integrally to the disc **33**. The gear **110** has a bore formed centrally therethrough to receive the axle **32** when the valve **10** is assembled. The gear **110** extends through the central bore **55** formed in the top plate **53** above the upper surface **61** of the top plate **53** and meshingly engages with the offset gears **51** of the reduction cassette **31** so that rotation of the offset gears **51** imparts rotation to the gear **110** and the disc **33**.

The disc **33** further includes a circular track **103** formed into the lower surface **101** of the disc **33**. The track **103** receives the circular, upstanding guide lip **95** when the disc **33** is carried on the bottom plate **54**. Cooperation of the track **103** and the guide lip **95** guides rotation of the disc **33** and limits lateral movement of the disc **33** within the cartridge **24**.

As seen in FIGS. **3**, **4**, **5A**, and **5B**, when the cartridge **24** is assembled, each of the apertures **63** in the top plate **53** is aligned with a corresponding one of the apertures **83** in the bottom plate **54**, thus forming a "set of apertures **63** and **83**." As described above, the apertures **83** in the bottom plate **54** are aligned with the outlets **23** in the valve **10**, such that each set of apertures **63** and **83** is also aligned with the outlets **23** in the valve **10**. As the disc **33** rotates, it passes over the sets of apertures **63** and **83** to open and close the sets of apertures **63** and **83**. Referring now to FIG. **3**, as water enters the valve **10** from the inlet **22** along arrowed line W, the impeller **25** rotates in a counter-clockwise rotation, causing the central and offset gears **50** and **51** in the reduction cassette **31** to rotate. The reduction cassette **31**, engaged with the gear **110** of the disc **33**, causes the disc **33** to rotate, albeit much more slowly than the impeller **25**. The rotating disc **33** sequentially moves the port **34** past each of the sets of apertures **63** and **83**. The disc **33** thus moves among a plurality of positions; when the port **34** is aligned with a first set of apertures **63** and **83**, the port **34** corresponds to the set of apertures **63** and **83**, and couples the interior **15** of the valve **10** in fluid communication with the outlet **23** with which the set of apertures **63** and **83** is aligned. Water may thus flow uninterrupted from the interior **15** through the aperture **63** in the top plate **53**, through the port **34** in the disc **33**, through the aperture **83** in the bottom plate **54**, and then exit out the outlet **23**, as shown by the line X in FIG. **3**. The outlet **23** is thereby fully opened.

Rotation of the disc **33** slowly moves the port **34** out of position and out of alignment with the set of apertures **63** and **83** and thus slowly closes the outlet **23** aligned with that set of apertures **63** and **83**. To distinguish from the set of apertures **63** and **83** and the outlet **23** which is being closed, the port **34** moves toward an "adjacent" set of apertures **63** and **83** which are aligned with an "adjacent" outlet **23**. As the port **34** is rotated out of alignment, the side **106** of the port **34** moves away from the sides **66** and **86** of the apertures **63** and **83**, respectively, and over the wedges **70** and **90** in the top and bottom plates **53** and **54**, respectively. Likewise, the opposed side **107** moves away from the sides **67** and **87** of the apertures **63** and **83**, respectively, and over the apertures **63** and **83** themselves. The approximately one-third surface area of the wedges **70** and **90**, compared with that of the apertures **63** and **93**, together with the wide inner ends **71** and **91** of the wedges **70** and **90**, provides the valve **10** with a unique timing feature. In other valves, water is nearly always simultaneously passed through one valve and an adjacent valve, or "shared" between adjacent valves. However, the valve **10** delays sharing between valves for a considerable amount of time. The port **34** is able to move approximately one third of the way out of one of the sets of apertures **63** and **83** before any water is passed through the adjacent set of apertures **63** and **93**. This provides a more dedicated flow of water out of each outlet **23** to each in-floor cleaning head for a longer amount of time than has been conventionally available.

The disc **33** continues rotation to place the port **34** over the adjacent set of apertures **63** and **83** to open the adjacent outlet **23** aligned with that adjacent set of apertures **63** and **83**. When the port **34** is aligned over the adjacent set of apertures **63** and **83**, water may flow uninterrupted from the interior **15** through the adjacent aperture **63** in the top plate **53**, through the port **34** in the disc **33**, through the adjacent aperture **83** in the bottom plate **54**, and then exit out the adjacent outlet **23**. The adjacent outlet **23** is thereby fully open. Rotation of the disc **33** continues, thereby slowly and sequentially opening and closing all of the outlets **23** to communicate water to the in-floor cleaning heads installed throughout the pool.

A preferred embodiment is fully and clearly described above so as to enable one having skill in the art to understand, make, and use the same. Those skilled in the art will recognize that modifications may be made to the described embodiment without departing from the spirit of the invention. To the extent that such modifications do not depart from the spirit of the invention, they are intended to be included within the scope thereof.

The invention claimed is:

1. A water distribution valve for directing a flow of water through a swimming pool cleaning system, the water distribution valve comprising:

a housing having an inlet, a plurality of outlets, and an inner surface bounding and defining an interior coupled in fluid communication with the inlet and the plurality of outlets;

a cartridge including top and bottom plates, and having a plurality of spaced-apart apertures corresponding to the plurality of outlets of the housing;

a disc including a port, the disc mounted for rotation in the housing between the top and bottom plates for movement among a plurality of positions, each position of the disc characterized by the port being aligned with a respective one of the plurality of outlets;

a drive assembly carried by the housing and operably coupled to impart rotation to the disc; and

application of the flow of water into the housing actuates the drive assembly, thereby imparting rotation to the disc through the plurality of positions;

wherein the disc is disposed in spaced relation away from the inner surface of the housing.

2. The water distribution valve of claim **1**, wherein

each of the plurality of positions of the disc is further characterized by the port being aligned with a respective one of the plurality of spaced-apart apertures in the cartridge.

3. The water distribution valve of claim **2**, further including wedges formed between each of the apertures, wherein each wedge is approximately one-third the size of each aperture.

4. The water distribution valve of claim **1**, wherein the cartridge spaces the disc apart from the inner surface of the housing.

5. The water distribution valve of claim **1**, wherein the drive assembly includes an impeller coupled to the disc to impart rotation to the disc in response to application of the flow of water into the housing.

6. The water distribution valve of claim **1**, further comprising:

the housing has a sidewall; and

the disc is disposed in spaced relation away from the sidewall of the housing.

7. The water distribution valve of claim **1**, further comprising:

the housing has a sidewall; and

the drive assembly is disposed in spaced relation away from the sidewall of the housing.

8. A water distribution valve for directing a flow of water through a swimming pool cleaning system, the water distribution valve comprising:

a housing having an inlet, a plurality of outlets, and an inner surface bounding and defining an interior coupled in fluid communication with the inlet and the plurality of outlets;

a distribution assembly consisting of all moving parts of the valve, the distribution assembly comprising:

a cartridge including means for sequentially coupling and decoupling the inlet and outlets in fluid communication, a plurality of spaced-apart apertures corresponding to the plurality of outlets of the housing, and a disc mounted for rotation between top and bottom plates of the cartridge, the disc including a port which moves over each of the apertures to sequentially open and close the apertures corresponding to the plurality of outlets;

a drive assembly operably coupled to the cartridge to cause the cartridge to sequentially couple and decouple the inlet and outlets in fluid communication in response to application of the flow of water into the housing; and

the distribution assembly is disposed in the interior of the housing away from the inner surface.

9. The water distribution valve of claim **8**, further comprising:

the housing has a sidewall; and

the cartridge is disposed in spaced relation away from the sidewall of the housing.

10. The water distribution valve of claim **8**, wherein the cartridge spaces the disc apart from the inner surface of the housing.

11. The water distribution valve of claim **8**, wherein the distribution assembly includes an impeller coupled to the disc to impart rotation to the disc in response to application of the flow of water into the housing.

12. A water distribution valve for directing a flow of water through a swimming pool cleaning system, the water distribution valve comprising:

a housing having an inlet, outlets, and an inner surface bounding and defining an interior coupled in fluid communication with the inlet and the outlets;

an operational assembly carried within the interior for diverting fluid from the inlet to the outlets, wherein the operational assembly includes a cartridge having a plurality of spaced-apart apertures corresponding to the plurality of outlets of the housing, and a disc mounted for rotation in the cartridge between top and bottom plates of the cartridge, the disc including a port which moves over each of the apertures to sequentially open and close the apertures; and

the operational assembly is disposed in spaced relation away from the inner surface of the housing.

13. The water distribution valve of claim **12**, wherein the operational assembly is mounted for rotational movement.

14. The water distribution valve of claim **12**, further comprising wedges formed between each of the apertures, wherein each wedge is approximately one-third the size of each aperture.

15. The water distribution valve of claim **12**, wherein the cartridge spaces the disc apart from the inner surface of the housing.

16. The water distribution valve of claim **12**, wherein an impeller is coupled to the disc to impart rotation to the disc in response to application of the flow of water into the housing.

17. The water distribution valve of claim **12**, further comprising:

the housing has a sidewall; and

the cartridge is disposed in spaced relation away from the sidewall of the housing.

* * * * *

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(54) **WEARLESS MULTI-PORT WATER DISTRIBUTION VALVE ASSEMBLY WITH BOTTOM INLET**

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(58) **Field of Classification Search**
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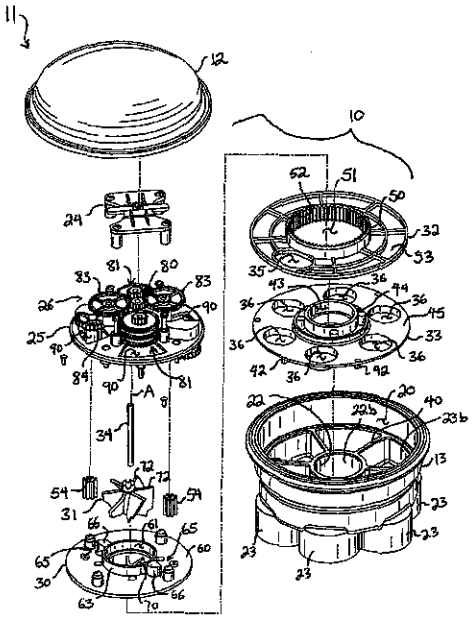
(74) *Attorney, Agent, or Firm* — Thomas W. Galvani, P.C.; Thomas W. Galvani

(57) **ABSTRACT**

A water distribution valve assembly is carried in a multi-port water distribution valve with a bottom inlet. The assembly includes a bearing plate including a plurality of openings, and a valve plate including a port, the valve plate mounted for rotation on and with respect to the bearing plate. A drive assembly is operably coupled to impart rotational movement of the valve plate with respect to the bearing plate, in response to the application of a flow of water, through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings.

25 Claims, 9 Drawing Sheets



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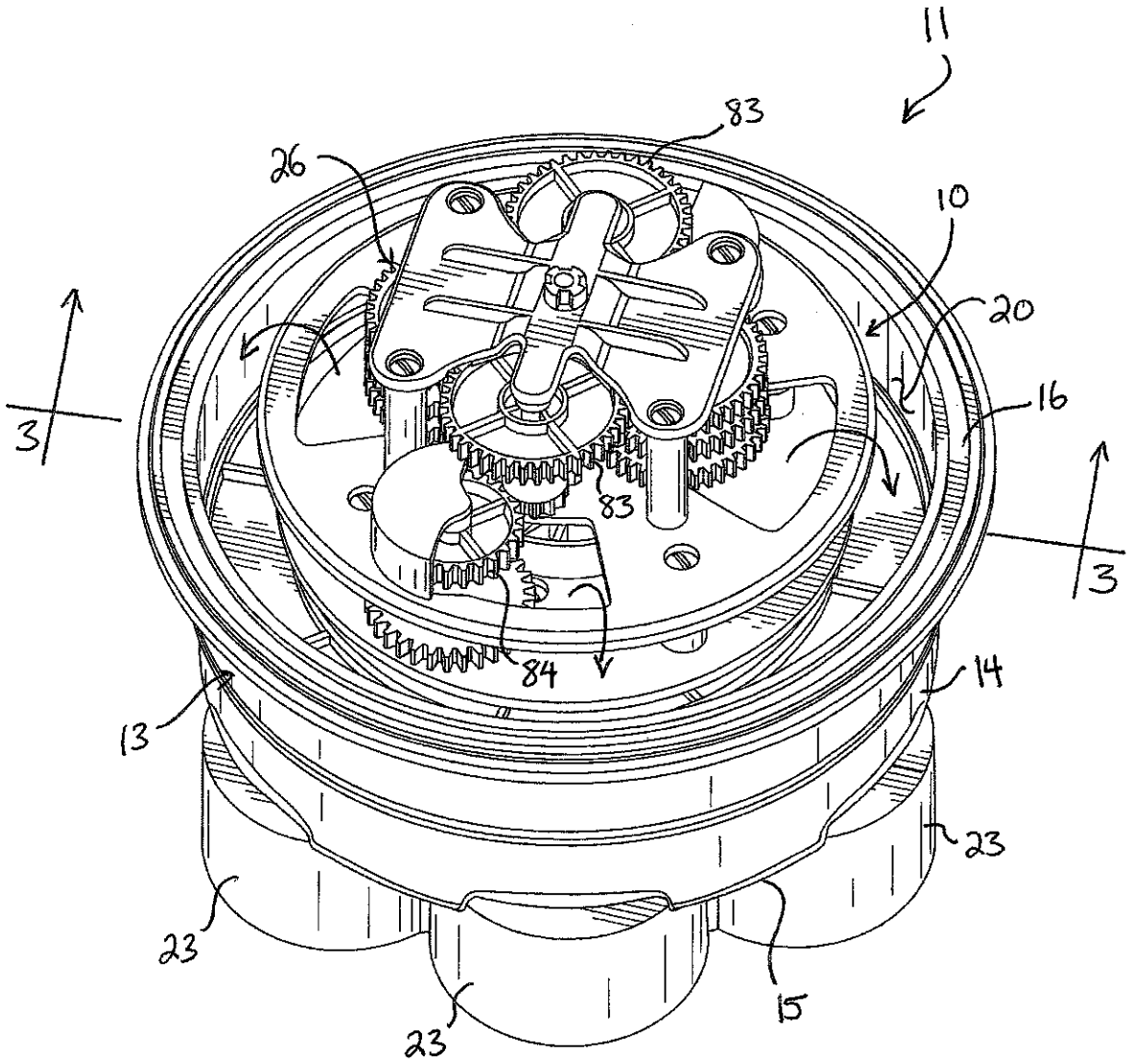


FIG. 1A

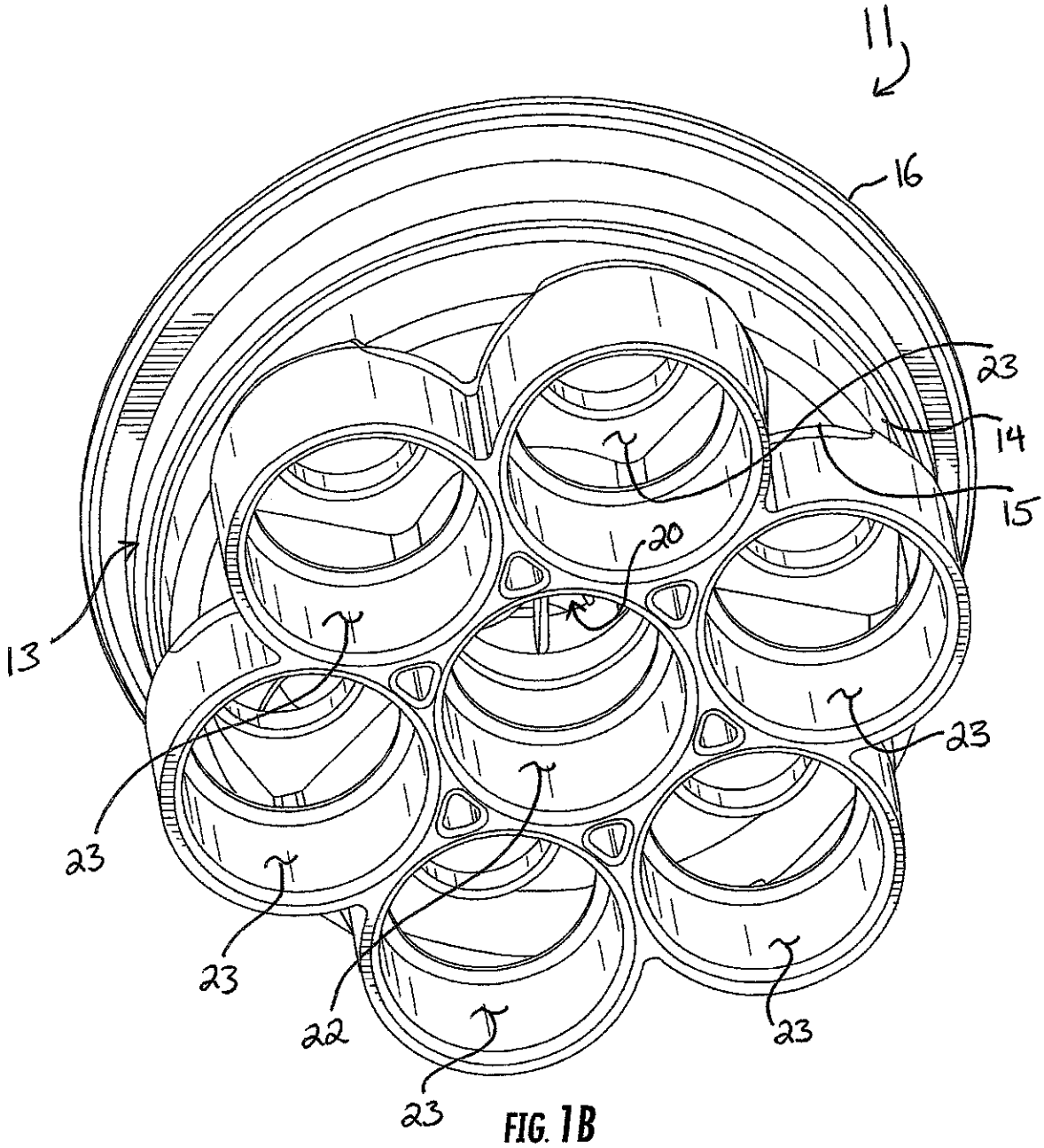
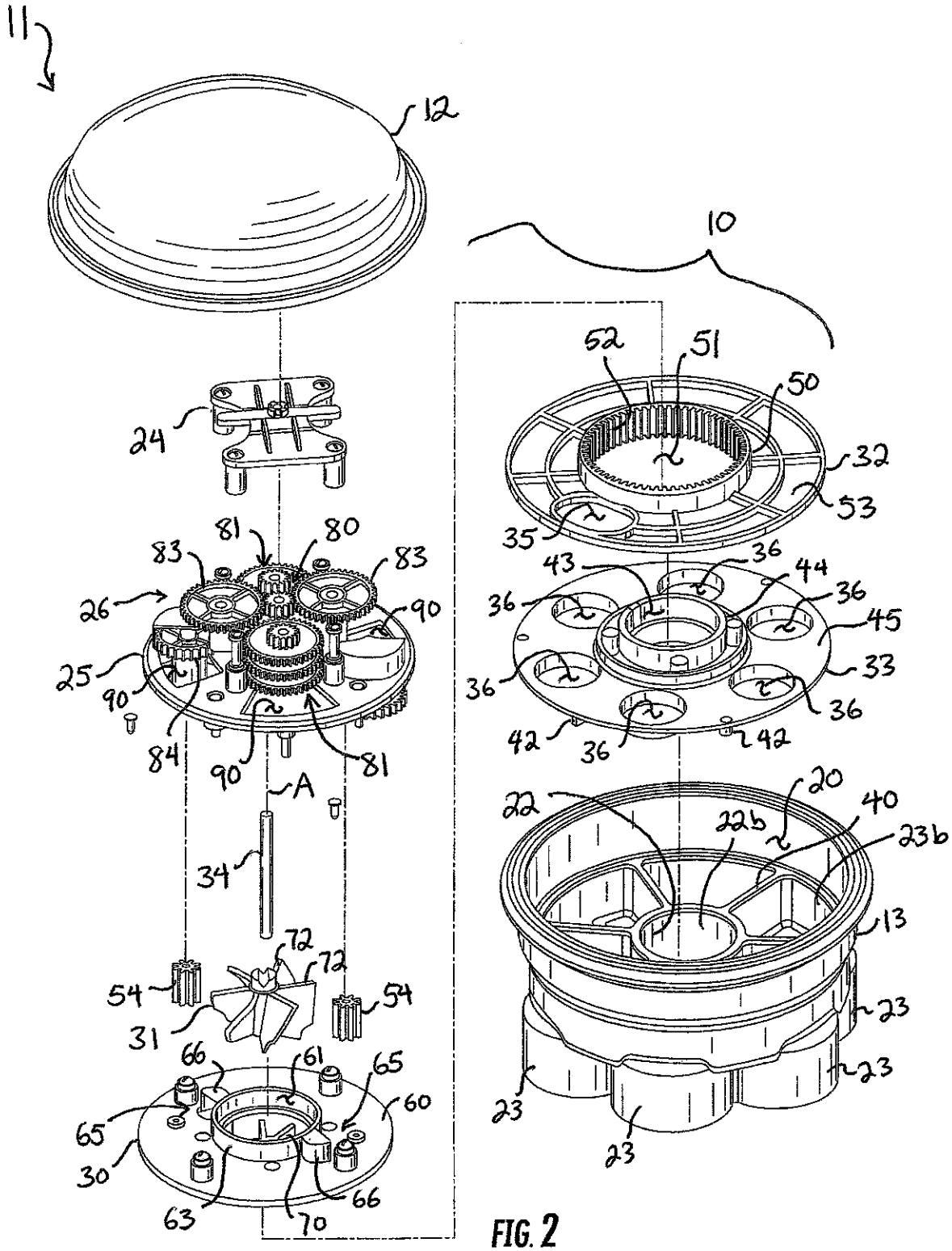


FIG. 1B


11
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80
83
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42
36
42
84
90
81
A
34
22
20
40
22b
23b
13
72
72
54
54
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66

FIG. 2

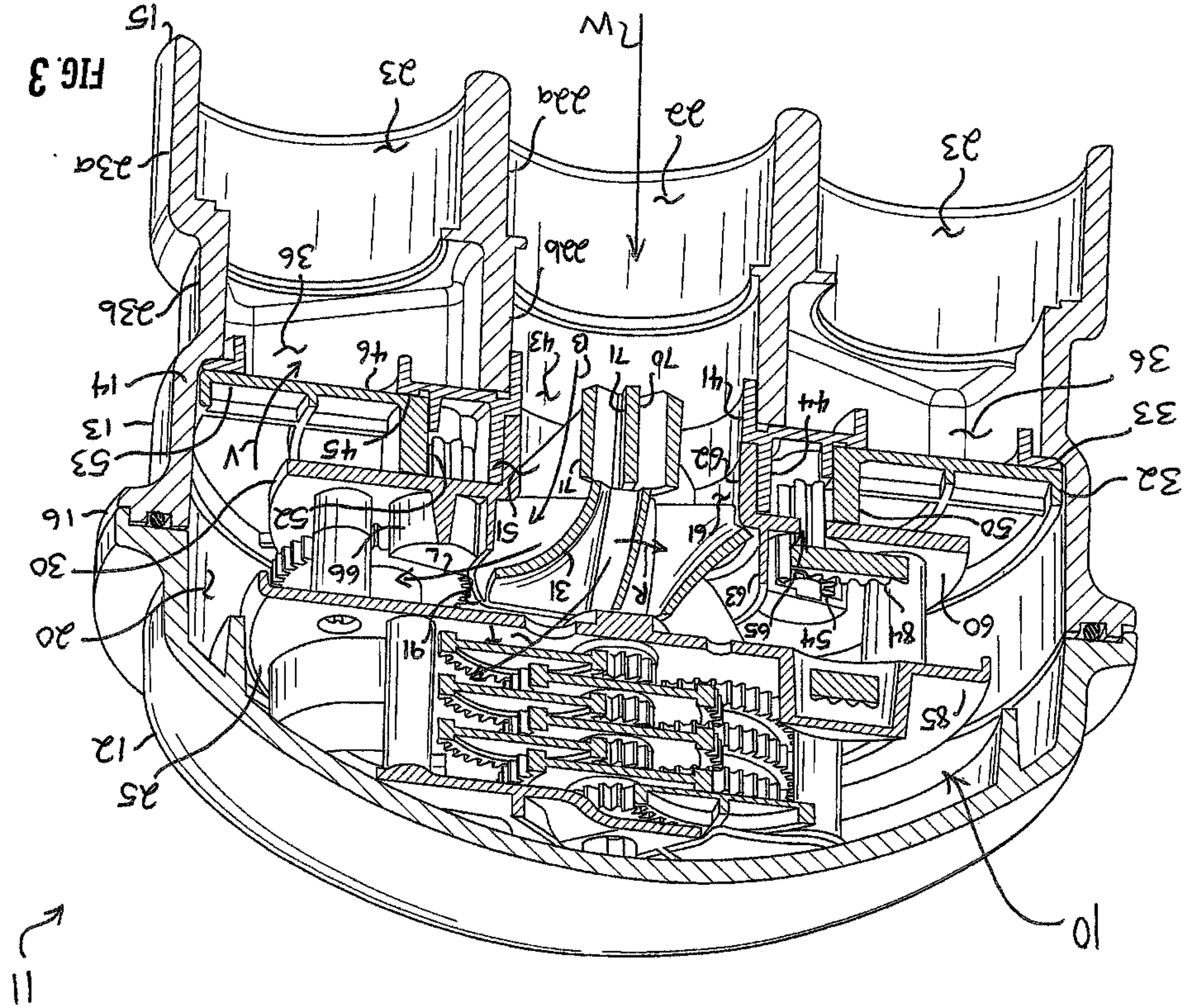
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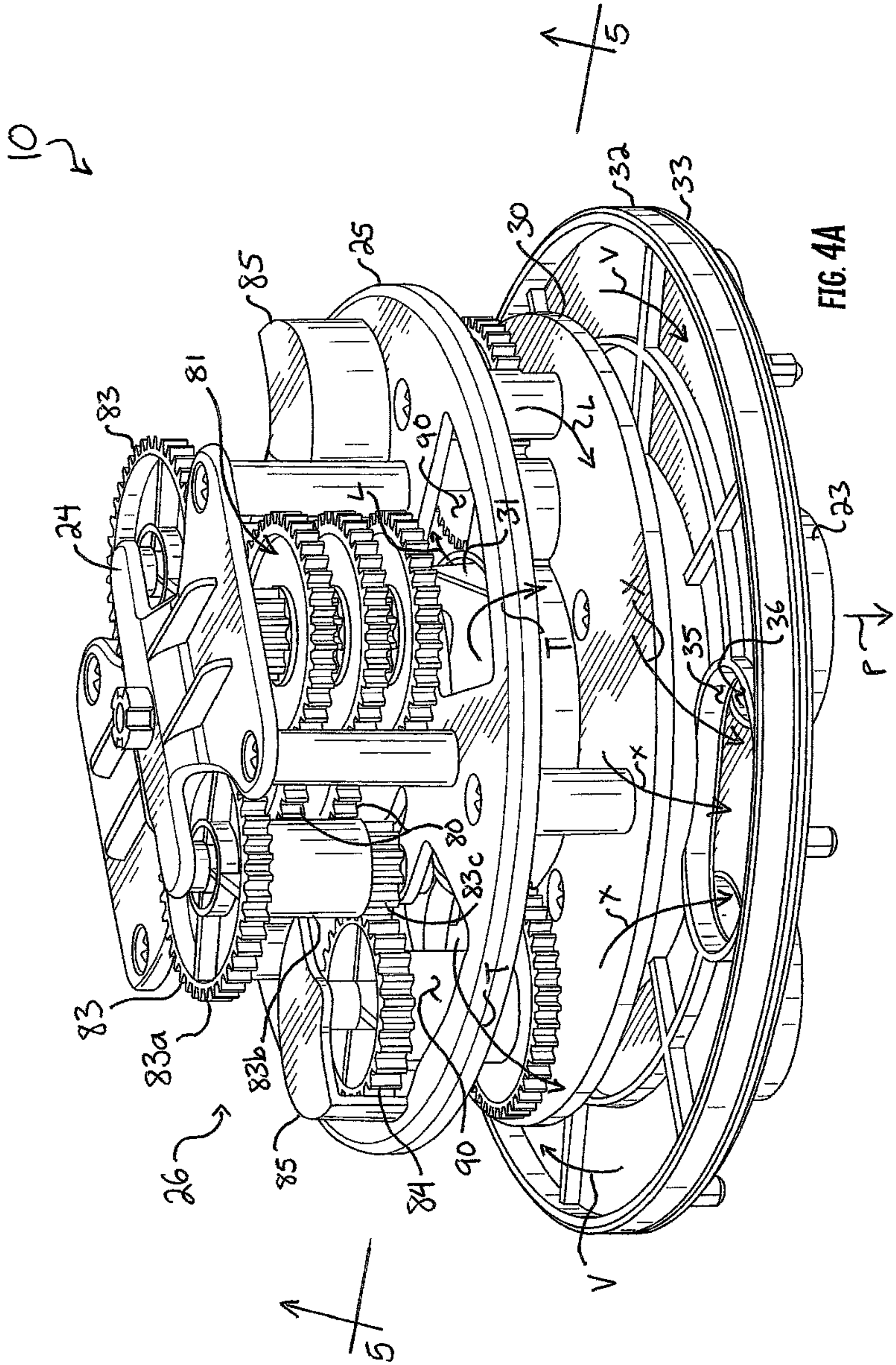
FIG. 3


10
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83a
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83c
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T
T
V
V
X
X
L
r

FIG. 4A

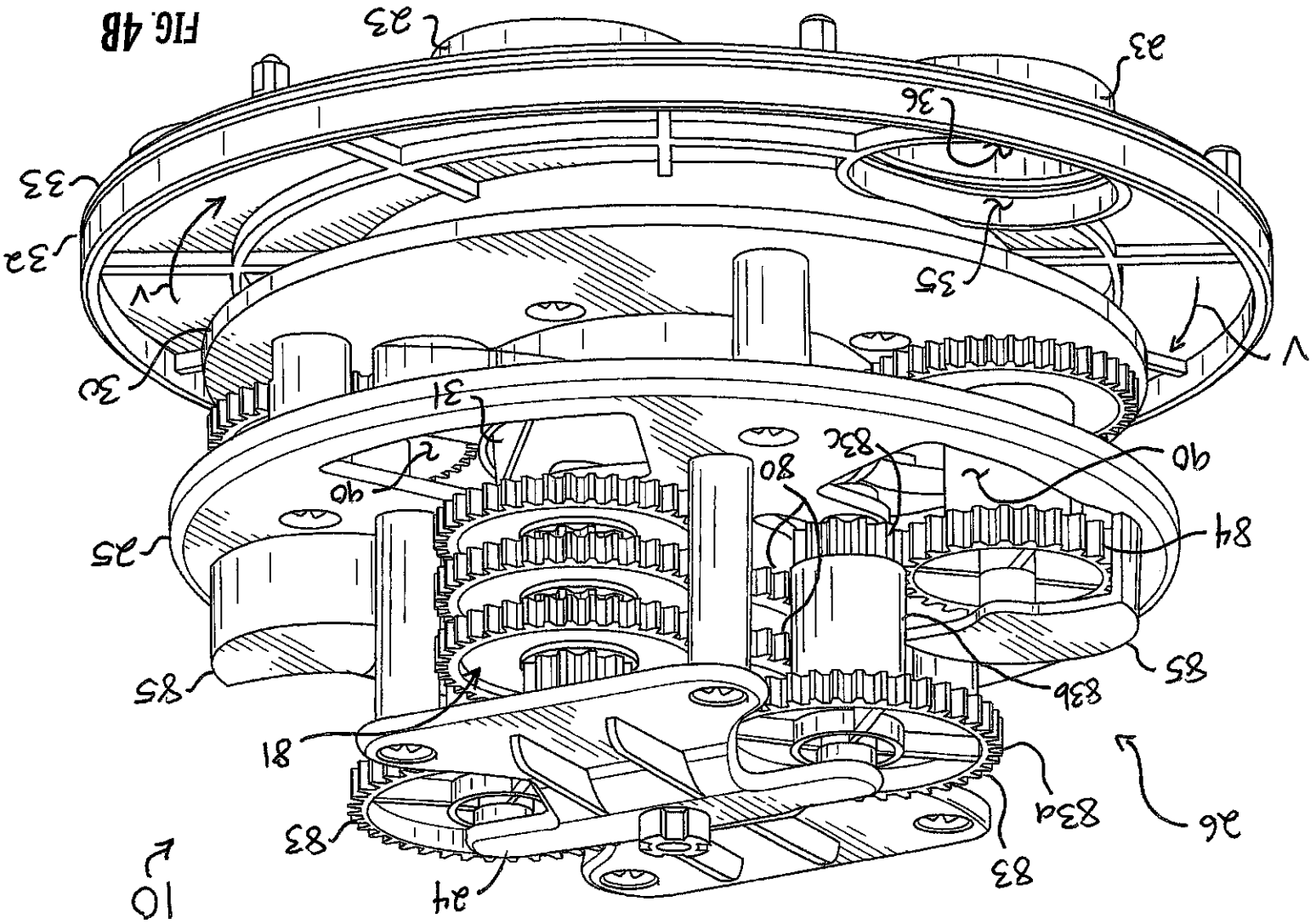
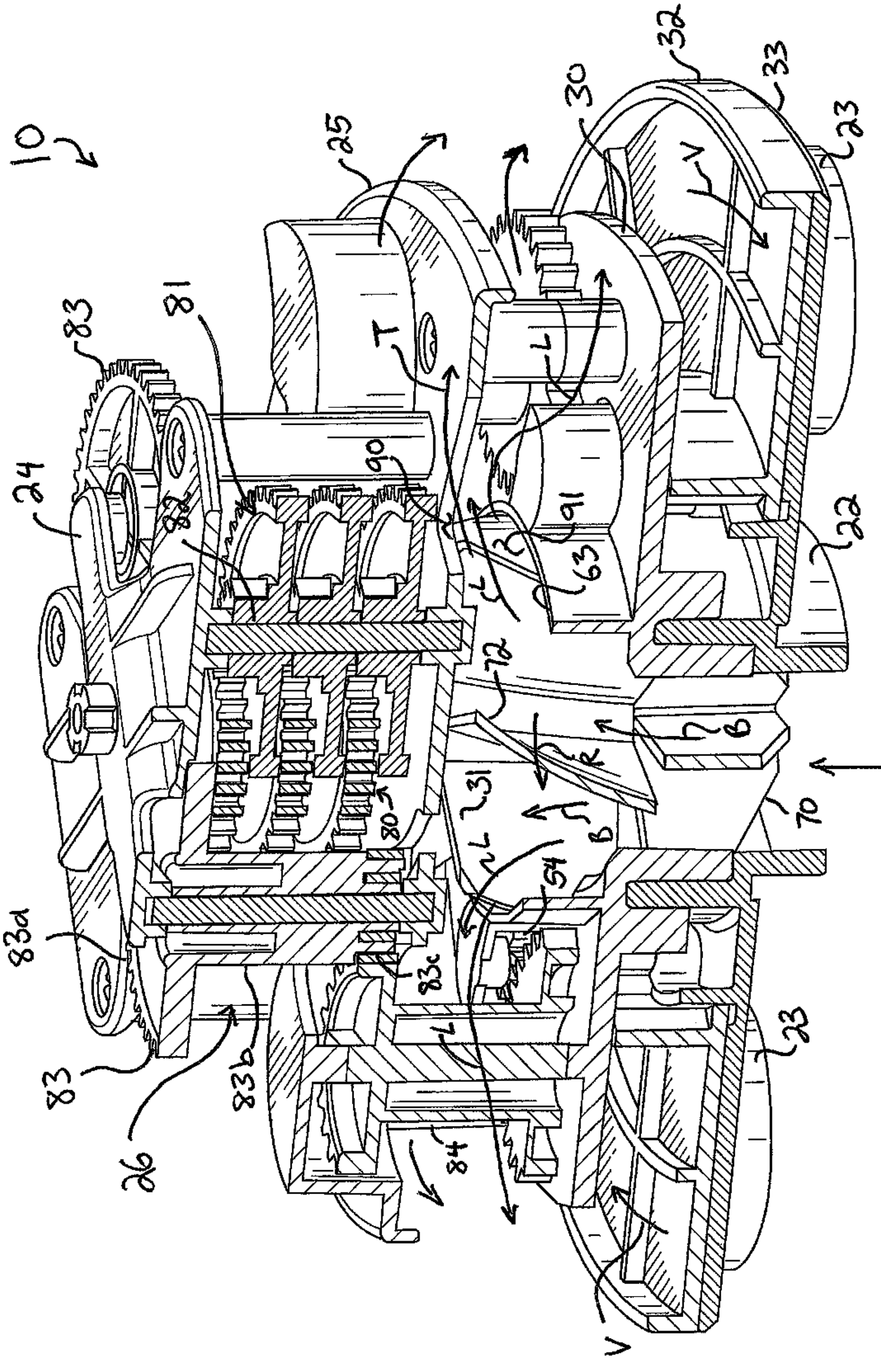


FIG. 4B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82
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91
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83a
83c
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26
83b
84
V

FIG. 5

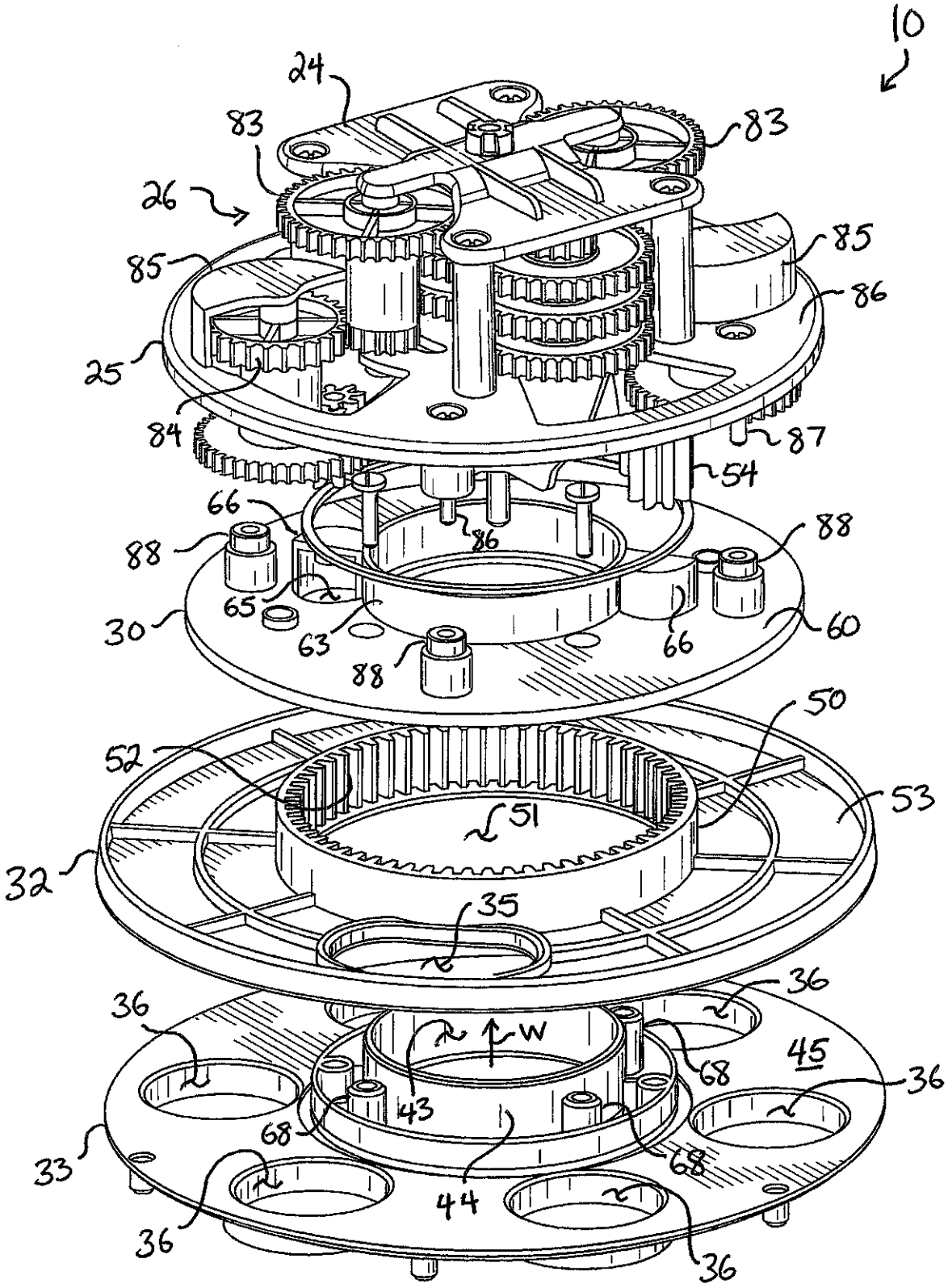
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FIG. 6A

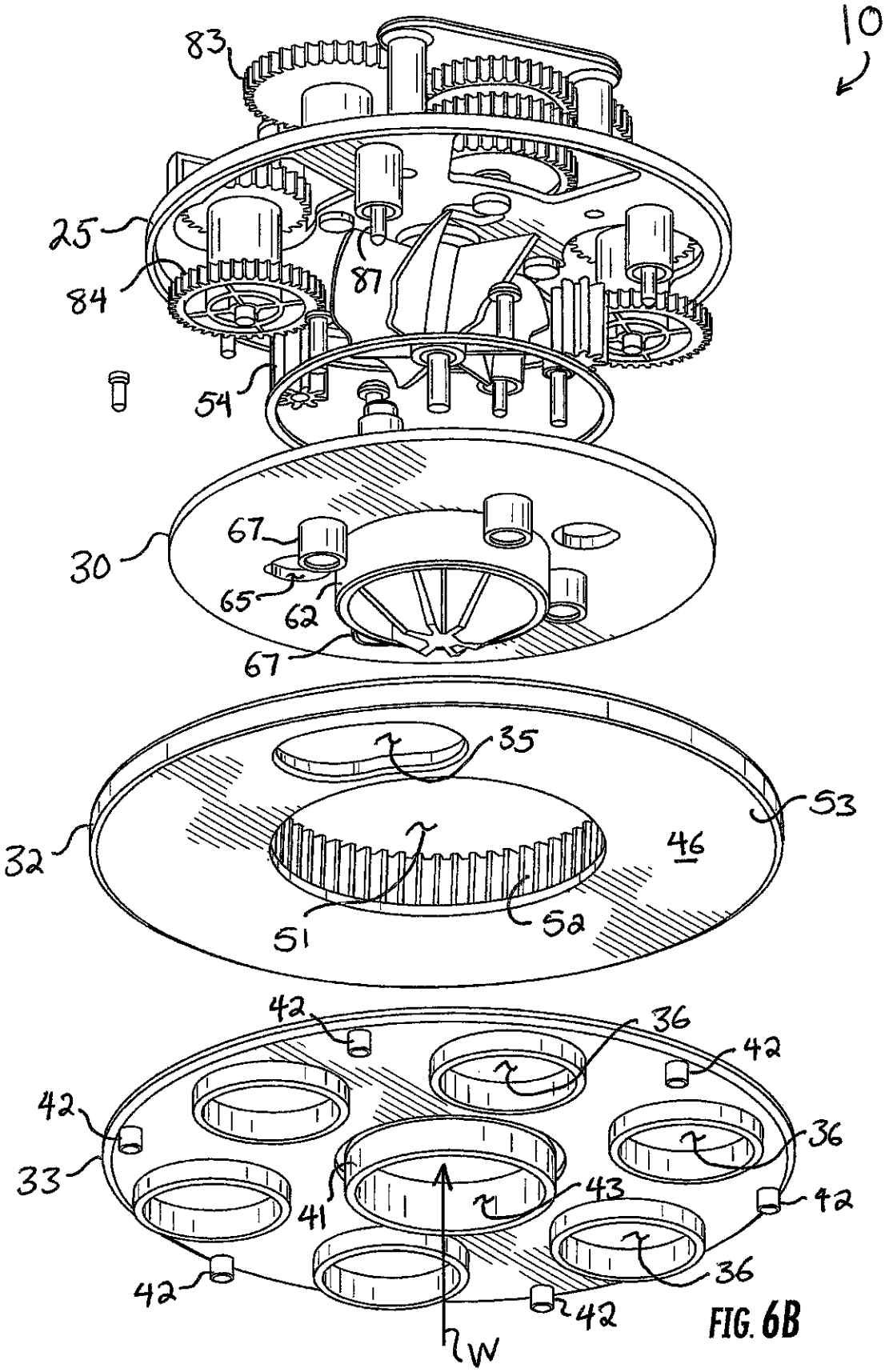
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FIG. 6B

WEARLESS MULTI-PORT WATER DISTRIBUTION VALVE ASSEMBLY WITH BOTTOM INLET

FIELD OF THE INVENTION

The present invention relates generally to swimming pools, and more particularly to valve assemblies for use with pool pump equipment in swimming pools having in-floor cleaning systems.

BACKGROUND OF THE INVENTION

There are many ways to clean a pool, and pool owners are continually looking for easier ways to do so. Pools can be cleaned by hand, such as by brushing the pool surface with a brush fit on the end of a long pole. This causes debris and material collected on the pool surface to be lifted off the surface; when the pool pump and filter assembly is operated in conjunction with this practice, the debris and water are together drawn through the pool pump into a filter which filters and collects much of the debris, thereby removing it from the pool and rendering the pool cleaner. Brushing can be laborious and time-consuming, however.

Automatic pool vacuums were developed to reduce the work of pool owners. Pool vacuums operate in a number of different ways, but most creep along the pool surface and suck, or disturb and then suck, debris and material collected on the pool surface up a hose into the operating pump and filter assembly. Vacuums can be difficult to operate, however. They must be calibrated to provide sufficient suction, they must be maintained, they are vulnerable to jamming from large debris, and they usually provide a random cleaning pattern that may be inadequate.

In-floor cleaning heads were developed as an automated, low-oversight way to keep a pool surface clean. In-floor cleaning heads are outlets that are permanently installed in the swimming pool structure. The heads recede into the pool structure when not in use, and then pop up when operating. Although there are a great number of kinds of pop-up heads, most operate with the basic functionality of directing a stream of water across a portion of the pool surface to clean that portion of the pool surface. Some heads rotate to direct that stream across different portions of the pool surface. Typically, the heads are installed in a number of locations across a pool surface, and often clusters of heads are grouped together in "lines," with each line including heads that receive water independently of the heads in other lines. This independent operation of lines requires a way to provide a flow of water to each line independently, and so swimming pool distribution valves were developed.

Swimming pool distribution valves generally have an inlet, a plurality of outlets, and some internal mechanism for directing the flow of water from the inlet to each of the outlets independently. However, many swimming pool distribution valves are susceptible to wear, which requires laborious maintenance or difficult replacement. Additionally, many distribution valves are susceptible to water blow-by, in which leaks develop between inlet and outlet, allowing water to flow into the other lines and thereby reducing the effectiveness of the valve. Back pressure can also develop in some valves, causing the valve to jam or fail. Still further, some prior art valves suffered from sharing water while one outlet is fully open—allowing one outlet to be completely

open while another outlet is partially open, leading to ineffective cleaning. An improved water distribution valve is needed.

SUMMARY OF THE INVENTION

A water distribution valve assembly is carried in a multi-port water distribution valve with a bottom inlet. The assembly includes a bearing plate including a plurality of openings, and a valve plate including a port, the valve plate mounted for rotation on and with respect to the bearing plate. A drive assembly is operably coupled to impart rotational movement of the valve plate with respect to the bearing plate, in response to the application of a flow of water, through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIGS. **1A** and **1B** are top and bottom perspective views, respectively of a multi-port water distribution valve carrying a distribution assembly;

FIG. **2** is an exploded, top perspective view of the valve of FIG. **1A**;

FIG. **3** is a section view of the valve of FIG. **1A** taken along the line **3-3** in FIG. **1A**;

FIGS. **4A** and **4B** are top perspective views of the distribution assembly of FIG. **1A** in isolation, showing steps of operation;

FIG. **5** is a top perspective, section view of the distribution assembly of FIG. **1A** taken along the line **5-5** in FIG. **4A**; and

FIGS. **6A** and **6B** are exploded top and bottom perspective views, respectively, of the distribution assembly of FIG. **1A** in isolation.

DETAILED DESCRIPTION

Reference now is made to the drawings, in which the same reference characters are used throughout the different figures to designate the same elements. FIGS. **1A** and **1B** are top and bottom perspective views of a wearless multi-port water distribution valve **11** including a distribution assembly **10** carried therein. The distribution assembly **10** is adapted to sequentially direct an incoming flow of water from a lower inlet to lower outlets without any leaks among the outlets. The valve **11** directs the flow of water among several conduits of a conventional piping assembly, each of which extends from one of the outlets of the valve **11** and each of which leads to a line of in-floor cleaning heads installed in the swimming pool. The valve **11**, fitted with the distribution assembly **10**, is useful for sequentially communicating water to each in-floor cleaning head to clean the pool surface of dirt, debris, growth, and other material without succumbing to internal wear, and without causing wear to any parts which are permanently fixed to the pool structure or the pump assembly.

FIG. **1A** shows the valve **11** with a lid **12** removed. The lid **12** is shown in other drawings. The valve **11** includes a generally symmetric housing **13** having a sidewall **14** extending between a bottom **15** and a lip **16** defining a top **20** of the housing **13**. The housing **13**, together with the lid **12** (shown in FIG. **2**) bounds and defines an interior **20**. The distribution assembly **10** is carried in the interior **20**.

Referring primarily now to FIG. **1B**, but also to FIG. **1A**, a downwardly-extending bottom inlet **22** is formed centrally

in the bottom **15** in fluid communication with the interior **20**, and six downwardly-extending outlets **23** are formed in the bottom **15** surrounding the inlet **22**, also in fluid communication with the interior **20**. Each of the inlet **22** and outlets **23** are cylindrical ports sized to interface and engage easily with conventional swimming pool pluming conduits, which are typically arranged in a circumferentially-spaced apart, radial arrangement with the inlet conduit centered among the outlet conduits. The pump of the swimming pool cleaning assembly pumps water through the inlet **22** into the interior **20** and then sequentially out each of the outlets **23** to each of the in-floor cleaning heads installed in the swimming pool.

Referring now to FIG. **2**, the housing **13** cooperates with the distribution assembly **10** carried in the interior **20** to sequentially and cyclically communicate water from the inlet **22** to each of the outlets **23** so that the surface of the swimming pool is cleaned. The housing **13**, which in operation is plumbed to the conduits leading to the cleaning heads, carries the distribution assembly **10**, which separates all of the moving parts of the valve **11** from interaction with the housing **13** so as to prevent wear to the housing **13**. The distribution assembly **10** sequentially and cyclically communicates water from the inlet **22** to the outlets **23** and includes a cap **24**, an upper table **25** carrying a reduction gear assembly **26**, a lower table **30** carrying an impeller **31** and the upper table **25**, a valve plate **32**, and a bearing plate **33**. A central axle **34** extends centrally through the distribution assembly **10** along a central axis identified with the reference character A in FIG. **2**. For purposes of orientation, various terms will be used herein with reference to the axis A, such as "horizontal," which means extending generally perpendicular to the axis A, "vertical," which means extending generally parallel to the axis A, "radial," which means extending horizontally outward from or inward to the axis A, and "circumferential," which means extending in a horizontal arc defined by the axis A.

The valve plate **32**—a portion of the distribution assembly **10**—includes a single port **35** which extends entirely though the valve plate **32**, oriented parallel to the axis A, to selectively allow water to pass through the valve plate **32** from the inlet **22** to the outlets **23**, as will be explained in detail herein. The valve plate **32** is coaxial to and mounted for rotation about the axis A, and as the valve plate **32** rotates, the port **35** sequentially moves through a plurality of positions into alignment with openings **36** formed entirely through the bearing plate **33**, oriented parallel with respect to the axis A, each of which is fixed in alignment with a respective one of the outlets **23**, thereby allowing water from the interior **20** out the respective outlet **23**. The use of a single port **35** in a monolithic horizontal valve plate **32** provides the advantage over prior art valves that only a single opening **36**—and thus only a single outlet **23**—can be fully opened at any given time, while also providing the advantage that the flow of water is purposely partially shared between neighboring outlets **22** for a brief time during movement of the port **35** from opening **36** to neighboring opening **36**, as will be explained.

Turning now to FIG. **3**, which is a section view taken along the line **3-3** in FIG. **1A** (and with the lid **12** shown applied), the distribution assembly **10** is shown applied within and operatively coupled to the housing **13** under the lid **12**, ready to operate so as to divert water from the inlet **22** to each of the outlets **23**. Each of the outlets **23** includes a cylindrical lower portion **23***a* and a narrowed, wedge-shaped upper portion **23***b*, thereby allowing the relatively compact housing **13** to interface with and couple to a conventional six-pipe plumbing configuration, most often installed and buried in the ground proximate to the swimming pool. Likewise, the inlet **22** includes a cylindrical lower portion **22***a* and a narrowed cylindrical upper portion **22***b*. As seen in FIG. **2**, the upper portions **22***b* and **23***b* terminate at a common floor **40** defined by structural ribs extending horizontally across the housing **13**. The floor **40** is a bottom of the interior **20**. The bearing plate **33** is fit onto the floor **40** and extends entirely across the floor **40** between the sidewall **14** in direct contact with the floor **40**, thus ensuring a snug and sealed fit between the outlets **23** and the bearing plate **33**. Downward posts **42** (shown in FIG. **2**) lock the bearing plate **33** to the floor **40** and prevent rotational movement of the bearing plate **33** relative to the floor **40**. As seen in FIG. **3**, the bearing plate **33** has a downwardly-turned collar **41** which fits into and is circumscribed by the upper portion **22***b* of the inlet **22**, thus ensuring a snug and sealed fit between the inlet **22** and the bearing plate **33**. The bearing plate is formed with the openings **36**, each of which is circumferentially-spaced apart and corresponds to one of the outlets **23**. Each opening **36** is aligned directly above and in fluid communication with one of the outlets **36**. The outlets **36** are circular.

As shown in both FIGS. **2** and **3**, the bearing plate **33** includes a central bore **43** extending through the bearing plate **33**. The bore **43** is circumscribed by the collar **41** below the level of the bearing plate **33** and by an upstanding collar **44** above the level of the bearing plate **33**.

The valve plate **32** rides on the bearing plate **33**. The valve plate **32** is disposed directly above the bearing plate **33** and rotates about the central axis A by sliding in direct and continuous bearing contact against a top surface **45** of the bearing plate **33**, such that the bearing plate **33** is interposed in direct contact between the floor **40** of the housing **13** and the valve plate **32**. With brief reference to FIGS. **6**A and **6**B, which are exploded top and bottom perspectives of the distribution assembly **10**, respectively, it can be seen that the top surface **45** of the bearing plate **33** and a corresponding bottom surface **46** of the valve plate are featureless but for the openings **36** and the port **35**, respectively, allowing them to slide and rotate in direct contact against each other with low friction. Turning back to FIGS. **2** and **3**, the valve plate **32** has a single disc-shaped lower element, defined by the annular, smooth bottom surface **46**. The disc-shaped lower element is a lower flange **53** extending radially from an upwardly-extending collar **50**. Formed entirely through the flange **53** is the port **35**, which is an elongated oval, curved to correspond to the radius of the annular flange **53**. The port **35** has a dimension in a radial direction and a dimension in a circumferential direction. In the radial direction, the dimension of the port **35** is equal to the diameters of the openings **36**. In the circumferential direction, the dimension of the port **35** is larger than the diameters of the openings **36**, so that the port **35** in its entirety is larger than each of the openings **36**. The dimension of the port **35** in the circumferential direction is approximately one and half times larger than the diameters of the openings **36**. Thus, for the purposes of this description, when the terms "aligned" or "alignment" are used, it is to be understood that the opening **36** is fully coupled in fluid communication with the port **35**, i.e., the opening **36** is disposed below the port **35** but is not concealed by any part of the valve plate **35**. In other words, the full expanse of the opening **36** is positioned within the port **35** and is not covered by the flange **53**, but the opening **36** need not necessarily be centered with respect to the port **35**. The upwardly-extending collar **50** defines a central bore **51** through the valve plate **32**. The collar **50** is an upstanding

annular wall having an inner geared surface **52** extending continuously around the inner surface of the collar **50**, with vertical teeth directed inward into the central bore **51**.

The valve plate **32** rotates smoothly on the bearing plate **33**, which is held stationary against and with respect to the housing **13**. Rotation of the valve plate **32** is imparted by a set of two spur or drive gears **54** depending from the reduction gear assembly **26**. The drive gears **54** rotate on their own axes and cause the inner geared surface **52** of the valve plate **32** to rotate, riding against the drive gears **54**. The drive gears **54** are diametrically opposed and prevent lateral movement of the valve plate **32**.

The drive gears **54** extend through and are carried in the lower table **30**. The lower table **30** is a platform fixed and stationary with respect to the housing **13**, mounted to the bearing plate **33** and disposed above the valve plate **32**, so that the valve plate **32** is interposed between the bearing plate **33** and the lower table **30**. Still referring to FIGS. **2** and **3**, the lower table **30** includes a flat, annular flange element **60** extending radially from a central bore **61**, defined by a lower collar **62** and a short upper collar **63**. The lower collar **62** is snug fit within the upstanding collar **44** of the bearing plate **33**, and the flange element **60** is disposed above the upstanding collar **50** of the valve plate **32**, thereby preventing upward movement or lift of the valve plate **32** during operation. Two diametrically opposed holes **65** are formed flanking the bore **61**, and semi-cylindrical chambers **66** are formed above and around these holes **65**. The holes **65** and the chambers **66** are sized and shaped to carry the drive gears **54** for rotation with the chambers **66**. The drive gears **54** extend just below the flange element **60**, as seen in FIG. **3**, so as to engage with the inner geared surface **52** of the valve plate **32** and drive the valve plate through rotation. The lower table **30** itself is fixed in position to the bearing plate **33** with downward sockets **67** which receive posts **68** extending upwardly from the bearing plate **33**, as seen in FIGS. **6**A and **6**B. The collar **44** and the posts **68** of the bearing plate **33** thus extend through the central bore **51** of the valve plate **32** so that the lower table **30** mounts to the bearing plate **33**. The lower table **30** includes a guide **70** disposed in the central bores **61** and **43** of the lower table **30** and the bearing plate **33**. The guide **70** controls and directs the flow of water as it enters the valve **11** through the inlet **22**. The guide **70** consists of a plurality of vanes **71**, each of which directs the flow of water and provides regularity and a laminar quality to the incoming flow of water.

The axle **34** is seated in a blind socket formed in the guide **70** and extends upwardly therefrom. The impeller **31** is mounted to the axle **34** for free rotation thereabout, and is disposed above the guide **70** and below the upper table **25**. The impeller **31** includes a plurality of canted blades **72** formed integrally to and extending radially outward from a hub mounted for free rotation on the axle **34**, so that the impeller **31** is mounted for free rotation on the axle **34**. There are preferably six blades **72**, but one having ordinary skill in the art will readily appreciate that a fewer or greater number of blades **72** may be used so long as performance of the valve **11** is comparable. Referring still to FIG. **3**, but also to FIG. **5**, the impeller **31** is contained laterally within the lower collar **62** and the upper collar **63**. The lower collar **62** has a reduced diameter with respect to the upper collar **63**, and thus, the blades **72** of the impeller are reduced in radial length near their bottom, where they fit within the lower collar **62**. The impeller **61** rotates in response to the application of the flow of water through the inlet **22** and past the guide **70**. The impeller **31** terminates at its top in a gear that extends through the upper table **25**. The impeller **31** is thereby coupled to the reduction gear assembly **26** in meshing engagement to drive the reduction gear assembly **26**, and, in turn, imparts rotation to the valve plate **32** so as to sequentially move the port **35** into and out of alignment with each of the openings **36** in the bearing plate **33** through a plurality of positions.

The reduction gear assembly **26** is shown most clearly in FIG. **2** and in FIGS. **4**A and **4**B, which shows the distribution assembly **10** in isolation. The reduction gear assembly **26** operates to convert the relatively fast rotation of the impeller into relatively slow rotation of the valve plate **32**. The reduction gear assembly **26** is carried primarily on the upper table **25**, which includes a horizontal top **85** and depending legs **86**. The legs **86** support and hold the top **85** stationary with respect to the lower table **30**; as seen in FIGS. **6**A and **6**B, the legs **86** are seated into sockets **87** projecting upwards from the lower table **30**. Four large, wedged-shaped holes **90** are formed entirely through the upper table **25** to allow water in the interior **20** to circulate between the inlet **22** and the outlets **23**.

The reduction gear assembly **26** includes a vertically-stacked set of central gears **80** meshingly engaged with two flanking, vertically-stacked sets of offset gears **81**. The central and offset gears **80** and **81** include a large gear integrally formed to a small gear, such that the large gears of the central gears **80** engage with the small gears of the offset gears **81**, and the small gears of the central gears **80** engage with the large gears of the offset gears **81**. The central gears **80** are mounted for free rotation on the axle **34**, and the offset gears **81** are mounted for free rotation on shafts **82** (shown in FIG. **5**) which are fit into and contained from vertical movement by the cap **24** and the upper table **25**. The impeller **31** and the reduction gear assembly **26** are thus elements of a drive assembly carried by the housing **13** and operably coupled to the valve plate **32** to impart rotation to the valve plate **32** in response to application of water through the valve **11** and consequential actuation of the drive assembly. The drive assembly includes the impeller **31**, the reduction gear assembly **26**, the upper and lower tables **25** and **30**, and the primary, secondary, and drive gears **83**, **84**, and **54**. The reduction gear assembly **26** is contained vertically between the cap **24** and the upper table **25**.

Rotation of the impeller **31** thus imparts rotation to each of the central and offset gears **80** and **81**. As shown in FIGS. **2**, **4**A and **4**B, and **5**, two large primary gears **83** are mounted proximate to the set of central gears **80**. Referring now to FIGS. **4** and **5**, the primary gears **83** have large top primary gears **83***a*, a vertical shaft **83***b*, and a small bottom gear **83***c*, preferably formed monolithically and integrally as a single piece. The primary gears **83** are meshingly engaged to the top-most gear of the central gears **80**, and imparts rotation from the central gears **80** to secondary gears **84** carried in semi-cylindrical holds **85**, which in turn, are meshingly engaged with and impart rotation to the drive gears **54**. Thus, in response to the application of a flow of water, rotation of the impeller **31** imparts rotation to all of the central and offset gears **80** and **81**, which in turn imparts rotation to the primary gears **83**, which impart rotation to the secondary gears **84**, which finally impart rotation to the drive gears **54**. The drive gears **54** extend down to the inner geared surface **52** and are disposed between the inner geared surface **52** and the collar **44** of the bearing plate **33**. The drive gears **54**, extending through the lower table **30**, are meshingly engaged to the inner geared surface **52**, thereby driving the valve plate **32** around in rotation so as to move the port **35** into and out of alignment with the openings **36** in the bearing plate **33**.

As described above, relatively fast rotation of the impeller **31** imparts operation of the reduction gear assembly **26** and rotation of each of its constituent central and offset gears **80** and **81**, the primary gears **83**, the secondary gears **84**, and the drive gears **54**, which impart reduced and relatively slow rotation to the valve plate **32**, which moves the port **35** sequentially into and out of alignment with each of the openings **36** in the bearing plate **33**, so as to sequentially open and close each of the outlets **23**. In this manner, the valve plate **32** controls the opening and closing of the outlets **23**, thereby directing the flow of water through the valve **11** from the inlet **22** to each of the outlets **23**.

In operation, the distribution assembly **10** is applied to a housing **13** to form the valve **11**. The distribution assembly **10**, and the reduction gear assembly **26**, are removable from the housing **13** and may be replaced if either wears out. Neither wears against nor engages with the housing **13** in a manner in which the housing **13** itself is worn, so that the housing **13** need not ever be replaced because of wear from the distribution assembly **10**. The distribution assembly **10** is applicable to the housing **13** to render the valve **11** operable.

With the distribution assembly **10** properly applied to the housing **13** and the lid **12** secured to the housing, such as with a conventional clamp ring, the valve **11** may be operated. The pump to which the valve **11** is connected in fluid communication is started, and a flow of water is supplied to the valve **11** along the line W indicated throughout several of the drawings. Referring now primarily to FIGS. **3**, **4**A and **4**B, and **5**, the flow of water enters the inlet **22** and encounters the guide **70**, which smoothes and directs the flow of water upward into the impeller **31** along the lines B, causing the impeller **31** to spin. The impeller **31** rotates in a clockwise direction, as indicated with rotational arrows R in FIGS. **3** and **5**, thereby imparting rotation to each gear of the reduction gear assembly **26**.

Disposed immediately above the impeller **31** is the upper table **25**, and thus water flowing upwardly along lines B encounters the upper table **25** and flows either upward or outward. Water flows upward by passing through the wedge-shaped holes **90** along lines T. Water moving along the lines T flows above the upper table **25** and circulates in the interior **20** above the upper table **25** before flowing back down toward the valve plate **32**. Contrasted with water flowing upward, water flows outward from the impeller **31** by passing through the annular, vertical gap **91** formed between the upper table **25** and the lower table **30**. The upper collar **63** of the lower table **30** is short, and does not extend fully to the upper table **25** above it, thereby forming a short, annular, vertical gap **91** between the upper table **25** and the upper collar **63** of the lower table **30**. This gap **91** provides a conduit for the transmission of water laterally out of the impeller along the lines L in the drawings. Water moving along lines L flows generally laterally between the upper and lower tables **25** and **30** before circulating into the rest of the interior **20** and then back down toward the valve plate **32**.

Water thus circulates throughout the interior **20** of the valve **11** and eventually moves downward toward the valve plate **32**. Rotation of the drive gears **54** causes the valve plate **32** to rotate. Water flows through the port **35** in the valve plate **32** along the lines X, and water flows out of the valve **11** through the outlets **23** along the line P. In FIG. **4**A, the valve plate **32** is illustrated rotating toward the next opening **36** in a clockwise direction, as indicated by the arcuate lines V, and away from the opening **36** disposed above the "current" outlet **23**. Therefore, outflow of water through the opening **36** and the current outlet **23** is ending, and the "next" outlet **23** will be fully opened promptly. Before the next outlet **23** is fully opened, however, there is a period in which both the current outlet **23** and the next outlet **23** will be partially open. Because, as described earlier, the circumferential dimension of the port **35** is larger than the diameter of the openings **36**, the port **35** uniquely extends over two adjacent openings **36** for a short time, thus coupling each of the corresponding adjacent outlets **22** in fluid communication with the inlet **22** for a short time. This provides an advantage over prior art valves, which experienced back pressure, excessive wear, and breakage issues because of the large pressure that would build inside a valve housing when water continued to be supplied to the valve from the pump but had no exit while transitioning from one outlet to another.

As the valve plate **32** continues to move along the line V, the opening **36** closes, and flow to the current outlet **23** terminates. The valve plate **32** is thus moving from one position to a subsequent position. The pop-up cleaning heads in the pool which are coupled to the current outlet **23** thus recede into the sidewall of the pool and cease operating. The valve plate **32** then moves fully over the next opening **36**, aligning with the opening **36**, thereby fully opening the next outlet **22** and causing the pop-up cleaning heads which are coupled to the next outlet **22** to rise and begin cleaning the pool surface. The valve plate **32** continues to rotate around, sequentially and continuously moving the port **35** into and out of alignment with each of the openings **36**, and sequentially and continuously opening and closing each of the corresponding outlets **22**.

A preferred embodiment is fully and clearly described above so as to enable one having skill in the art to understand, make, and use the same. Those skilled in the art will recognize that modifications may be made to the described embodiment without departing from the spirit of the invention. To the extent that such modifications do not depart from the spirit of the invention, they are intended to be included within the scope thereof.

The invention claimed is:

1. An assembly for directing a flow of water through a water distribution valve including a housing having a bottom, an inlet at the bottom, and a plurality of outlets at the bottom, the assembly comprising:

a bearing plate including a plurality of openings and a central, upstanding collar projecting above the bearing plate between the openings, wherein the collar is open at both of its ends;

a valve plate coaxial to and encircling the upstanding collar and including a port, the valve plate mounted for rotation on and with respect to the bearing plate; and

a drive assembly operably coupled to impart rotational movement of the valve plate with respect to the bearing plate, in response to the application of a flow of water, through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings.

2. The assembly of claim **1**, wherein the drive assembly is operably coupled to the valve plate to impart rotational movement to the valve plate.

3. The assembly of claim **1**, wherein the valve plate is in direct and continuous contact with the bearing plate.

4. The assembly of claim **1**, wherein the port is larger than each of the plurality of openings.

5. The assembly of claim **1**, wherein the valve plate and the bearing plate each include a coaxial central bore formed entirely therethrough.

6. The assembly of claim 1, wherein the valve plate includes an upstanding wall formed with a gear surface.

7. The assembly of claim 1, wherein the drive assembly includes an impeller.

8. The assembly of claim 1, wherein the drive assembly includes a table and a reduction gear assembly mounted on the table.

9. The assembly of claim 8, wherein the table has a top, legs spacing the table vertically apart from the valve plate, and holes formed through the top so as to allow water to flow through the table.

10. A water distribution assembly for directing a flow of water through a water distribution valve, the assembly comprising:

a bearing plate including a plurality of openings and a central, upstanding collar projecting above the bearing plate between the openings, wherein the collar is open at both of its ends;

a valve plate coaxial to and encircling the upstanding collar, and including a port, the valve plate mounted for rotation about an axis on and with respect to the bearing plate;

a table, and a reduction gear assembly carried on the table; and

the reduction gear assembly imparts rotation to the valve plate in response to application of a flow of water through the reduction gear assembly.

11. The assembly of claim 10, further comprising an impeller operably coupled to the reduction gear assembly.

12. The assembly of claim 10, wherein the valve plate rotates through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings.

13. The assembly of claim 10, wherein the openings of the bearing plate and the port of the valve plate are oriented parallel to the axis.

14. The assembly of claim 10, wherein the port is larger than each of the plurality of openings.

15. The assembly of claim 10, wherein the valve plate and the bearing plate each include a coaxial central bore formed entirely therethrough.

16. The assembly of claim 10, further comprising:

an upstanding wall on the valve plate formed with an internal gear surface; and

a drive gear depending from the reduction gear assembly is engaged with the internal gear surface.

17. The assembly of claim 10, wherein the valve plate is in direct and continuous contact with the bearing plate.

18. A water distribution valve for directing a flow of water through a swimming pool cleaning system, the water distribution valve comprising:

a housing having a bottom, an inlet at the bottom, and a plurality of outlets at the bottom;

a valve plate including a port, the valve plate mounted for rotation in the housing among a plurality of positions, each position of the valve plate characterized by the port being aligned with a respective one of the plurality of outlets of the housing;

an upstanding collar, around which the valve plate is coaxially mounted, projecting between the outlets and though the valve plate, wherein the collar is open at both of its ends;

a drive assembly carried by the housing and operably coupled to impart rotation to the valve plate; and

in response to application of the flow of water into the housing, the drive assembly imparts rotation to the valve plate through the plurality of positions.

19. The water distribution valve assembly of claim 18, further comprising:

a bearing plate formed with a plurality of openings, each of the plurality openings aligned with a respective one of the plurality of outlets;

wherein the valve plate is mounted for rotation in contact with the bearing plate.

20. The water distribution valve assembly of claim 19, wherein the bearing plate is interposed in direct contact between the bottom of the housing and the valve plate.

21. An assembly for directing a flow of water through a water distribution valve including a housing having a bottom, an inlet, and a plurality of outlets at the bottom, the assembly comprising:

a bearing plate including a plurality of openings and a central, upstanding collar projecting above the bearing plate between the openings, wherein the collar is open at both of its ends;

a valve plate coaxial to and encircling the upstanding collar and including a port, the valve plate mounted in the housing for rotation with respect to the bearing plate; and

a drive assembly coupled to impart rotational movement of the valve plate with respect to the bearing plate, in response to the application of a flow of water into the inlet, through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings.

22. A water distribution assembly for directing a flow of water through a water distribution valve, the assembly comprising:

a housing having a bottom;

a bearing plate including a plurality of openings above the bottom of the housing and a central, upstanding collar projecting above the bearing plate between the openings, wherein the collar is open at both of its ends;

a valve plate coaxial to and encircling the upstanding collar, the valve plate including a port and being mounted for rotation about an axis with respect to the bearing plate;

a reduction gear assembly and an impeller coupled to the reduction gear assembly, wherein the reduction gear assembly imparts rotation to the valve plate in response to application of a flow of water against the impeller.

23. The water distribution valve assembly of claim 22, wherein the valve plate moves through a plurality of positions each characterized by the port of the valve plate being aligned with a respective one of the plurality of openings, in response to the application of a flow of water into the inlet.

24. A water distribution valve for directing a flow of water through a swimming pool cleaning system, the water distribution valve comprising:

a housing having a bottom and a plurality of outlets at the bottom;

a bearing plate above the bottom, the bearing plate including a plurality of openings and a central, upstanding collar projecting above the bearing plate between the openings, wherein the collar is open at both of its ends;

a valve plate coaxial to and encircling the upstanding collar, the valve plate including a port and being mounted for rotation for rotation in the housing among a plurality of positions, each position of the valve plate characterized by the port being aligned with a respective one of the plurality of outlets of the housing;

a drive assembly carried by the housing and coupled to impart rotation to the valve plate; and

in response to application of the flow of water into the housing, the drive assembly imparts rotation to the valve plate through the plurality of positions.

25. The water distribution valve of claim **24**, wherein the bearing plate is disposed between the bottom of the housing and the valve plate.

* * * * *

Exhibit B

Barry Greenwald April 15, 2015 at 11:54 AM

Zodiac

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

Thanks for meeting with us yesterday. We are very interested in your products AND your ideas . We look forward to the next step . I know we can work something out that fulfills the needs of both parties .

Barry

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald April 15, 2015 at 11:55 AM

Re: Zodiac

To: Pool Patch LLC

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

Great. Let me know when you are ready and we will set it up

Sent from my iPhone
Barry Greenwald
VP SALES
ZODIAC COVER POOLS
925 389 7209
Barry.greenwald@zodiac.com

> On Apr 15, 2015, at 11:27 AM, Pool Patch LLC <tom@poolpatch.com> wrote:
>
> Hi Barry,
>
> It was a good session yesterday. I'm interested in working with you and Zodiac/Caretaker and will put together a proposal within the next week. I think it would be best for both of us if I fly over and visit with you once I have the proposal ready and I can bring the water valve and other in-floor related items that are relative.
>
> Thomas
>
> Thank You,
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Cell: 602-334-3948 | Fax: 602-465-3426
>
> See More from Barry Greenwald

Barry Greenwald April 15, 2015 at 3:08 PM

Re: Zodiac

To: Pool Patch LLC

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

Any chance you'd have your model on the 29th ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On Apr 15, 2015, at 11:50 AM, Pool Patch LLC <tom@poolpatch.com> wrote:
>
> Excellent.
>
> See More from Barry Greenwald

Barry Greenwald April 16, 2015 at 2:34 PM

Date

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com Add to Contacts...

Any shot at Tuesday the 28th in SALT LAKE CITY. ? I have to get 3 of us here at the same day.

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Found in Sent Mailbox

Pool Patch Products April 16, 2015 at 2:38 PM

RE: Date

To: Barry Greenwald

I'll confirm this weekend, I'll do my best to make this happen.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

---------- Original message ----------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 04/16/2015 2:12 PM (GMT-07:00)
To: Tom Lopez <tom@poolpatch.com>
Subject: Date

See More from Barry Greenwald

Any shot at Tuesday the 28th in SALT LAKE CITY. ? I have to get 3 of us here at the same day.

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald April 20, 2015 at 8:57 AM

Re: Date

To: Pool Patch LLC

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com Add to Contacts...

Yes. No problem. First week in May looks good

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On Apr 20, 2015, at 8:20 AM, Pool Patch LLC <tom@poolpatch.com> wrote:
>
> Barry
>
> I'm getting back to you in regards to the April 28th meeting in Salt Lake. My supplier was out for 5 days last week on a family emergency, in order for them to finish my requests and ship back to me I think the 28th is too soon. Will early May work for you?
>
> > On Apr 16, 2015, at 2:12 PM, Barry Greenwald wrote:
> >
> > Any shot at Tuesday the 28th in SALT LAKE CITY. ? I have to get 3 of us here at the same day.
> >
> > Barry Greenwald
> > Vice President Sales
> > Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
> > 925-389-7209 cell
> > Barry.greenwald@zodiac.com

Barry Greenwald April 27, 2015 at 1:51 PM

Meeting

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com Add to Contacts...

Any idea on when you can meet ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald May 1, 2015 at 10:53 AM

Re: Meeting

To: Pool Patch LLC

Looking at dates now.

Sent from my iPhone

> On May 1, 2015, at 10:39 AM, Pool Patch LLC <tom@poolpatch.com> wrote:
>
> I have the valve prototype in my possession.
>
> See More from Barry Greenwald

Barry Greenwald May 1, 2015 at 10:58 AM Details

Re: Meeting

To: Pool Patch LLC, Cc: Todd Cramer

May 7. ?

Sent from my iPhone

> On May 1, 2015, at 10:39 AM, Pool Patch LLC <tom@poolpatch.com> wrote:
>
> I have the valve prototype in my possession.
>
> See More from Barry Greenwald

Barry Greenwald May 1, 2015 at 11:01 AM Details

Re: Meeting

To: Pool Patch Products, Cc: Todd Cramer

I land at 8:45 AM. Can you get close to that

Sent from my iPhone

> On May 1, 2015, at 11:00 AM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> that will work.
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-954-8147 | Fax: 602-466-3426
>
> ---------- Original message ----------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 05/01/2015 10:58 AM (GMT-07:00)
> To: Pool Patch LLC <tom@poolpatch.com>
> Cc: Todd Cramer <todd.cramer@zodiac.com>
> Subject: Re: Meeting
>
> See More

Barry Greenwald May 5, 2015 at 9:21 AM

Flight

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

What airline Thursday morning ? Time arrive and depart ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Found in Sent Mailbox

Pool Patch Products May 5, 2015 at 10:03 AM

RE: Flight

To: Barry Greenwald

Southwest Airlines arriving at 9:35 a.m. departing at 10:30 p.m.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

-------- Original message --------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 05/05/2015 9:15 AM (GMT-07:00)
To: Tom Lopez <tom@poolpatch.com>
Subject: Flight

See More from Barry Greenwald

What airline Thursday morning ? Time arrive and depart ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald May 5, 2015 at 10:22 AM

Re: Flight

To: Pool Patch Products

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

Any return flights between 3 and 6 you can take. 10:30. Wow

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On May 5, 2015, at 10:03 AM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> Southwest Airlines arriving at 9:35 a.m. departing at 10:30 p.m.
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-354-8147 | Fax: 602-466-3428
>
> -------- Original message --------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 05/05/2015 9:15 AM (GMT-07:00)
> To: Tom Lopez <tom@poolpatch.com>
> Subject: Flight
>
> What airline Thursday morning ? Time arrive and depart ?
>
> Barry Greenwald
> Vice President Sales
> Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
> 925-389-7209 cell
> Barry.greenwald@zodiac.com

Found in Sent Mailbox

Pool Patch Products May 5, 2015 at 2:02 PM

Re: Flight

To: Barry Greenwald

Yes, it's a little late. I'll grab a cab and go downtown for the evening.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

-------- Original message --------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 05/05/2015 10:22 AM (GMT-07:00)
To: Pool Patch Products <tom@poolpatch.com>
Subject: Re: Flight

See More from Barry Greenwald

Any return flights between 3 and 6 you can take. 10:30. Wow

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

On May 5, 2015, at 10:00 AM, Pool Patch Products <tom@poolpatch.com> wrote:

Barry Greenwald May 5, 2015 at 2:03 PM

Re: Flight

To: Pool Patch Products

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

Ok

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On May 5, 2015, at 2:02 PM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> Yes, it's a little late. I'll grab a cab and go downtown for the evening.
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-354-8147 | Fax: 602-466-3428
>
> -------- Original message --------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 05/05/2015 10:22 AM (GMT-07:00)
> To: Pool Patch Products <tom@poolpatch.com>
> Subject: Re: Flight
>
> See More

Barry Greenwald May 5, 2015 at 2:05 PM

Re: Flight

To: Pool Patch Products

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com add to Contacts...

If not. There is a 5:45 non stop

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On May 5, 2015, at 2:02 PM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> Yes, it's a little late. I'll grab a cab and go downtown for the evening.
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-354-8147 | Fax: 602-466-3428
>
> ------ Original message ------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 05/05/2015 10:22 AM (GMT-07:00)
> To: Pool Patch Products <tom@poolpatch.com>
> Subject: Re: Flight
>
> See More

Found in Sent Mailbox

Pool Patch Products May 5, 2015 at 2:20 PM

Re: Flight

To: Barry Greenwald

Ok, I'll call American Express Travel and see if they can change that around I might have a non-refundable situation at this point.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

------ Original message ------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 05/05/2015 2:05 PM (GMT-07:00)
To: Pool Patch Products <tom@poolpatch.com>
Subject: Re: Flight

See More from Barry Greenwald

If not. There is a 5:45 non stop

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

> On May 5, 2015, at 2:02 PM, Pool Patch Products <tom@poolpatch.com> wrote:

Barry Greenwald May 5, 2015 at 2:21 PM

Re: Flight

To: Pool Patch Products

You can always change in SW. I will pay the difference.

Sent from my iPhone

> On May 5, 2015, at 2:20 PM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> Ok, I'll call American Express Travel and see if they can change that around I might have a non-refundable situation at this point.
>
> Thomas Lopez | Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-354-8147 | Fax: 602-466-3428
>
> ------ Original message ------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 05/05/2015 2:05 PM (GMT-07:00)
> To: Pool Patch Products <tom@poolpatch.com>
> Subject: Re: Flight
>
> See More

Found in Sent Mailbox

Pool Patch Products May 5, 2015 at 2:26 PM

Re: Flight

To: Barry Greenwald

I might have to take you up on your offer. I appreciate that.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

---------- Original message ----------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 05/05/2015 2:21 PM (GMT-07:00)
To: Pool Patch Products <tom@poolpatch.com>
Subject: Re: Flight

See More from Barry Greenwald

You can always change in SW. I will pay the difference.

Sent from my iPhone

Barry Greenwald June 11, 2015 at 7:01 AM

Re: Flight

To: Thomas Lopez | Pool Patch LLC

Yes. Where are we on valve sample ?

Sent from my iPhone

On Jun 11, 2015, at 6:43 AM, Thomas Lopez | Pool Patch LLC <tom@poolpatch.com> wrote:

> Barry
>
> Next week I'm getting a few new things that will interest you, do you still have an interest in my newer developments?
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020
>
> See More from Barry Greenwald

Barry Greenwald June 11, 2015 at 7:27 AM

Re: Flight

To: Thomas Lopez | Pool Patch LLC

Would love to see it

Sent from my iPhone

On Jun 11, 2015, at 7:13 AM, Thomas Lopez | Pool Patch LLC <tom@poolpatch.com> wrote:

> Ok, I have new sample coming Monday I was telling you about and need to show you this, also another associated item related to the market. I guarantee you will be interested in marketing this with the systems.
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020
>
> See More from Barry Greenwald

Barry Greenwald June 22, 2015 at 11:27 AM

6 port valve plus

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com Add to Contacts...

Ready?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald June 24, 2015 at 10:27 AM

Re: 6 port valve plus

To: Thomas Lopez | Pool Patch LLC

Ok

Sent from my iPhone

On Jun 24, 2015, at 10:16 AM, Thomas Lopez | Pool Patch LLC <tom@poolpatch.com> wrote:

> I think we could do this next week. Let me look into the date for next week.
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020
>
> See More from Barry Greenwald

Barry Greenwald June 29, 2015 at 11:51 AM

Salt Lake

To: Tom Lopez

Siri found new contact info in this email: Barry Greenwald Barry.greenwald@zodiac.com Add to Contacts...

Can you be there on the 8Th ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Found in Sent Mailbox

Pool Patch Products June 29, 2015 at 8:12 PM

RE: Salt Lake

To: Barry Greenwald

That's tight timing, I'm doing a little vacation and need till the 13th.

Thomas Lopez | Founder
Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, Arizona 85020
Tel: 602-354-8147 | Fax: 602-466-3428

------ Original message ------
From: Barry Greenwald <barry.greenwald@zodiac.com>
Date: 06/29/2015 11:51 AM (GMT-07:00)
To: Tom Lopez <tom@poolpatch.com>
Subject: Salt Lake

See More from Barry Greenwald

Can you be there on the 8Th ?

Barry Greenwald
Vice President Sales
Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
925-389-7209 cell
Barry.greenwald@zodiac.com

Barry Greenwald July 30, 2015 at 6:20 AM Details

Re: Salt Lake

To: Pool Patch Products, Cc: Todd Cramer

Has to be after 20th. Will get back to you

Sent from my iPhone

> On Jun 29, 2015, at 8:12 PM, Pool Patch Products <tom@poolpatch.com> wrote:
>
> That's tight timing, I'm doing a little vacation and need till the 13th.
>
> Thomas Lopez ! Founder
> Pool Patch LLC
> 11430 N. Cave Creek Rd.
> Phoenix, Arizona 85020
> Tel: 602-354-6147 ! Fax: 602-466-3428
>
> ------ Original message ------
> From: Barry Greenwald <barry.greenwald@zodiac.com>
> Date: 06/29/2015 11:51 AM (GMT-07:00)
> To: Tom Lopez <tom@poolpatch.com>
> Subject: Salt Lake
>
> Can you be there on the 8Th ?
>
> Barry Greenwald
> Vice President Sales
> Zodiac Cover Pools ,Zodiac/SAVI Pool Lighting , CareTaker In Floor
> 925-369-7209 cell
> Barry.greenwald@zodiac.com

Barry Greenwald July 16, 2015 at 9:26 AM Details

Re: Salt Lake

To: Thomas Lopez ! Pool Patch LLC, Cc: Todd Cramer

Working on Aug 10 or 11. Will let you know

Sent from my iPhone

On Jul 15, 2015, at 9:06 AM, Thomas Lopez ! Pool Patch LLC <tom@poolpatch.com> wrote:

> I'm back in Phoenix and ready when you are.
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020

See more from Barry Greenwald

Barry Greenwald July 17, 2015 at 9:47 AM Details

Re: Salt Lake

To: Thomas Lopez ! Pool Patch LLC, Cc: Todd Cramer

The 12th

Sent from my iPhone

On Jul 15, 2015, at 9:46 AM, Thomas Lopez ! Pool Patch LLC <tom@poolpatch.com> wrote:

> Sounds good.
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020

See more from Barry Greenwald

Barry Greenwald

Re: Salt Lake

To: Thomas Lopez | Pool Patch LLC Cc: Todd Cramer

July 17, 2015 at 10:06 AM

Details

Morning. As early as you can. Out at 5-7 PM

Sent from my iPhone

On Jul 17, 2015, at 9:59 AM, Thomas Lopez | Pool Patch LLC <tom@poolpatch.com> wrote:

> What time do you want me to fly in?
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020
>
> See More from Barry Greenwald

Barry Greenwald

Re: Salt Lake

To: Thomas Lopez | Pool Patch LLC, Cc: Todd Cramer

July 18, 2015 at 2:46 PM

Details

Got it

Sent from my iPhone

On Jul 18, 2015, at 1:11 PM, Thomas Lopez | Pool Patch LLC <tom@poolpatch.com> wrote:

> Arrive in SLC August 12th @ 10:09 am on US Airways departing SLC @ 4:55pm on Delta
>
> Thank You,
> Thomas Lopez
>
> POOL PATCH LLC
> Cell (602) 334-3948||Fax(602) 466-3428
> 11430 N. Cave Creek Rd. Phoenix, Arizona 85020
>
> See More from Barry Greenwald

Barry Greenwald

Wednesday

To: Tom Lopez

Inbox - Pool Patch August 11, 2015 at 9:56 AM

What time ? What airline tomorrow

Barry

Sent from my iPhone

Cramer, Todd

In-Floor Patents

To: Thomas Lopez, Cc: Barry Greenwald

August 26, 2015 at 8:02 AM

Details

Siri found new contact info in this email: Todd Cramer todd.cramer@zodiac.com

add to Contacts...

Hi Thomas,

Barry Greenwald forwarded your proposals to me and I have in turn discussed them with Zodiac's Management team.

We will be declining your offer.

Zodiac's resources are being applied to other parts of its business, and they prefer to acquire businesses with existing revenue streams.

You have made a good impression on our team here in Salt Lake City, and we think your products hold excellent potential.

I wish you the best of luck in bringing them to the market.

Todd Cramer
President, Cover-Pools and Caretaker
General Manager, SAVI
todd.cramer@zodiac.com
800-447-2838

Pool Patch LLC
11430 N. Cave Creek Rd.
Phoenix, AZ 85020

May 7, 2015

Zodiac Pool Systems, Inc.
66 East 3335 South
Salt Lake City, UT 84115
Attn: Todd Cramer

Re: Sale of U.S. Patents

Dear Mr. Cramer:

The purpose of this letter ("Letter of Intent") is to outline the terms of the offer by Pool Patch LLC ("Pool Patch") to sell certain proprietary technology to Zodiac Pool Systems, Inc. ("Zodiac"). The offer is contingent upon negotiation and execution by Zodiac and Pool Patch of a definitive agreement as further discussed in Section 6 below (the "Definitive Agreement").

1. Purchase of the Proprietary Technology. Pool Patch is willing to sell the following patents and patents pending (collectively, the "Patents"):

Head Patents:

- Reciprocating In-Floor Pool Cleaner Head, U.S. Patent No. 8,590,071, issued November 26, 2013
- Guided Reciprocating In-Floor Pool Cleaner Head, U.S. Patent No. 8,984,677, issued March 24, 2015
- Reciprocating In-Floor Pool Cleaner Head With Cover Flange, U.S. Serial No. 14/593,204, filed January 9, 2015
- Reciprocating In-Floor Pool Cleaner Head With Adjustable Nozzles, U.S. Serial No. 14/504,320, filed October 1, 2014

Valve Patent:

- Sequentially-Gated Multi-Port Water Distribution Valve, U.S. Serial No. 14/620,989, filed February 12, 2015

The Patents do not include any foreign rights related to the foregoing patents.

2. Purchase Price. The purchase price (the "Purchase Price") for the Patents will be:

(a) $5,500,000.00 to be paid in immediately available funds at Closing (as defined in Section 7 below); and

(b) The Royalty payments described in Section 3 below (the "Royalty Payments").

3. Royalty Payments. Zodiac agrees to pay Pool Patch (a) $5.00 for each product sold by Zodiac that utilizes any of the subject matter embodied in the Head Patents (each, a "Head Product"), and (b) $15.00 for each product sold by Zodiac that utilizes any of the subject matter embodied in the Valve Patent (each, a "Valve Product" and, together with the Head Products, the "Products") based upon net sales of the Products in the United States. Royalty Payments will be made monthly and Zodiac will furnish to Pool Patch complete and accurate statements showing the monthly sales volume of the Products and the calculation of the Royalty Payment for such period. Such statements will be furnished no later than 30 days after the end of each month. Zodiac's obligation to pay the Royalty Payments will continue until the expiration of the applicable Patent. Pool Patch will have the right, at its expense, to have an independent public accountant selected by Pool Patch examine Zodiac's books, records and any other documents and materials necessary to verify the accuracy of Zodiac's monthly statements and calculation of the Royalty Payments. If the inspection or audit discloses a deficiency between the amount found to be due to Pool Patch and the amount actually paid, then Zodiac will pay the entire deficiency, plus interest thereon at the prime rate (as published in the Wall Street Journal) from the date such amount became due until the date of payment. If any such audit reveals any payment deficiency of more than 5% of the amount actually owed to Pool Patch, Zodiac shall reimburse to Pool Patch an amount equal to the actual and reasonable costs of the audit.

4. Consulting Services. As partial consideration for the Purchase Price, Thomas V. Lopez, the managing member of Pool Patch ("Lopez"), will perform consulting services related to the Patents, including without limitation, research and development, production and branding (the "Consulting Services"), as reasonably requested by Zodiac from time to time. Lopez will perform Consulting Services for up to 10 hours per month for a period of five years following the Closing of the Definitive Agreement (the "Consulting Term") for no additional consideration and will perform Consulting Services in excess of 10 hours per month during the Consulting Term or after the expiration of the Consulting Term at a mutually agreed upon hourly rate.

5. Right of First Offer. Pool Patch will grant Zodiac a right of first offer in connection with the proposed sale by Pool Patch of any inventions and discoveries created by Pool Patch or Lopez related to in-floor swimming pool cleaning (each, a "Future Invention"). Specifically, in the event Pool Patch or Lopez desires to sell a Future Invention, Pool Patch will give Zodiac written notice of its intent to sell the Future Invention and Zodiac will have 30 days in which to negotiate in good faith the terms of purchase for such Future Invention. In the event the parties are unable to agree upon the terms of purchase for a Future Invention, Pool Patch will

be free to sell the Future Invention in the open market to any third party willing to purchase such Future Invention.

6. Definitive Agreement. All terms and conditions concerning the purchase and sale of the Patents as described in this Letter of Intent will be set forth in a Definitive Agreement, to be prepared by the parties' counsel, which will be subject to the approval of Pool Patch and Zodiac. Those terms and conditions will include, without limitation, representations, warranties, covenants, conditions and indemnities that are customarily included in agreements providing for transactions of the nature contemplated by this Letter of Intent.

7. Conditions to Closing. The conditions precedent to close the sale and purchase of the Patents under the Definitive Agreement (the "Closing") will include, without limitation, the following:

(a) No declaratory judgment action, reexamination, interference or other action challenging the validity of the Patents shall exist or be threatened prior to the Closing;

(b) Pool Patch cooperating, as reasonably requested by Zodiac, for the purpose of facilitating Zodiac's analyses and investigation of the Patents; and

(c) Pool Patch's continued management and prosecution of the Patents to pay maintenance fees, respond to office actions and otherwise ensure that the Patents remain enforceable until the parties have entered into a Definitive Agreement.

8. Fees and Expenses. Zodiac and Pool Patch will each pay their own legal, accounting and other fees and expenses incurred in connection with the transaction, whether or not the Closing occurs.

9. Governing Law. The laws of Arizona shall govern the construction, performance and enforcement of this Letter of Intent.

10. Nature of Letter of Intent. This Letter of Intent is a non-binding statement of the intentions of the parties. The foregoing notwithstanding, Sections 8 through 10 of this Letter of Intent will be binding and enforceable agreements of the parties and will supersede any existing agreement between the parties that conflicts with any of such provisions. No party will have any liability whatsoever because of a failure of any of the parties to enter into and deliver the Definitive Agreement, regardless of the reason for such failure.

If the foregoing is acceptable to you, please indicate by signing this Letter of Intent where indicated below and by returning it to Pool Patch before 5:00 p.m. PDT on May 22, 2015 at which time the proposal embodied in this Letter of Intent will terminate if this Letter of Intent has not been so executed and delivered.

Yours very truly,

By: _____
Thomas Lopez, Managing Member

ACCEPTED AND AGREED to this ____ day of _____, 2015.

Zodiac Pool Systems, Inc.

By: _____
_____

Found in Inbox - Pool Patch Mailbox

Tom Galvani

Final draft

To: Thomas Lopez

July 23, 2019 at 5:45 AM

Siri found new contact info in this email: Tom Galvani tom@galvanilegal.com

Add to Contacts...

Hi Thomas,

Please take a look and let me know what you think. I've addressed it to the prosecution attorney recently on record for Zodiac's patent filings. He will get it in the right hands, or let us know who to send it to.

Thanks,
Tom

Registered U.S. Patent Attorney
Thomas W. Galvani, P.C.
3519 E. Shea Blvd. Suite 129
Phoenix, Arizona 85028
www.galvanilegal.com
Office: 602.281.6481
tom@galvanilegal.com

6074-PL2 - Initial L...1.1.pdf

6074-P7 - Patent...-17.pdf

From: Tom Galvani
Sent: Tuesday, July 23, 2019 1:30 PM
To: 'drussell@kilpatricktownsend.com' <drussell@kilpatricktownsend.com>
Cc: Joseph Kong <joe@galvanilegal.com>
Subject: Initial Letter; Docket No. 6074-PL2

Mr. Russell,

Please see the attached letter regarding your client Zodiac Pools.

Thank you,
Tom Galvani

Registered U.S. Patent Attorney
Thomas W. Galvani, P.C.
3519 E. Shea Blvd. Suite 129
Phoenix, Arizona 85028
www.galvanilegal.com
Office: 602.281.6481
tom@galvanilegal.com

Thomas W. Galvani, P.C.
Registered U.S. Patent Attorney

3519 E. Shea Blvd. Suite 129
Phoenix, Arizona 85028
phone: 602.281.6481
fax: 801.992.1573
tom@galvanilegal.com

July 23, 2019

by email

Zodiac Pool Systems, Inc.
2620 Commerce Way
Vista, CA 92081

c/o
Dean W. Russell
Kilpatrick Townsend & Stockton LLP
1100 Peachtree Street NE Suite 2800
Atlanta, GA 30309
drussell@kilpatricktownsend.com

Re: Caretaker Revolution 6-Port Valve
Docket No.: 6074-PL2

Dear Mr. Russell:

I am intellectual property counsel for Pool Patch LLC. I believe you are patent counsel to Zodiac Pool Systems. If not, I would appreciate you please forwarding this to the appropriate person or contacting me. Zodiac's newly-released Caretaker Revolution 6-Port Valve is remarkably similar to a design that Pool Patch patented two years ago. I write now to address the infringement of the patent.

Pool Patch is owned by Mr. Lopez, who has worked in the pool industry for several decades. In April 2015, Zodiac's Vice President of Sales, Barry Greenwald, met with Mr. Lopez and discussed Zodiac's interest in developing a new water valve. At the time, Mr. Lopez had developed and filed a patent application on a Sequentially-Gated Multi-Port Water Distribution Valve.

On May 7, 2015, at Zodiac's request, Mr. Lopez flew to Salt Lake City and met with Mr. Greenwald, as well as President Todd Cramer, engineer James Oberlin, and VP of Operations LaMont Dreschel. They discussed the Sequentially-Gated Valve at that meeting, and Mr. Lopez noted he had another valve design. The details of this design were not discussed.

On August 12, 2015, Mr. Lopez again flew out for a meeting with Zodiac. At this meeting, they discussed the new valve design, which was the subject of U.S. Patent Application No. 14/819,338 entitled Wearless Multi-Port Water Distribution Valve, filed August 5, 2015. Zodiac expressed interest in acquiring both patent applications, as well as other assets in Pool Patch's portfolio. Pool

Patch sent an offer letter to Zodiac, but on August 26. Mr. Cramer declined the offer, noting that Zodiac preferred to acquire businesses with existing revenue streams.

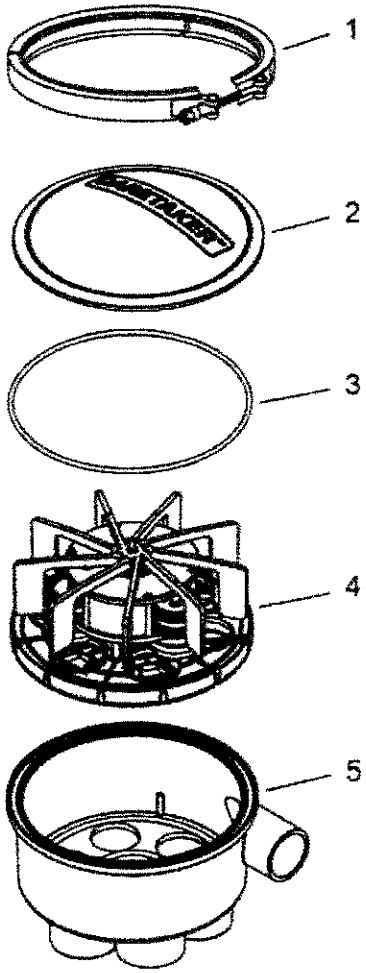
On April 18, 2017, the second patent application issued as U.S. Patent No. 9,625,041. A copy of the patent is attached.

In the past few months, Zodiac has begun distributing and selling the Caretaker Revolution 6-Port Valve. As can be seen in the '041 Patent, and as illustrated in the side-by-side exploded views of the respective designs in Exhibit A, the designs are nearly identical. We believe that the Caretaker design infringes at least claims 1, 2, 4-13, and 15-17. As such, we must demand that Zodiac cease and desist from manufacturing, distributing, selling, offering for sale, advertising, and/or importing the Revolution 6-Port Valve or any other pool valve that embodies the '041 Patent's claims. This letter is sent without prejudice to Pool Patch's rights and claims, all of which are expressly reserved.

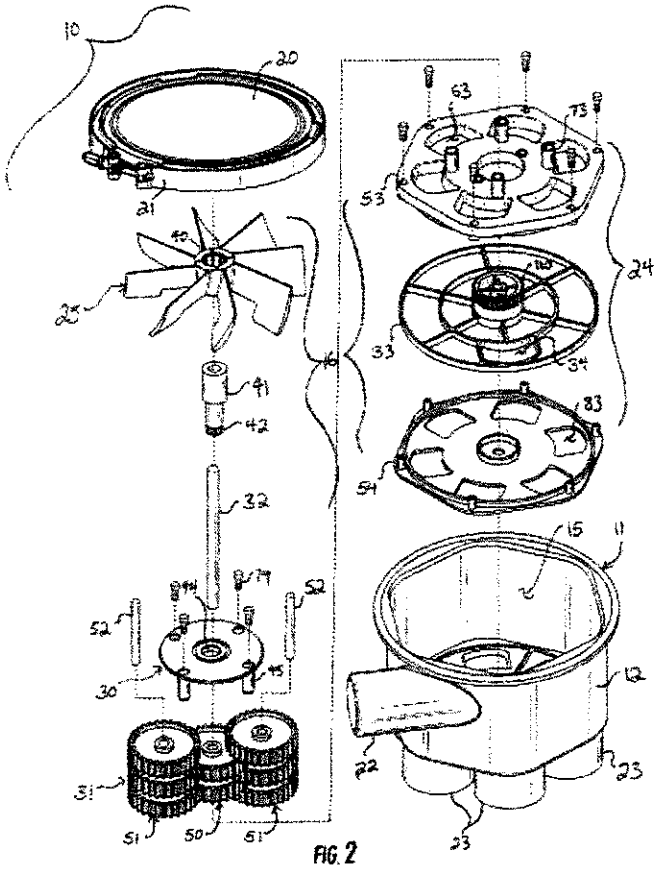
Sincerely,

Thomas W. Galvani

Exhibit A



Caretaker Design



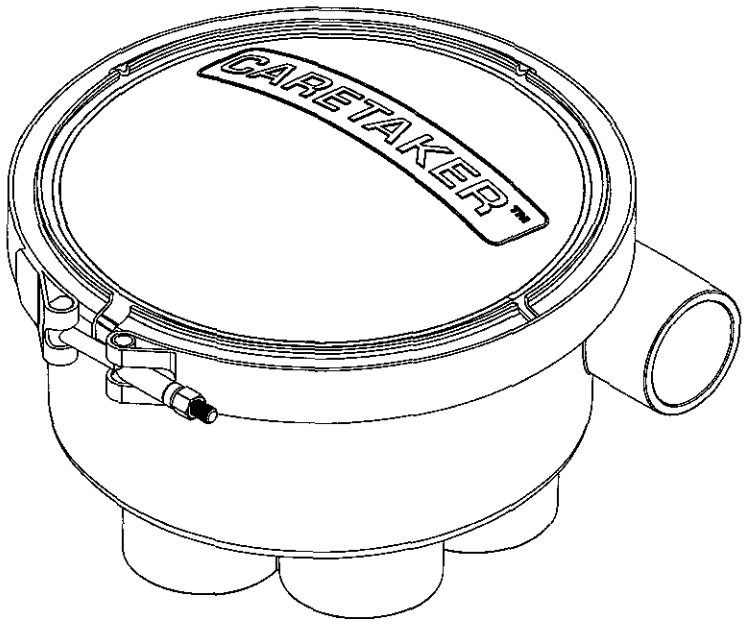
Pool Patch Patent

Exhibit C

CARETAKER™

the REVOLUTION™ 6-port valve

Installation and Maintenance Guide



⚠ WARNING

FOR YOUR SAFETY - This product must be installed and serviced by a contractor who is licensed and qualified in pool equipment by the jurisdiction in which the product will be installed where such state or local requirements exists. In the event no such state or local requirement exists, the installer or maintainer must be a professional with sufficient experience in pool equipment installation and maintenance so that all of the instructions in this manual can be followed exactly. Before installing this product, read and follow all warning notices and instructions that accompany this product. Failure to follow warning notices and instructions may result in property damage, personal injury, or death. Improper installation and/or operation will void the warranty.

Caretaker
2580 S Decker Lake Blvd, STE 300 West Valley City, UT 84119
855.280.6465 toll-free ¦ 801.906.6701 fax
caretaker.custsupport@zodaic.com
www.caretakersystem.com

T0073500 Rel-0001

Table of Contents

Important Safety Information

READ AND FOLLOW ALL INSTRUCTIONS.

⚠ WARNING

Read these instructions completely before starting the procedures. If these instructions are not followed exactly, a fire or electric shock could result, causing property damage, personal injury, and/or death.

⚠ WARNING

This product must be installed and serviced by authorized personnel, qualified in pool/spa installation. Improper installation and/or operation can create an unwanted electrical hazard which can cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

Installation of this equipment should be performed by a licensed pool contractor and conform to the National Electrical Code® (NEC)®. All applicable local installation codes and regulations must be followed.

⚠ WARNING

This manual contains important information about the installation, operation, and safe use of this product. This information should be given to the owner/operator of this equipment.

⚠ WARNING

To reduce the risk of electrical shock:

- Install all electrical equipment at least 5 feet (1.5 m) from inside wall of pool or spa.
- Disconnect power before servicing this equipment.

⚠ WARNING

To reduce the risk of injury, do not allow children to handle this equipment unless they are closely supervised.

Caretaker Free In-Floor Design Services

To ensure complete cleaning and to qualify for the 99% cleaning guarantee, the pool builder must fax or email a Design Fact Sheet along with a scaled pool plan for FREE In-Floor Design Service prior to plumbing the pool.

Email: design@zodiac.com
Fax: (801)-906-6701

If the pool design or dimensions change during excavation, a new design plan must be drawn, or the cleaning guarantee will be void.

Install the valve above ground and the finished pool water level. Do not bury valve after installation.

Install cleaning heads and nozzles according to the Design Plan.

If pool includes an elevated spa, install a check valve on the line feeding the spa heads to avoid spa draining. Install other check valves (as normal) to avoid spa return jets and suction lines from draining.

SAVE THESE INSTRUCTIONS.

For Customer Service or Support

To contact Caretaker: Customer Service
2580 S Decker Lake Blvd, STE 300
West Valley City, UT 84119

toll-free: 855.280.6465
email: caretaker.custsupport@zodiac.com

www.caretakersystem.com

Introduction

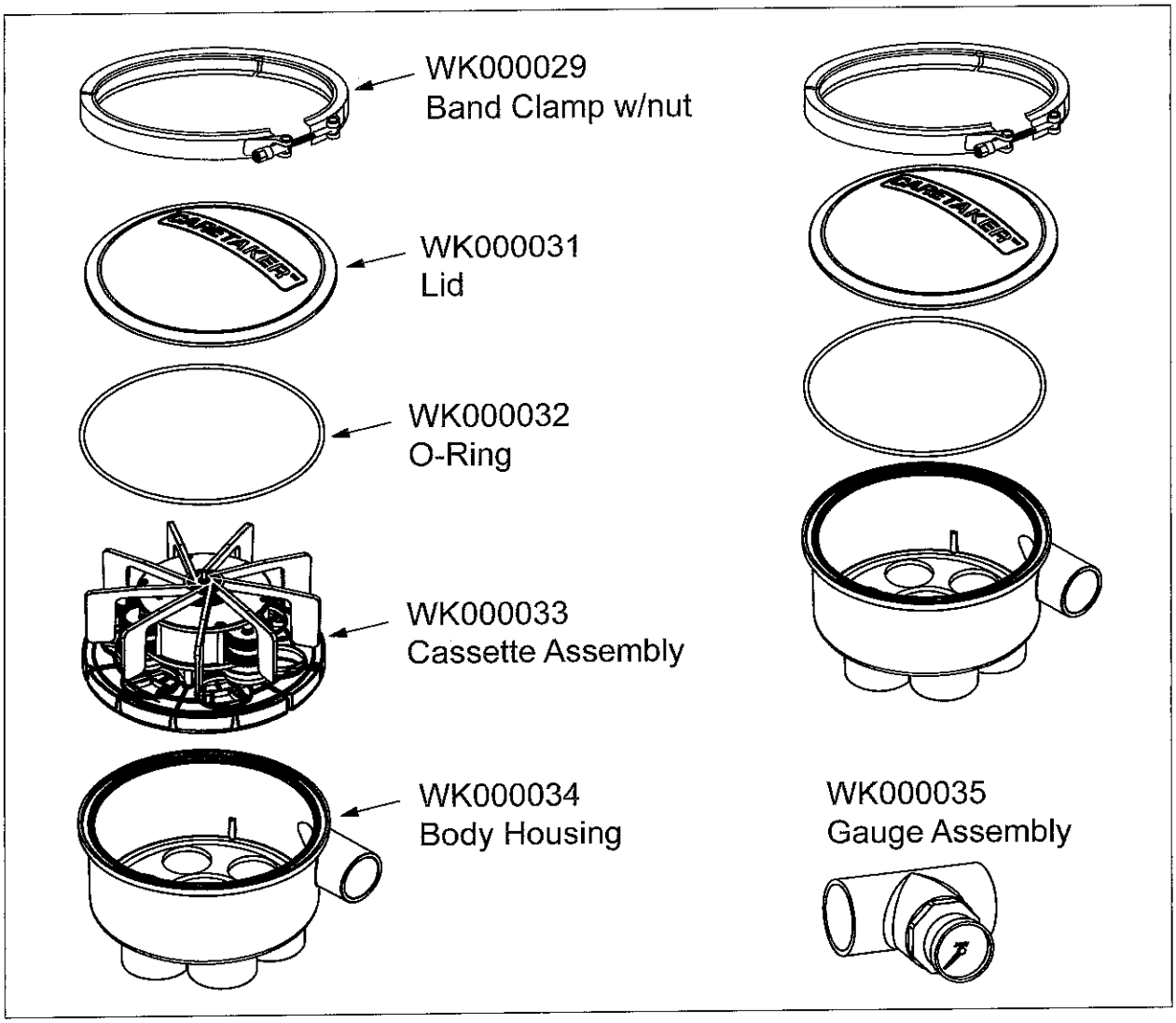
The 6-Port Revolution valve is a hydraulically-driven, in-floor pool cleaning system from Caretaker™. The 6-port valve provides dependable and efficient in-floor cleaning by maximizing water flow through strategically placed cleaning heads to give your pool a robust and thorough cleaning.

Installation of this equipment should be performed by a licensed pool contractor and should comply with all applicable local laws, ordinances, codes, and regulations. Failure to follow recommended installation methods and maintenance procedures could cause damage to pool equipment and/or personal injury, and may void the warranty.

Components

WK000030–Revolution™ 6-Port Valve
(Gauge Assembly sold separately)

WK000036–Pre-plumb kit
(Cassette Assembly sold separately)



Site Planning

Verify that the excavated pool matches the Zodiac Pool Systems, Inc. ("Zodiac") certified pool plan. Check the break, width, depth, and designated step/bench locations. Zodiac® design dimensions are from finished pool, not excavation. **If any dimensions have changed, a new plan must be drawn to ensure cleaning and warranty.**

Position the valve as close as possible to the swimming pool or water feature to reduce piping and improve performance. The valve can be placed near the other pool equipment for aesthetic purposes. However, the installer needs to follow pipe size guidelines found on the certified pool plan.

Install the valve so that the body housing and outlet ports are above ground and the finished pool water level. If the valve must be installed below water level, check valves or manual valves on the inlet and outlet ports are required to prevent flooding of the valve.

Lay out system so feed pipes enter the pool in the center of the wall closest to the pool equipment and valve. Use a check valve on the feed line in elevated spas to prevent spa water from flowing back into the pool.

Follow the certified design plan to position and stake the cleaning head locations. Each head has a designated nozzle that has a precise cleaning radius (see Figure 1). Perimeter heads have a 1 ft. (0.3 m) overlap. Mark the cleaning radius around each stake to verify cleaning coverage (Figure 2).

Flare steps and benches to ensure debris does not get cornered (see Figure 2). Heads should be positioned 2 in. (5.1 cm) from the outer edge on steps and benches.

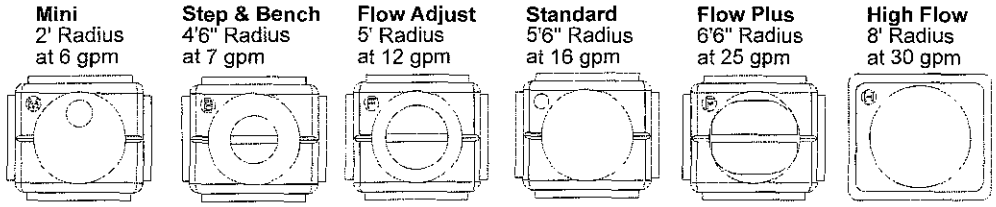


Figure 1. Nozzle options

Plumbing the System

Feed Lines for Cleaning Heads

The Zodiac certified pool plan indicates which cleaning heads will be plumbed together to form a bank. Run all feed lines to the top of the bond beam to facilitate easy valve hookup. Number the lines according to the design plan (see Figure 2).

- Excavate a niche in pool wall, 6" x 24" (15.2 cm x 61.0 cm) down to the pool floor.
- Make line trench depth sufficient to cover all pipes with 6" (15 cm) of soil.
- Do not cross lines in floor.
- Use 2" (5.1 cm) Schedule 40 PVC pipe.
- Use 45° and sweep elbows to improve water flow.
- Use 90° elbows or tees at each head location.
- Left justify heads next to sharp corners.

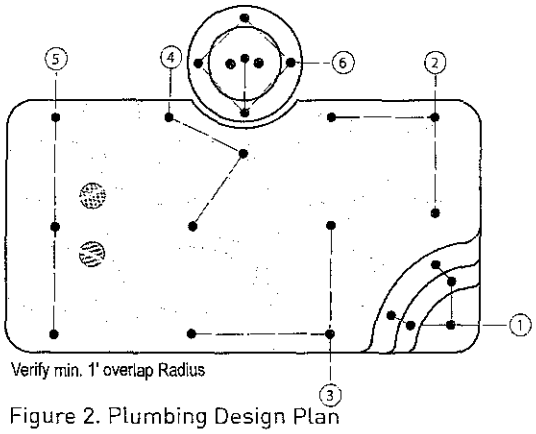


Figure 2. Plumbing Design Plan

For Vinyl Liner Pools:

- Stake but do not plumb lines until walls are set; plumbing lines are fed under walls.
- Vinyl collars are not adjustable, stub-ups **must be** perpendicular to finished pool floor.
- Dig trenches 8 in. (20.3 cm) below excavation grade to accommodate setting of fittings.

Cleaning Head Risers

Risers or stub-ups are glued into 2" (5.1 cm) Tee's, 90-degree elbows, to stub-ups through the pool shell.

Match the riser width to collar width.

- 2" collars require 2" class 200 pipe (no reaming required) or 2" schedule 40 pipe (reaming required)
- 2.5" collars require 2.5" (6.35 cm) Schedule 40 Pipe (no reaming required)
- Position stub-up perpendicular (90°) to the slope of the finished pool floor and secured to avoid movement durring gunite process. (see Figure 3)
- Top of stub-ups must be 6" (15.2 cm) above finished elevation.
- During gunite application, leave a 1" (2.5 cm) deep x 1" (2.5 cm) wide well around each stub-up.

Note: If 2" schedule 40 stub-ups are used, pipe reamer (part # 4-17-2) is required to allow the 2" collar to fit into the pipe.

Hint: Save plumbing time by using 2.5" (Part # 5-9-150) or 2" (Part #WK000001) Prefabricated stub ups. They glue directly into 2" schedule 40 fittings, don't require reaming and are ready for pressure testing.

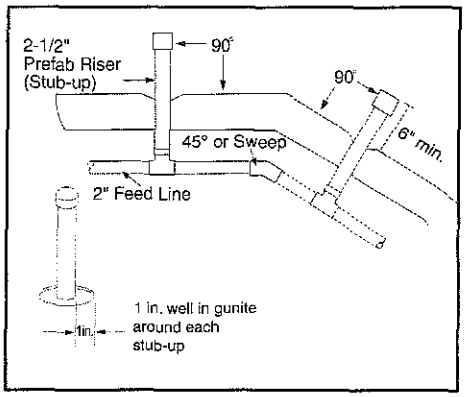


Figure 3. Cleaning Head Risers

Auxiliary Equipment

Pump: Choose an appropriate pump size and style to meet the GPM flow rate minimums specified on your certified pool plan. For variable speed pumps, see page 12.

Heaters: To compensate for heater system pressure drops, plumb heaters in a bypass line before the water valve, even if the heater has an internal bypass. Perform a temperature rise test to determine where to set the bypass valve (see Figure 7). Ensure proper water flow can be reached.

Chlorinators: In-floor systems can be used with erosion feeders, ozone generators, and in-line salt-chlorine generators. Consult manufacturers' instructions for proper installation to protect the water valve and other pool equipment from high concentrations of chlorine or chlorine gas.

Automatic Pool Cleaners: When using an automatic pool cleaner with the in-floor system, plumb the dedicated cleaner line (booster pump if applicable) before the valve (see Figure 4).

Water Features, Falls and Returns: Plumb so the 6-port valve receives the GPM's mentioned in the certified design during the cleaning sessions.

Filters: Use of a filter is highly reccommended. Size the filter to exceed the flow requirements of the certified design. Consult manufacturers' installation instructions.

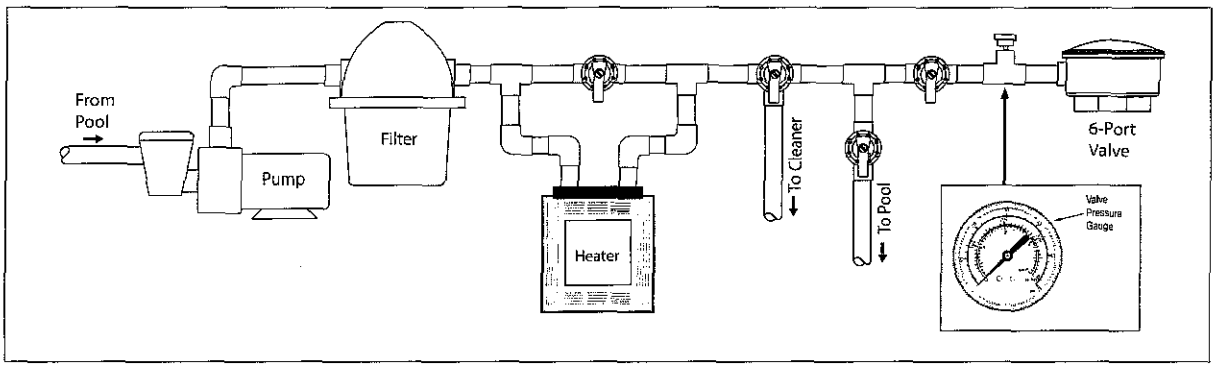


Figure 4. Example of a Plumbing Setup

6-Port Valve Discharge Lines

The distribution system is designed to rotate from the shallow end to the deep end; pushing debris to the drain. Port 1 should always be the step or bench port, followed by the shallow bank, etc. Looking down on the valve, it rotates clockwise. If a spa is included, it will require a dedicated line from the valve. Follow the design plan to install the lines in the correct order (See Figure 5).

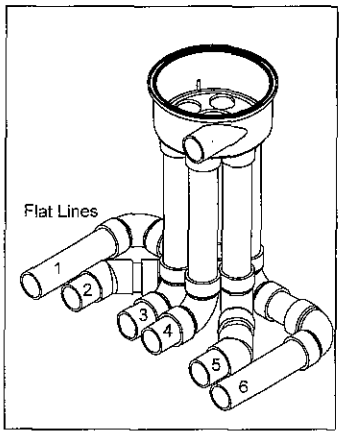


Figure 5. Flat Configuration of Valve Discharge Lines

- Open the valve and remove cassette assembly and packaging prior to gluing. Body housing must be primed heavily before gluing.
- Use heavy bodied PVC glue to connect the PVC pipe to the valve housing using glue manufacturer's instructions. **CAUTION: Do not get glue inside the housing as it will prevent the valve from rotating and void the warranty.**
- Use a 3 in. (7.6 cm) stagger when cutting pipes to provide enough clearance for the elbows.
- Install the discharge lines from the valve in a stacked or flat configuration. **CAUTION: Ensure pipes do not touch each other.**
- Install all lines with a minimum of 6" (15.2 cm) cover or in accordance with local codes.
- If all outlet ports on the valve are not needed, double-port the line by tying the unused port into an active port. Customarily, **double-port** lines to the hardest-to-clean area. Refer to the design plan for the proper connections. **CAUTION: Always plumb a check valve in each double-ported line.**
- If a port is used as a return line, install an eyeball fitting at the pool wall to create back pressure on the line. If the wall return line can also recieve water pressure from the pump, install a check valve between the Caretaker valve and wall returns to prevent water from back flowing into the valve.

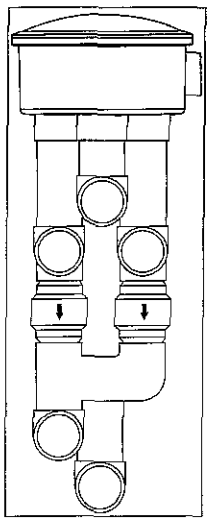


Figure 6. Double-Ported Stacked Lines

Plumbing For Cold Climates

Prepare for cold weather by plumbing the valve so it can be winterized easily.

- Plumb 2-way valves into each discharge line so they can be pressurized to push water below the freeze zone and sealed to prevent water from coming back up into the valve. (See Figure 7)
- Discharge pipes should extend 24" below the freeze zone before turning toward the pool.

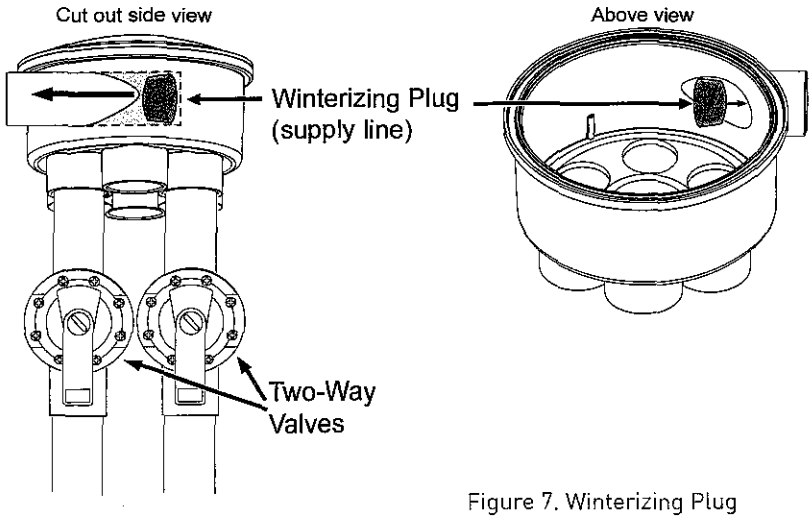


Figure 7. Winterizing Plug

Pressure Testing

Perform a Hydrostatic pressure test by filling each line and the 6-Port valve with water. Isolate the plumbing so that the filter, pump, and heater are not subjected to the pressure test. Ensure cassette assembly is removed. Install the o-ring, lid and band clamp and torque clamp to approx. 95 inch-pounds. Pressure-test the system at a minimum of 35 psi for 24-48 hours or as local code requires. Keep the water valve secure and under pressure throughout the construction process. When all connections are complete and it is clear that the system is holding pressure, backfill, tamp and level all trenches.

When performing hydrostatic pressure tests or when testing for external leaks of the completed filtration and plumbing system, ensure that the maximum pressure the system is subjected to does not exceed the maximum working pressure of any of the components within the system.

⚠ WARNING

When pressure testing a system with water, air is often trapped in the system during the filling process. Should the system fail, this trapped air can propel debris at a high speed and cause injury. Every effort to remove trapped air must be taken.Pressure testing applies only to the plumbing and not to the pool equipment such as the filters, pumps, and heaters. To minimize risk of severe injury or death the filters, pumps, and heaters should not be subjected to the piping pressurization test. Refer to the manufacturer's instructions for the pumps, filters, and heaters for instructions regarding the maximum pressures the pool equipment can be subjected to.

Preparing the System

Cut Stub-ups

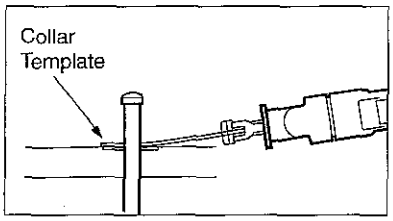


Figure 8. Riser Installation

1. Verify that the system is holding pressure (minimum of 35 psi), then relieve system pressure.
2. Verify all stub-ups are above the pool shell.
3. Cut each stub-up
   - **For 2" collars:** Cut ½" (1.3 cm) above the cement.
   - **For 2-1/2" collars:** Cut flush with the cement **Tip: Use the UltraFlex® Collar Template (part #1-17-7) (see Figure 8).**
4. **Use a sander/grinder to sand each stub-up smooth and level** with the shell finish to ensure proper glue adhesion with collar setting. Insert test plug in each stub-up.
5. Use a blower assembly unit (blower, check valve, air/water supply, and connectors) to blow out debris that can gather in the plumbing during the construction process. For technical assistance, contact Caretaker for assembly instructions. Turn on blower and water supply and direct the flow to one zone at a time.
6. Starting at the cleaning head farthest from the valve, remove test plug and flush the pipe, blocking and releasing pressure several times to ensure a clear line. Replace test plug and repeat for each riser.

For Vinyl Liner Pools:

Set collar fittings before clearing lines.

1. Cut pipe stub-up flush with the pool floor. Then use an inside pipe cutter to cut it again 1 ⅞ in. (4.8 cm) lower than the floor level.
2. **Use ABS to PVC glue to secure the collar fitting. (Primer can be used on the pipe but not the fitting. Use glue on both.)** Insert collar to a full stop to ensure proper height.
3. Excavate an area (12 in. (30.5 cm) around head and 8 in. (20.3 cm) below excavated floor) and fill with concrete to form a "thrust block" to eliminate movement of the cleaning head.
4. Clear lines and insert test plugs limiting water use as there is no solid pool bottom.

Install Collars

When the pool interior is completely clean and ready for the final finish application, install the collars (see Figure 9).

1. Set blue protective caps in collars.
2. Use heavy bodied PVC glue to secure the cleaning collars. (Primer can be used on the stub-ups but not the collars. **Use glue on both.**)
3. Push collar firmly into pipe with a 1/4 turn.
4. Ensure collar is perpendicular with pool shell; you can rotate the 2-1/2 Ultraflex® collar up to 10° to accommodate a crooked 2.5" stub-up.

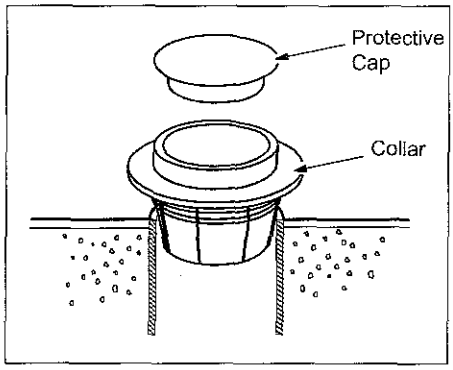


Figure 9. Collar Installation in a Gunite Pool

For Vinyl Liner Pools:

Pool liner must be in final position before installing collars and cleaning heads (see Figure 10).

1. Press locking ring firmly into place in groove on collar fitting. **Installation Tip**: Turn collar upside down and use as a tool to press ring into place.
2. Use a razor knife to cut liner inside the locking ring, leaving at least a ¼ in. (0.6 cm) edge around the ring perimeter.
3. Tighten the collar into the collar fitting, turning clockwise until the collar lip fits snugly against locking ring.
4. Insert Metal Combination Tool (part #3-17-7) into collar and rotate clockwise until collar is firmly seated.

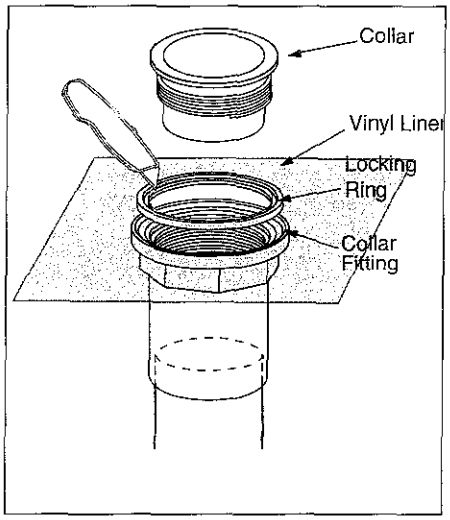


Figure 10. Collar Installation in a Vinyl Liner Pool

Install Valve Cassette Assembly

Remove the band clamp and lid. (see Figure 11).

1. Install the cassette assembly.
2. Position o-ring in place and replace lid.
3. Replace band clamp and torque to approx. 95 inch-pounds. (tap on the perimeter periodically to ensure equal tension).
4. Turn on the system and check for leaks.

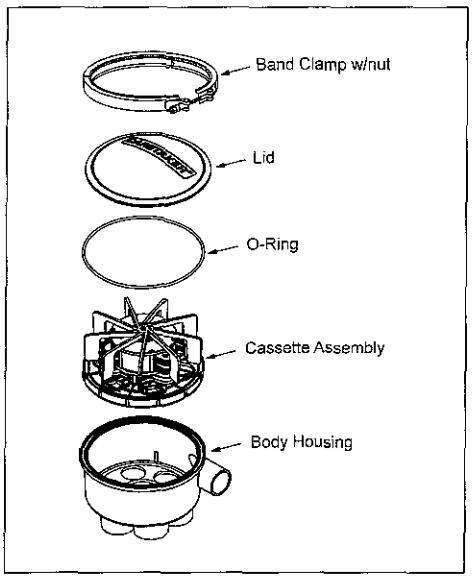


Figure 11. Installing the Functional Valve

Starting the System

Before initiating the system, open a discharge line before the valve and flush the pool pump and filtration system.

- Clear debris from all filters and pump basket.
- Remove the protective caps from the collars.
- **Run the in-floor system without cleaning heads installed for 24 hours to ensure the lines are clean.**

Install the Cleaning Heads

1. Install the nozzles into the cleaning head. Refer to the design plan to verify nozzle size.
2. Attach the Head Removal Tool (part #3-17-8) to the pool pole.
3. Snap tool into the head. Set head in collar; make sure the head is completely in the collar.
4. Turn clockwise (about 1/4 turn) to lock the head into position.
5. Lift straight up to release head from the removal tool.
6. Run the system for a complete cycle to confirm that all cleaning banks operate and that each head advances during pop-up and retraction.
7. Verify proper water pressure at the gauge on the water valve.
   Optimum level is 14-22 psi (97 - 152 kPa).

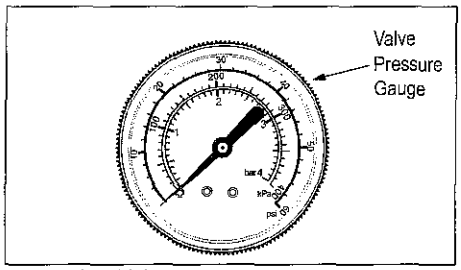


Figure 12. Valve Pressure Gauge

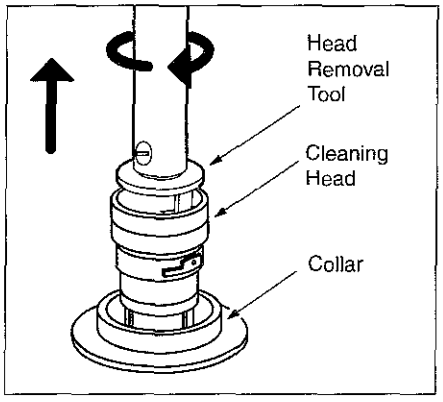


Figure 13. Installing Cleaning Heads

Operation and Routine Maintenance

The Caretaker cleaning heads are designed to operate at a specific gallonage and pressure. To maintain flow through the heads, run the system whenever the pump is on.

Cleaning times will vary according to application and environment. To determine the optimum cleaning time, run the system 24 hours a day to start. Reduce run times by 2 hours every 2 days until minimum cleaning time is determined. Six hours a day is recommended.

Electrical cost savings can be gained by using a variable speed pump. The pump can be run through out the day at low RPM's, allowing water rotation through the filtration system. However, a high speed cleaning session will still be required to clean the floor of the pool.

Fine tune your system by finding the minimum speed required to fully lift the heads.

Cleaning the Filtration System

For optimum cleaning efficiency, routinely clean the pool pump basket, skimmer and filter screens. Clean the pool filter whenever pressure increases 3 psi above normal clean-filter operating pressure. Refer to the manufacturer's instructions of the filter for proper cleaning instructions.

Changing Cleaning Heads

The cleaning head MUST be in the full down position before removal (see Figure 13).

1. Attach the Head Removal Tool (part number 3-17-8) to the pool pole.
2. Snap tool into the head.
3. Turn counter-clockwise (1/4 of a turn) to release head from collar.
4. Pull and lift head out of collar.

To reinstall, simply insert head into collar and turn clockwise to lock it into position.

Winterizing

⚠ CAUTION

To prevent freeze damage in cold climates, remove water from the feed lines that are above the freeze line and seal the valve.

1. Remove the cassette assembly. Refer to instructions on Page 11.
2. Remove any cleaning heads located above the freeze line (step or bench heads).
3. Use compressor or blower to blow water from discharge lines.
4. Insert winterizing plugs into ports on the valve bottom or use 2-way valves on each line. (see page 8)
5. Place winterizing plugs into collars that are above water line to prevent runoff from filling the lines and refreezing.

Troubleshooting

If the Caretaker cleaning system displays the following actions, adjustments may be necessary to restore performance. Refer to exploded parts diagram for part references.

Action: Dirty spots appear.

Solution:
1. Clean the pool filter, pump basket, and skimmer baskets.
2. Make sure all auxiliary valves (surface returns, waterfall, spa overflow, etc.) are closed.
3. Ensure proper pressure, heads are rotating, proper nozzles are installed, and valve is rotating from zone to zone.

Action: Dirt is trapped between heads.

Solution:
1. Verify that the heads on each side of dirt are pointed in the same direction. Advance a head, if necessary, using the head removal tool to ratchet the head up and down until nozzle points in the correct direction.
2. Increase the cleaning time.
3. May need to flow balance.

Action: Cleaning head advances, but is not cleaning.

Solution:
1. Check for debris in the nozzle.
2. Remove cleaning head and run pump for two (2) full cycles on problem bank. Check nozzle and reinstall head.

Action: Cleaning head will not pop up or does not go down.

Solution:
1. Remove the head. Inspect the cleaning head and collar for plaster remnants or debris.
2. With system running on the problem bank, lightly depress the problem head using a telescoping pool pole.

Action: Pressure is lower than normal.

Solution:
1. Clean the pool filter, pump basket, and skimmer baskets.
2. Make sure all auxiliary valves (surface returns, waterfall, spa overflow, etc.) are closed.
3. Confirm that the pool pump is operating normally.
4. Verify that the valve plate is completely over a port.

Action: The 6-Port valve does not cycle.

Solution:
1. Clean the pool filter, pump basket and skimmer baskets.
2. Make sure all auxiliary valves (surface returns, waterfall, spa overflow, etc.) are closed.
3. Check pressure gauge on supply line to ensure that you have water flowing to the valve. Pressure should be 14-22 PSI.
4. Turn pump on and off several times to clear system.
5. Remove cassette and rotate fan by hand to check that the gears are functioning properly.
6. If necessary, use part number WK000033 to replace the cassette assembly.

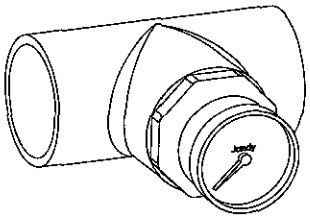
REVOLUTION™
Caretaker 6-Port Valve

NO.	PART #	DESCRIPTION	QTY
1	WK000029	Band Clamp	1
2	WK000031	Housing Lid	1
3	WK000032	O-Ring	1
4	WK000033	Cassette Assembly	1
5	WK000034	Body Housin	1
6	WK000035	Gauge Assembly	1

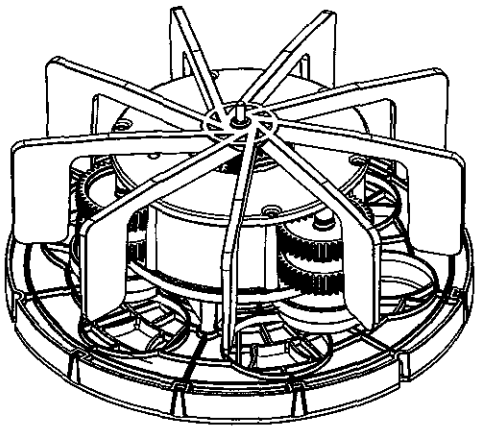
WARNING:

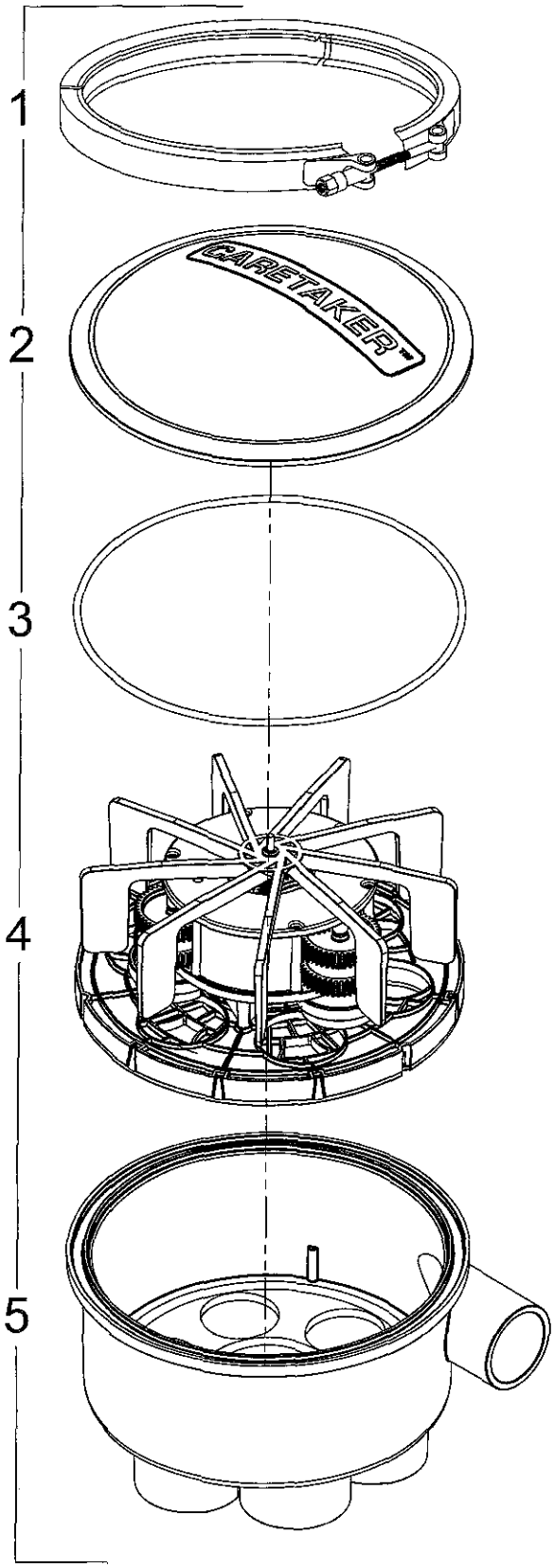
Disassembly of the cassette will void the warranty.

6



Cassette Assembly





Notes

CARETAKER™

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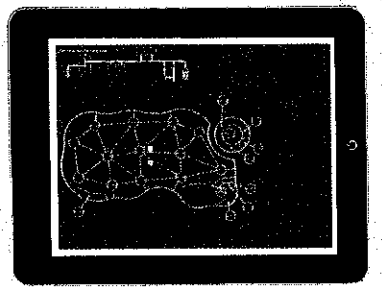
855.280.6465 toll-free | 801.906.6701 fax
caretaker.custsupport@zodiac.com
www.caretakersystem.com

T0073500 Rel-0001

HISTORY

Developed in 1972, Caretaker is the original in-floor pool cleaning system. Color-matching cleaning heads installed to fit flush with the pool floor makes the system virtually invisible while working continuously to keep a pool clean and provide complete circulation of water, heat, and chemicals. In-floor cleaning systems replace vacuum hoses and other stand-alone pool cleaners allowing for more time spent enjoying your pristine pool.



FREE DESIGN SERVICE

Each Caretaker In-Floor Cleaning System is custom designed for the unique size and shape of the pool. Submit pool building plans through caretakersystem.com/submit-plans or email design@zodiac.com and a trained technician will provide a free custom Caretaker Certified Pool Design within 1-2 business days.

CARETAKER™
2660 S Decker Lake Blvd Suite 300
West Valley City, UT 84119

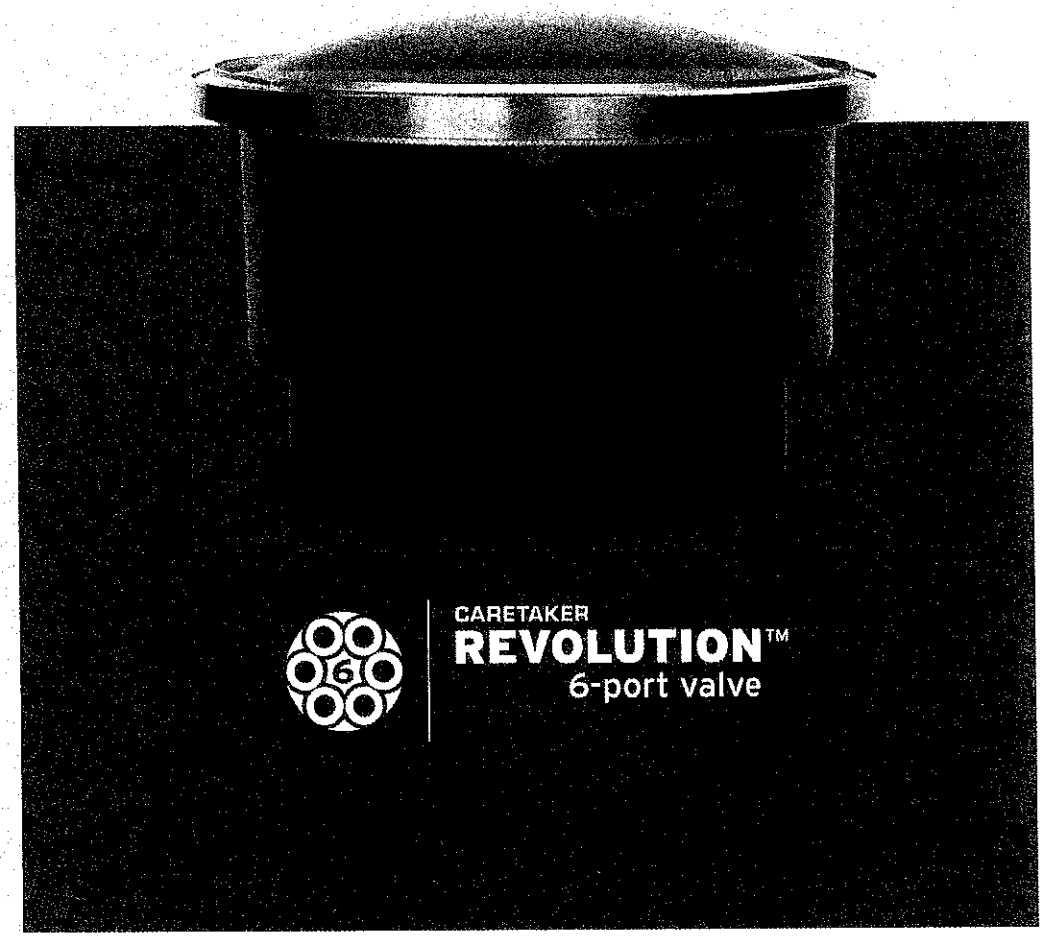
CaretakerSystem.com | 1.855.280.6465

H0656800 Rel-0002

CARETAKER™

In-Floor Pool and Spa Cleaning

THE REVOLUTION IS HERE



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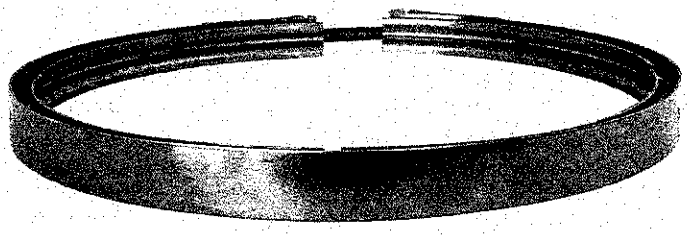
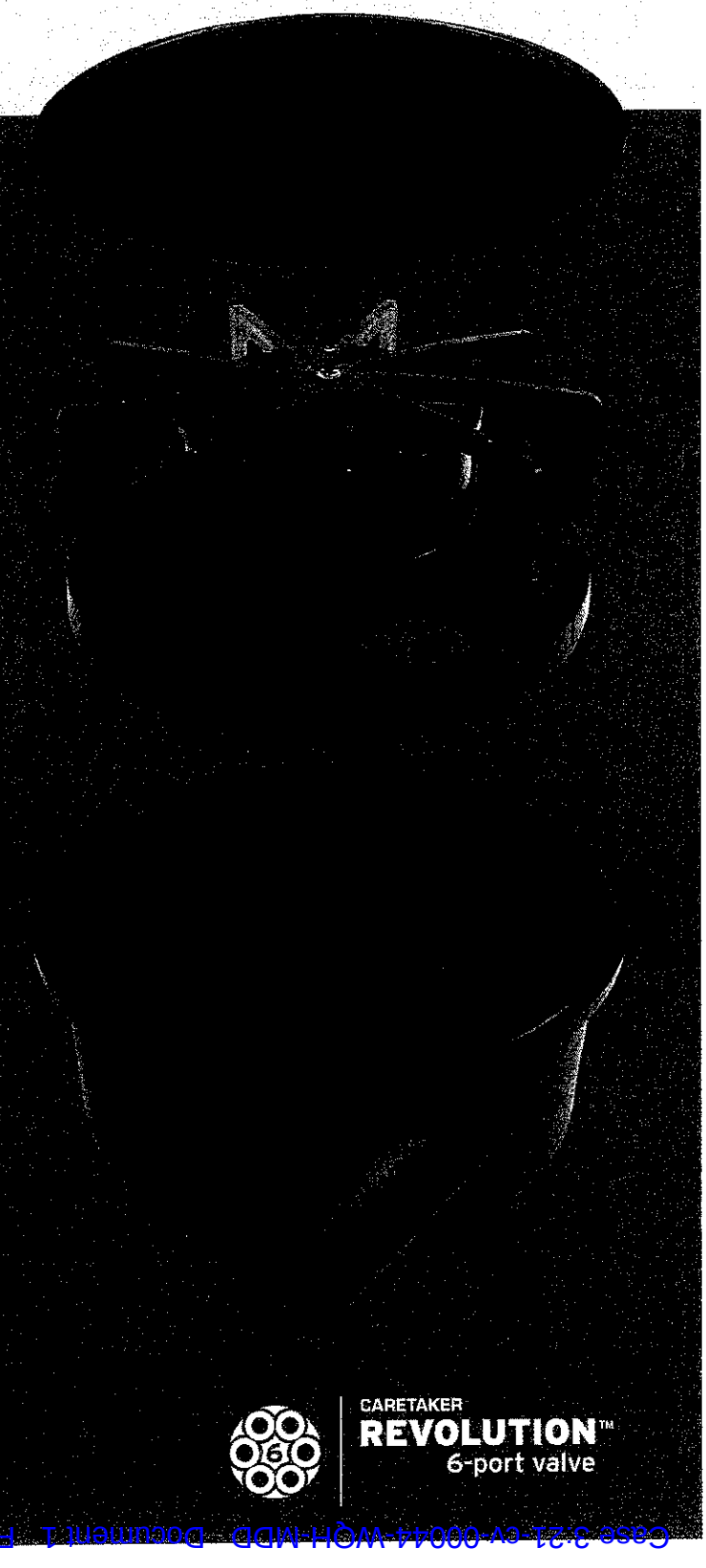
JOIN THE REVOLUTION



We call the all-new 6-port in-floor pool cleaning valve - *Revolution.* With its revolutionary design and unique functionality, the in-floor pool cleaning industry will never be the same.



EASY AND SIMPLE:

Revolution features incredible, hassle-free internal accessibility thanks to a single band clamp allowing for quick access to the easily replaceable, one-piece gear cassette. We had service technicians in mind when designing Revolution as our easiest and simplest in-floor cleaning valve to service.

NEW LEVELS OF EFFICIENCY:

With the new and innovative design of the QuickFlow™ Hydraulic Shifting System, Revolution maximizes full-pressure cleaning time with shorter and smoother zone shifting. The result, more debris being flushed out of the pool with reduced head loss. Revolution also eliminates dead head and is low pressure compatible.

- Larger 2" diameter ports
- Longer, full-pressure, cleaning time on each zone
- Little to no head loss
- Compatible with low speed pumps

ULTIMATE DURABILITY:

Featuring an all-new design and industry-exclusive technologies, Revolution is built for ultimate durability. Designed and tested in-house, Revolution passed the most rigorous tests we have ever conducted. This is the most durable in-floor pool cleaning valve we've built. Ever.

- Ultra-durable valve plate with ball bearings
- Extra thick gears
- Dual-reinforced support shafts
- New, strong hydraulic drive system

WARRANTY

Limited 1-year warranty or 3-years for Certified Zodiac ProEdge Builders

Join the Revolution at
caretakersystem.com/revolution

CARETAKER
REVOLUTION™
6-port valve

Court Name: USDC California Southern
Division: 3
Receipt Number: CAS126800
Cashier ID: asepulve
Transaction Date: 01/11/2021
Payer Name: THOMAS LOPEZ

CIVIL FILING FEE- NON-PRISONER
For: THOMAS LOPEZ
Case/Party: D-CAS-3-20-CV-000044-WQH
Amount: $402.00

CHECK
Check/Money Order Num: 6000678847
Amt Tendered: $402.00

Total Due: $402.00
Total Tendered: $402.00
Change Amt: $0.00

There will be a fee of $53.00
charged for any returned check.