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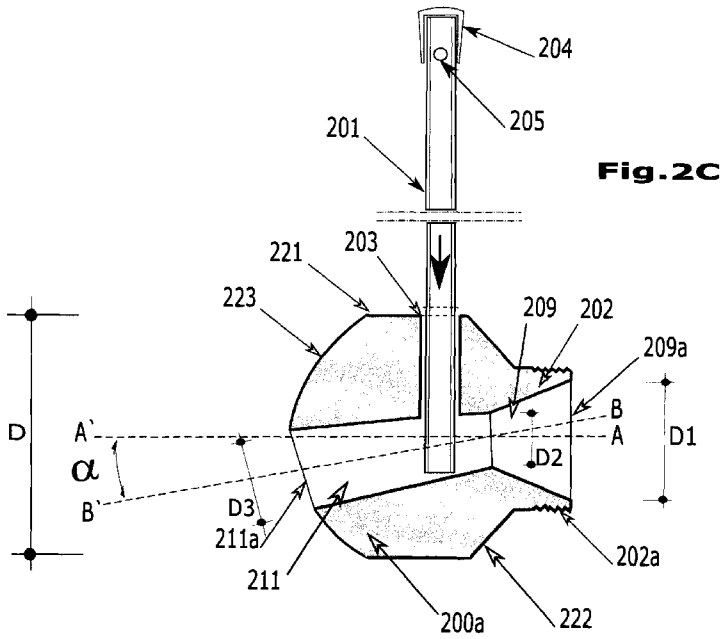
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(54) **Title:** POOL AERATOR



(57) **Abstract:** The invention provides an improved pool aerator for pools with water recirculation circuit, comprising a hemispherical body (200a) and an atmospheric air intake pipe (201). The body of the aerator comprises a rounded plastic object, having in the middle area a cylindrical portion (221), and at one end with a connecting means (202) to the pool nozzle, the middle portion of the aerator body continuing with a hemispherical dome (223), inside being a Venturi tube made in the form of two intersected frustoconical spaces - one for inlet (209) and the other (211) for mixing and discharging water mixed with air - whose two axes form an angle (α) between 10 and 20 degrees. The mixing hole communicates with a vertical cylindrical hole (203), in which the intake pipe is inserted by sliding, until the inner wall of the frustoconical hole is reached.

[Continued on next page]

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POOL AERATOR

FIELD OF THE INVENTION

The present invention relates to a improved pool water aerator, being intended for use in swimming pools equiped with a water recirculation and filtration circuit, used in order to oxygenate the water.

BACKGROUND OF THE INVENTION

[001] Maintaining the pool water at the quality parameters recommended by the rules in force is an essential factor for a public or private pool, and is achieved by recirculating, filtering, aerating and adding specialized chemical agents.

[002] Water recirculation is an essential process that helps keep a pool clean and within quality parameters. Recirculation is performed in a circuit with the help of a pump, the circuit being provided with water filtration means (a sand filter or filtering paper) and after the water is filtered of the impurities, it is sent back to the pool.

In parallel with water filtration, several chemical agents dissolved in the pool water are used, such as: slow chlorine, shock chlorine, flocculant, anti-algae, pH minus, pH plus and others, all with different specialized functions in terms of water cleaning and maintaining it in optimal parameter conditions.

[003] The advantages of water aeration are multiple, known and verified for many years, being use in obtaining of a very clear water, like spring running water compared to the stagnant water of a lake, with a fresh and airy smell. Aeratios improve pool water circulation, substantial reduction of chlorine odor, obtaining an uniform distribution of chlorine in the water mass, which leads to an increase in its efficiency while reducing the amount needed to be used and, at the same time, prevents the production of algae in water or on the walls and bottom of the pool; Aeration also helps to get a faster cleaning of the water surface of floating impurities that reach the surface collector (skimmer). At the same time, by aerating the water with small diameter air bubbles, a high transfer of oxygen dissolved in the water is obtained, which improves the appearance and quality of the water by: maintaining some species of aerobic bacteria that consume organic matter in water; destruction of anaerobic bacteria that produce CO2 and hydrogen sulfide (responsible for the unpleasant smell of stagnant water); oxidation of Mg and Fe particles responsible for water

opacification; bonding the microparticles (like limestone) into larger particles, which can then be easily retained by the filter; increasing the pH of the water without changing the alkalinity (due to the elimination of CO2 from the water at an accelerated rate). In addition, aeration helps to heat or cool the water depending on the temperature of the aspirated air (the air is hot during the day and cold at night) by lowering its temperature in the water mass. In the end, the aeration ensures an extremely appreciated visual effect which is the air bubbles passing through the pool water.

SUMMARY OF THE INVENTION

[004] The present invention relates to an improved swimming pool aerating device, that is working even at low water jet pressures, and it can be easily installed by simply screwing in the discharge nozzles of any type of existing swimming pool made out of concrete, metal or plastic, either above or underground, in order to mix the water coming from the filtration system, with the air captured from the water surface, mixture coming out in the swimming pool water in the form of a jet of high efficiency small air bubbles, which contributes to obtaining a high degree of oxygen dissolved in water, in the purpose of its aeration. Aerating the water of a swimming pool brings many benefits, its effects can be easily found in nature, just comparing the crystalline water of a running water, to the cloudy, dark and full of algae water of a stagnant water. The aerator comprising a plastic hemispherical or frustoconical spray body made in the form of a Venturi tube and an atmospheric air intake pipe. The air is attracted inside the aerator by the negative pressure generated by the moving water of the existing pool filtration circuit (the Venturi effect).

[005] The technical problem solved by the invention is the aeration of water from a swimming pool provided with a recirculation-filtration circuit, using a simple and efficient device, which can be mounted very easily to already built swimming pools.

[006] The aerator for swimming pools provided with a water recirculation circuit, according to the invention, is defined by its characteristics which are highlighted in claims 1-8.

STATE OF THE ART

[007] From physics - fluid dynamics, we know about the Venturi effect (application of Bernoulli's principle), according to which an increase in the velocity of a laminar flow fluid flowing going through a tube, when passing through a narrow portion of a tube, occurs simultaneously with a decrease in pressure.

[**008**] Since 1797, when Giovanni Venturi discovered the effect that bears his name, many applications have been built based on his principle, some of them that are successfully applied in the most diverse fields of technology, of which, perhaps the best known is the airbrush or sprayer, but also in the aeration of ponds and pools waters, wich shows there is a continuing need for improvement.

[**009**] Typical devices used for water aeration are shown, for example, in the following United States of America patents:

US 10 202 781 B1	Orosco
US 4,308,138	Woltman
US 6,398,194 B1	Tsai et al
US 6,237,897 B1	Marina
US 6,367,097 B1	Arnau
US 5,172,432 A	Beland
US 3,745,994 A	Kane
US 3,577,571 A	Belinson
US 6,138,293 A	Mathews

[**010**] In relation to the state of the art, the pool aerator according to the invention has the following advantages:

- high efficiency of aeration of pool water, including at low water jet pressures, due to the ideal positioning and angle of the air pipe mounted in the frustoconical cone hollow body of the Venturi tube, located inside the aerator body
- extremely easy installation, by simply screwing in the existing nozzle of the pool, and does not require operations inside or behind the wall of the pool,
- gives the possibility to be used in an already built swimming pool, at any time, and it is not necessary to drain the water for installation, nor even to stop the pump from functioning,
- possibility to be used in underground or above ground pools, made of concrete, plastic or metal,
- simple, elegant design and safe to operate at a low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[011] Some embodiments of the invention is given below in connection to Fig.1-4 which represents:

- Fig.1 is an overview of a first embodiment of the pool aerator according to the invention;
- Fig.1A, is a detailed view of the pool aerator from Fig.1;
- Fig.1B, is a longitudinal cross-section view of the pool aerator from Fig.1;
- Fig.2, is a perspective view of the preferred embodiment of the pool aerator;
- Fig.2A, is a side view of the preferred embodiment of the pool aerator from Fig.2;
- Fig.2B, is a comparative cross-sections of the hemispherical shape of the aerator of Fig.2, superimposed over that of the aerator in Fig.1;
- Fig.2C, is a longitudinal cross-section view of the preferred embodiment of the body of the pool aerator in Fig.2, and of the air intake pipe from the atmosphere;
- Fig.2D, is a cross-section view of the aerator of Fig.2, mounted in the existing nozzle of the pool;
- Fig.3, is a perspective view of an alternative of the preferred embodiment of the pool aerator body according to the invention;
- Fig.3A, is a side view of the body of the pool aerator from Fig.3;
- Fig.3B, is a longitudinal cross-section of the body of the pool aerator from Fig.3;
- Fig.4, is a top view and a longitudinal cross-section of a pool provided with two pool aerators according to the invention.

DETALIED DESCRIPTION OF THE INVENTION

[012] The invention consists of two plastic parts, which work on the Venturi principle, the first part being mounted in the existing discharge nozzle in the pool, and the second, which brings the air from the atmosphere from the water surface, into the aerator.

[013] With reference to Fig.1 and Fig.1A, the pool aerator with water recirculation circuit includes a spray body **100** and a intake pipe **101** of the atmospheric air. The spray body **100** consists of a frustoconical plastic tube, being provided at the smaller diameter end with a connecting means **102** to a recirculated water outlet/nozzle, in the pool, below the level of the pool water; the other end,

larger in diameter, is free for the evacuation of the aspirated air mixed with recirculated water, in the pool water.

[**014**] With reference to Fig.1B, cross-section through the aerator of Fig.1, the longitudinal axis of the frustoconical plastic tube of the spray body **100** is inclined at an angle (α) between 10 - 20 degrees from the horizontal (perpendicular to the basic plane of the connecting means **102**, so that the intake pipe once inserted in the body of the aerator stands in a vertical position, parallel to the pool wall. In the length of the spray body **100**, it is provided with a branch having also the role of cylindrical guide **103**, in which it is inserted by sliding, until reaching the inner wall of the tube, the lower end of intake pipe **101**. The axis of the cylindrical guide **103** is vertical, so that between this and the longitudinal axis of the spray body there is an angle (α) between 10 – 20 degrees, an optimal angle and position to produce the maximum efficiency of the density of air bubbles dispersed in water.

[**015**] With reference to Fig.1, Fig.1A and Fig.1B, the air intake pipe **101** consists of a plastic pipe having an outer diameter that allows it to slide through the cylindrical guide **103**, and a length that makes its upper third stand above the water. This pipe is closed at the upper end by a plug **104**, being provided, also at this end, in a first embodiment, with a longitudinal slot **105** for air absorption, which ensures a low noise level during operation.

[**016**] In a first concrete embodiment, the spray body **100** has the approximate dimensions: the outer diameter of 18 mm at the narrow end, the outer diameter of 43 mm at the opposite end, and a total length of about 195 mm. As shown in Fig.1, Fig.1a and Fig.1b, the aerator has, at the narrow end, cast, a cylindrical flange threaded on the outside, acting as a connecting means **102**, having a hollow interior, also of frustoconical shape which is connected on the same diameter to a plastic tube of frustoconical shape of the spray body **100**. With the help of this flange the body of the spray **100** is screwed into the body of an existing nozzle in the pool wall (after removing the nozzle ball), thus ensuring the installation of the aerator in the pool. Also, in the first third of the length of the aerator from the connecting means **102**, there is a cylindrical guide **103**, cast, with an inner diameter of about 11 mm, a height of about 15 mm, vertically oriented, a guide in which the pipe is inserted by sliding air intake **101**.

[**017**] The air intake pipe **101** consists of a cylindrical plastic pipe with an outer diameter of about 11 mm and a length of about 350 mm, which makes one end of it stand out of the water, the recommended dimensions for mounting the discharge nozzles being 300 mm below the water level.

This pipe is closed at one end by a plug **104** and also provided, also at this end, with an air slot **105** of approximate dimensions: 0,5 mm width and 30 mm length. This slot ensures a low level of noise during the operation of the aerator according to the invention.

[**018**] The spray body **100** is mounted by screwing the threaded flange **102** into an existing pool discharge nozzle, the air intake pipe **101** is slid into the spray body **100** so that the air slot **105** remains on the surface of the water and the water jet exits through the discharge nozzle, due to the optimal angle of inclination and the position in relation to the spray body **100**, sucks the air through the intake pipe **101**; air and water are mixed in the spray body and then evacuated with pressure over a length of about 2 m resulting in a curtain of air bubbles **106** (illustrated in Fig.4).

[**019**] With reference to Fig.2, Fig.2A and Fig.2C, in a preferred embodiment of the invention, the body of the aerator (**200a**) comprises a rounded plastic object, having in the middle area a cylindrical portion (**221**), which continues at the end from the pool wall with a connecting means (**202**), corresponding to the outlet of the water recirculated in the pool, the middle portion (**221**) of the aerator body (**200a**) continuing with an area in the form of a hemispherical cap/dom (**223**), inside the aerator body (**200a**) being a Venturi tube made in the form of two frustoconical holes with a small common base, one for inlet (**209**) and the other (**211**) for mixing and discharging water mixed with air. The axes (**A-A'**) and (**B-B'**) of the two frustoconical trunks form an angle (α) between 10 and 20 degrees. The frustoconical mixing hole (**211**) communicates in the first third from the common base with a cylindrical hole (**203**) having a vertical axis, in which the lower end of the intake pipe (**201**) is inserted by sliding, until the inner wall of the frustoconical mixing and discharge hole (**211**) is reached.

[**020**] The pool aerator according to the invention has two parts, preferably of plastic material - a pool aerator body **200a** with rounded anti-impact shapes and an atmospheric air intake pipe **201** which is inserted into the aerator body, operating based on the Venturi principle, inside of the aerator body being found the pool aerator from Fig.1, as shown schematically in Fig.2B, adjusted to be surrounded and to fit the dimensions of the rounded body, for reasons of impact protection, robustness and for an enhanced aesthetic appearance. The body of the pool aerator shall be mounted by means of a connection means **202** to the water recirculation circuit, at least in one of the existing outlets to the pools with water recirculation circuit (preferably to be mounted in all, otherwise it is necessary to block the outlets without aerators in order to equalize the water pressure at the outlet), holes located below the pool water level, and pipe **201** that sucks air from the atmosphere from the water surface, is attached to the spray body in a cylindrical hole **203** which communicates with said

Venturi tube. The pipe **201** has an upper end closed with a cylindrical plug/lid **204**, with an inner diameter larger than the outer diameter of the intake pipe **201**, below which is provided an atmospheric air intake hole **205**, hidden/masked by plug **204**.

[**021**] The body **200a** of the pool aerator with water recirculation circuit consists of a plastic object, generally round, having in the middle a cylindrical shape portion **221** of diameter **D**, this middle portion continuing at the end from the wall of the pool (which is mounted in the recirculated water discharge nozzle), with the connecting means **202**, made in the form of a cylindrical portion with a diameter **D1** smaller than the diameter **D**, the connection between them being made by a frustoconical portion **222**. The connecting means **202** is provided with an external thread **202a** corresponding to the recirculated water outlet in the pool, if it is provided with an internal thread. At the opposite end (from the pool wall), the middle portion **221** of the aerator body **200a** is continued with a hemisphere-shaped portion (spherical caps) **223**.

[**022**] The Venturi tube inside the body **200a** of the aerator is made in the form of two frustoconical holes **209** and **211** having the small common base (neck) of diameter **D2**. The frustoconical inlet hole **209** is located mostly in the connecting means **202**, has the horizontal axis **A-A'**, and the inlet port **209a** of the diameter **D1**. The frustoconical conical hole **211** for mixing and evacuating water mixed with air, is located mostly inside the middle portion and the end of the hemispherical portion, having the longitudinal axis **B-B'** inclined with respect to the axis **A-A'** of the the frustoconical inlet hole **209,** with an angle α around 10 - 20° (sexagesimal degrees), and the outlet **211a** of diameter **D3**. The frustoconical hole **211** communicates in the first third from the common base, with a cylindrical hole **203** having the vertical axis (perpendicular to the axis **A-A'** of the frustoconical inlet hole **209**). In the cylindrical hole **203** is inserted by sliding, until the inner wall of the frustoconical mixing and discharge hole **211** is reached, the lower end of the intake pipe **202**, thus automatically reaching the maximum yield position and angle.

[**023**] With reference to Fig.2C, the air intake tube **201** consists of a cylindrical pipe preferably made of plastic having an outer diameter that allows sliding through the cylindrical hole **203**, and a length that makes its upper end stand above the water. This pipe is closed at the upper end by a plug **204**, being also provided, also at this end, with an air absorption hole **205**, round in shape or rectangular slot which ensures a low level of noise during operation. The intake pipe can be made of a single section or of several sections, for example two or three, tightly connected to each other.

[024] Fig.2D shows, in section, the way in which the pool aerator **200a** and the air intake pipe **201** are mounted in the existing nozzle in the wall of a swimming pool with reinforced concrete walls, according to the invention.

[025] With reference to Fig.3, Fig.3A and Fig.3B, in an alternative of the preferred embodiment, the body **200b** of the pool aerator has the connecting means **202** made in the form of a cylindrical portion of diameter **D1**, being elongated so that the inlet hole continues with a cylindrical hole **202b** of the same diameter **D1** with the large base of the cone, said cylindrical hole (**202b**) being threaded inwards (female threaded) corresponding to the recirculation of the water recirculated in the pool, if it is provided with external thread, and which ensures connection to the recirculation circuit of water.

[026] The body **200a** or **200b** of the pool aerator, with the exception of the vents of the Venturi tube **209-211** and the cylindrical hole **203**, may be solid (made of homogeneous material) or may have a honeycomb structure with the provision of continuous surfaces for the aerator body (outer surface), for the Venturi **209-211** tube and for the cylindrical hole **203**.

[027] In a concrete/preferred embodiment, the body of the sprayer **200a** is made of plastic, honeycomb structure and has inside the frustoconical hole **209** with approximate dimensions: the diameter **D1** of the inlet **209a** of 40 mm and the diameter of the neck **D2** of 18 mm, the frustoconical hole **211** having a diameter **D3** of the outlet **211a** of approximately 28 mm, the cylindrical hole **203** having a diameter slightly larger than 11 mm. The entire spray body of the aerator has a total length of about 90 mm and the diameter **D** of the middle portion of 80 mm.

[028] In the concrete/preferred embodiment of the invention, the air intake tube **201** consists of a cylindrical plastic pipe having an outer diameter of less than or equal to 11 mm and a length of about 350 mm, which makes an end rise at least 50 mm above the water level of the pool water (the recommended elevations for mounting the nozzles/discharge holes when constructing a pool are 300 mm below the water level).

[029] The spray body **200a** or **200b** is mounted by screwing the threads **202a** and **202b** into an existing pool discharge nozzle, the air intake pipe **201** is slid into the spray body so that the air intake hole **205** remains at the surface of the water and the water jet pushed by the pump of the circuit coming out of the discharge nozzle sucks the air through the intake pipe **201**. Air and water are mixed in the body of the sprayer and evacuated with pressure over a length of about 2 m, resulting in a curtain of air bubbles **140** (illustrated in Fig.4).

[030] Fig.4 shows the top view and cross-section of a swimming pool (provided with a water recirculation circuit, which includes, among others, water filtration and treatment elements, a pump that absorbs water from the pool and discharges it back through some holes/discharge nozzles) in which two aerators according to the invention are mounted.

[031] Use of other known materials for making the spray body **100**, **200a** or **200b** and/or intake pipe **101** or **201**, and use of other known profiles (polygon, ellipse, oval) for making the spray tube body **100**, **200a** or **200b** and/or intake pipe **101** or **201**, are obvious to a person skilled in the field and fall within the scope of the claims set out below.

CLAIMS

1. Swimming pool aerator provided with a water recirculation circuit, comprising a body with a Venturi tube channel and an atmospheric air intake pipe above the pool, **characterized in that** said spray body consists of a frustoconical plastic tube (**100**), provided at the smaller diameter end with a connecting means (**102**) to a recirculating water outlet in the pool, below the pool water level, the other end, of larger diameter, being free for the jet outlet of the aspirated air together with the recirculated water, in the pool water, the axis of the frustoconical plastic tube (100) being inclined at an angle (α) between 10 - 20 degrees to the perpendicular to the base plane of the connecting means (102), and in the first third of the length of the spray body (**100**) from the end with the connecting means (102), said spray body (**100**) being provided with a cylindrical branch (**103**) also acting as guide, in which the lower end of the intake pipe (**101**) is inserted by sliding until it reaches the inner wall of the tube.

2. Pool aerator according to claim 1, **characterized in that** the connecting means (**102**) is a cylindrical flange threaded on the outside, also having a hollow interior, which is also frustoconical in shape, being connected to the frustoconical plastic tube of the spray body (**100**), the threaded flange screwed into the existing nozzle in the pool wall, thus ensuring the installation of the aerator in the pool.

3. Pool aerator according to Claim 1, **characterized in that** the air intake pipe (**101**) consists of a plastic pipe having an outer diameter which allows it to slide through the cylindrical guide (**103**), and a length that makes its upper third rise above the water, the pipe being closed at the upper end by a plug (**104**) and being provided, also at this end, with a longitudinal slot (**105**) for air absorption, which ensures a low noise level during operation.

4. A hemispherical pool aerator provided with a water recirculation circuit comprising a spray body made in the form of a Venturi tube (**200a**) and an atmospheric air intake pipe (**201**), **characterized in that**, in preferred embodiment, the body of the aerator (**200a**) comprises a rounded plastic object, having in the middle area a cylindrical portion (**221**), which continues at the end from the pool wall with a connecting means (**202**), corresponding to the outlet of the water recirculated in the pool, the middle portion (**221**) of the aerator body (**200a**) continuing with an area in the form of a hemispherical cap (**223**), inside the aerator body (**200a**), being a Venturi tube made in the form of two frustoconical holes with a small common base - one for inlet (**209**) and the other (**211**) for mixing and discharging water mixed with air - the

frustoconical inlet hole (**209**) being located for the most part between the connecting means (**202**) having a horizontal axis (**A-A'**), and the other frustoconical hole (**211**) is located mostly in the middle of the connecting means and the spherical portion of the aerator body, having a longitudinal axis (**B- B'**) inclined in relation to the horizontal axis (**A-A'**) of the frustoconical inlet hole (**209**) at an angle (α) of about 10 to 20 degrees, the frustoconical mixing hole (**211**) communicating in the first third from the common base with a cylindrical hole (**203**) having a vertical axis, in which the lower end of the intake pipe is inserted by sliding, until the inner wall of the frustoconical mixing and discharge hole (**211**) is reached (**201**).

5. Pool aerator according to Claim 4, **characterized in that** the connecting means (**202**) is made in the form of a cylindrical portion with a diameter (**D1**) smaller than the diameter (**D**) of the middle portion, the connection between them being made by a frustoconical portion (**222**), the connecting means (**202**) being provided with an external thread (**202a**) corresponding to the outlet used for evacuating recirculated water in the pool.

6. Pool aerator according to Claim 4, **characterized in that** the connecting means (**202**) of the body (**200b**) of the pool aerator is made in the form of a cylindrical portion, is elongated so that the frustoconical inlet hole (**209**) continues with a cylindrical hole (**202b**) of the same diameter as the large base of the cone, said cylindrical hole (**202b**) being threaded inwards corresponding to the outer thread of the outlet used for evacuating recirculated water in the pool.

7. Pool aerator according to Claims 4 to 6, **characterized in that** the intake pipe is closed at the upper end by a plug (**204**) and is also provided, also at this end, with an air intake hole (**205**), hidden under the plug, round in shape, which ensures a low level of noise during operation.

8. Pool aerator according to Claims 1 to 6, **characterized in that** the intake pipe (**101**, **201**) can be made of a single section or of several sections, tightly connected to each other.

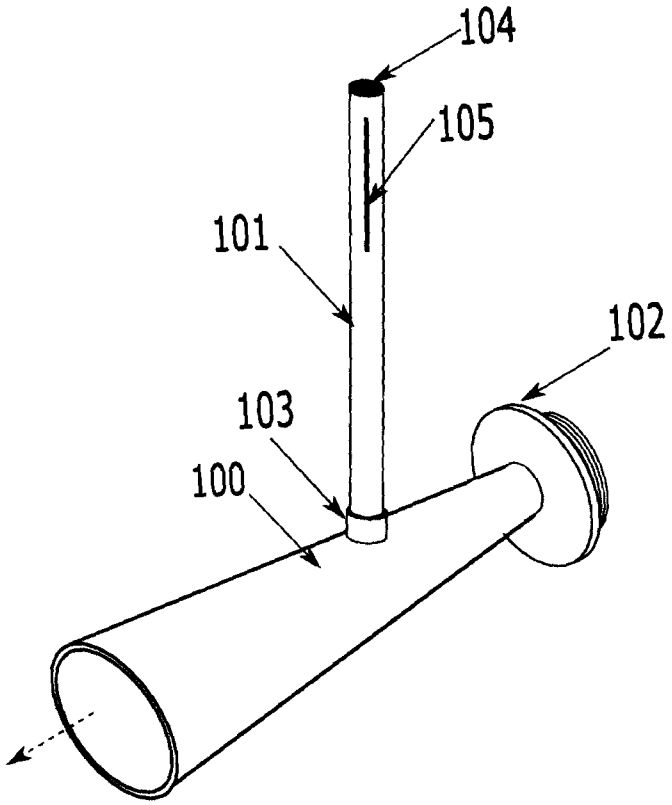


Fig.1

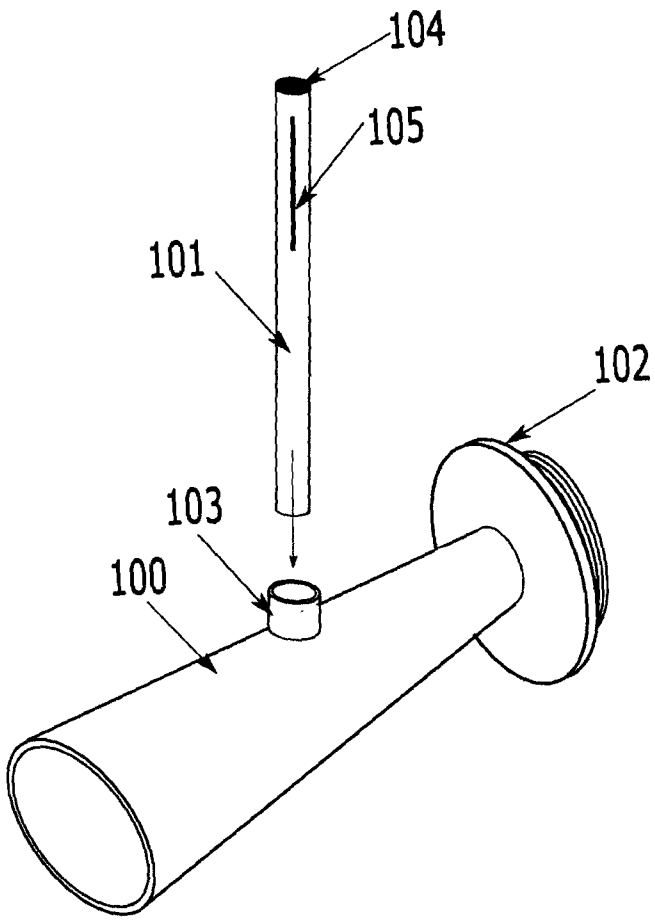


Fig.1A

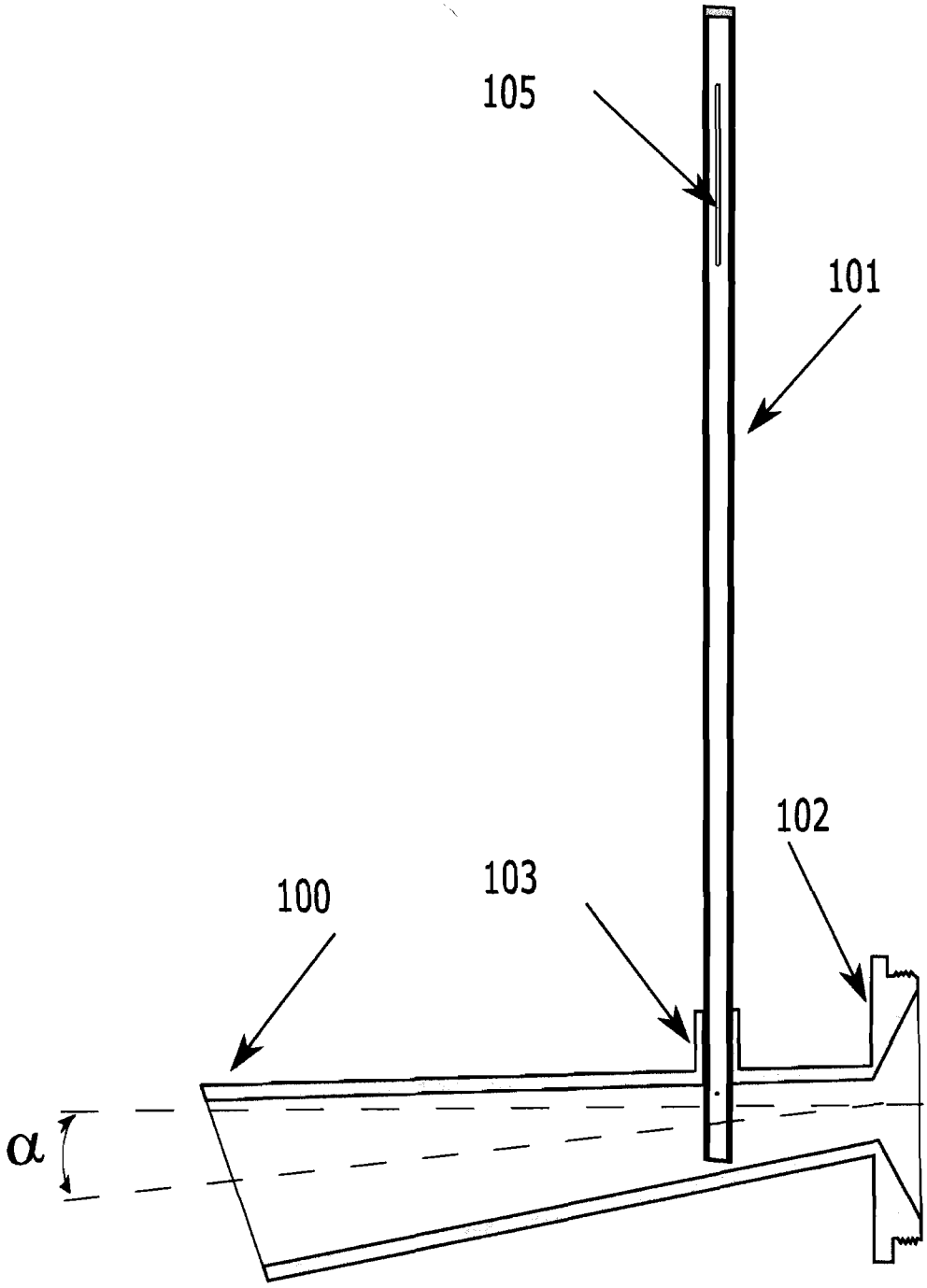


Fig.1B

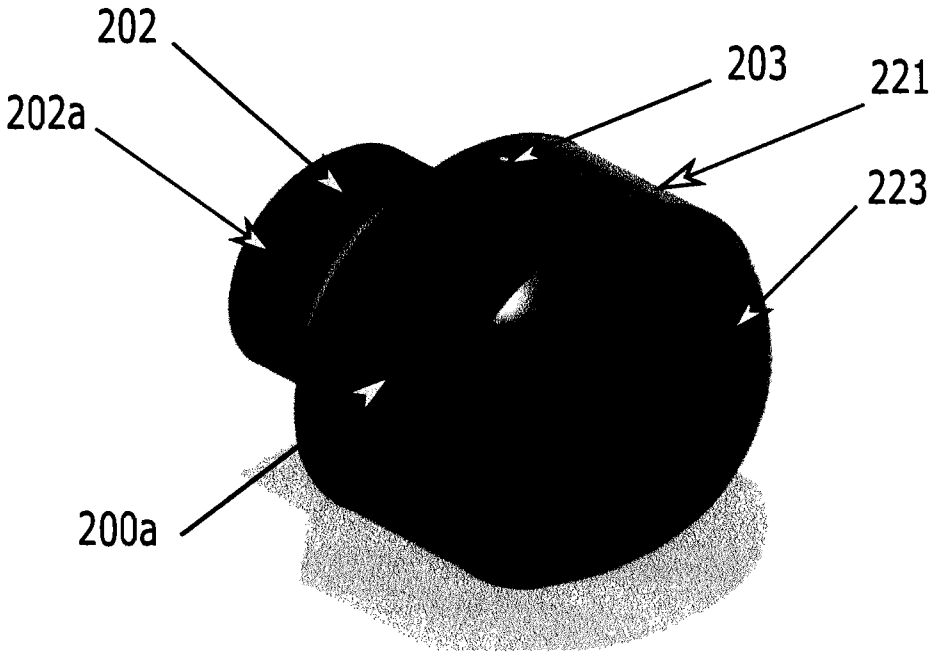


Fig.2

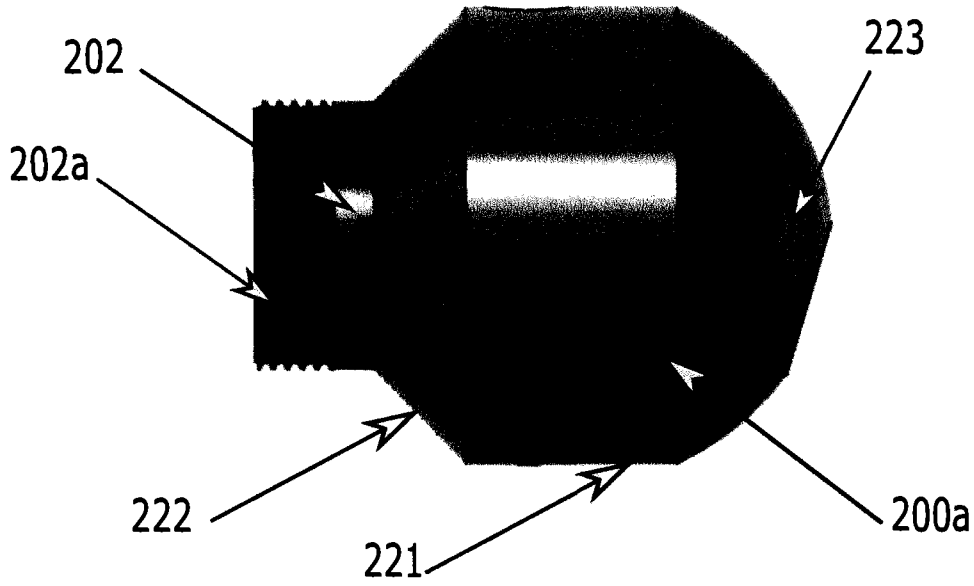


Fig.2A

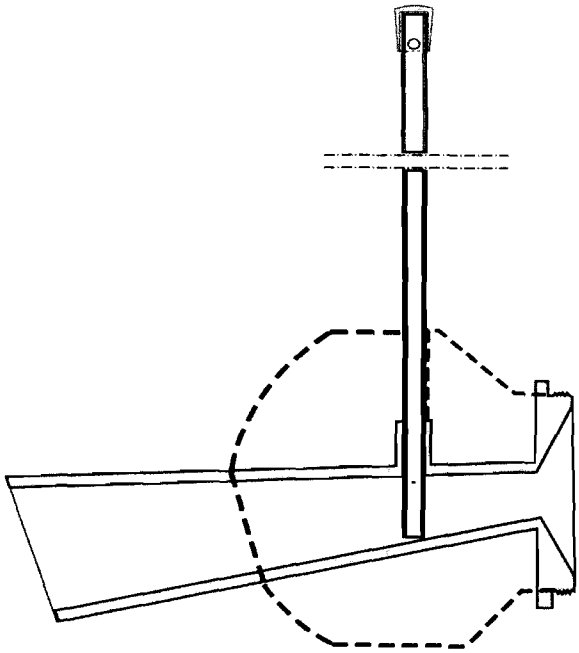


Fig.2B

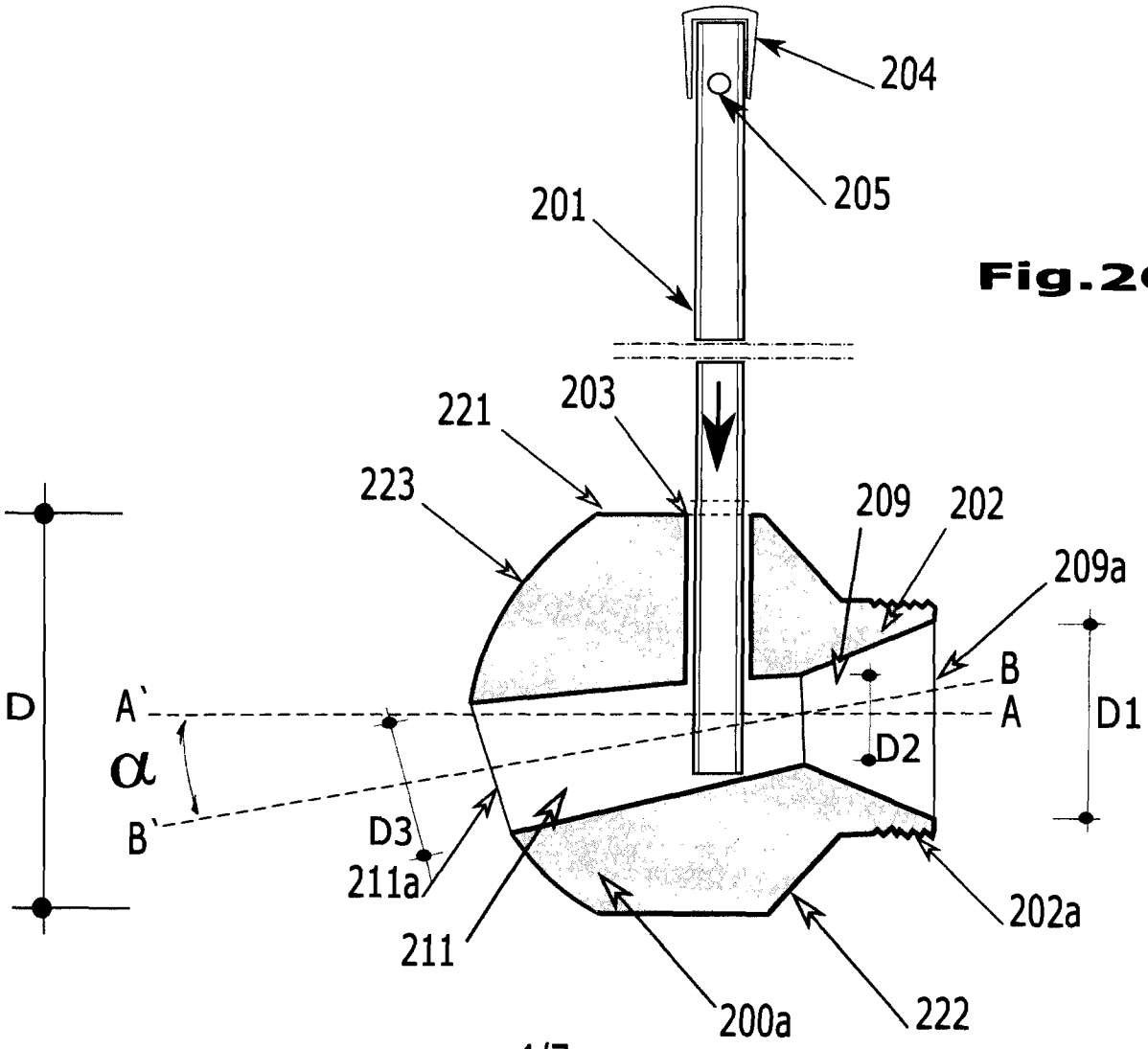

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223
209
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B
A
D
A`
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B`
D1
D2
D3
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211
202a
200a
222

Fig.2C

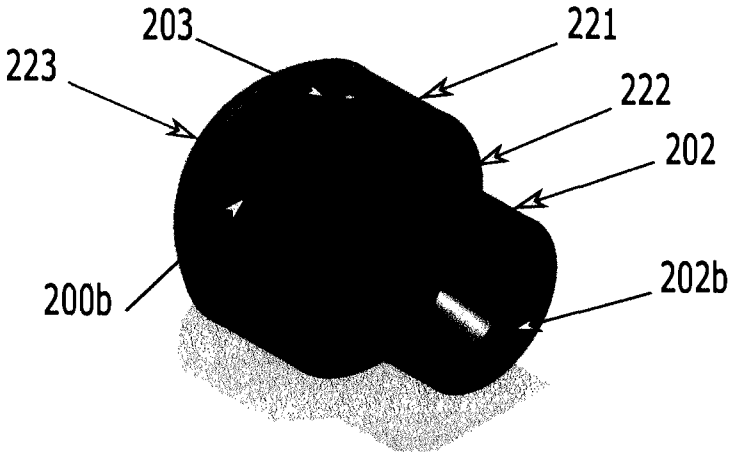


Fig.3

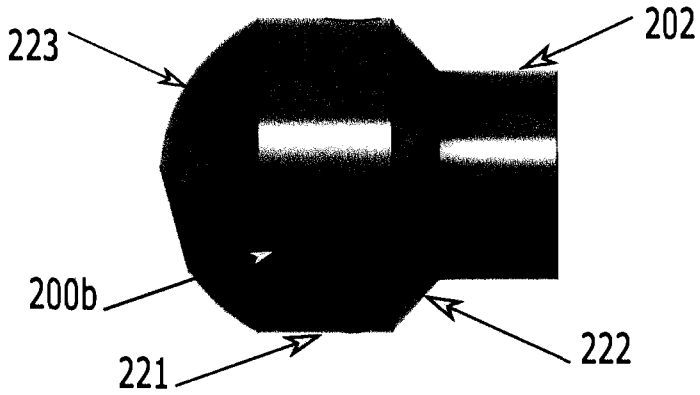


Fig.3A

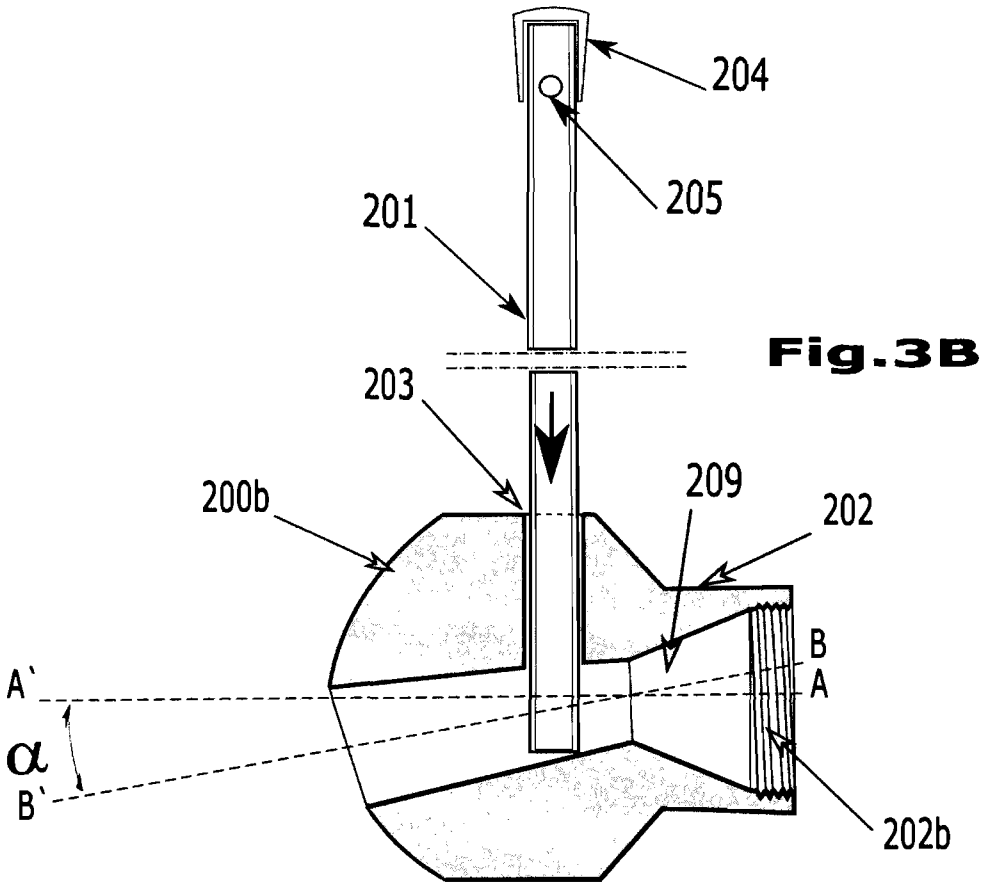


Fig.3B

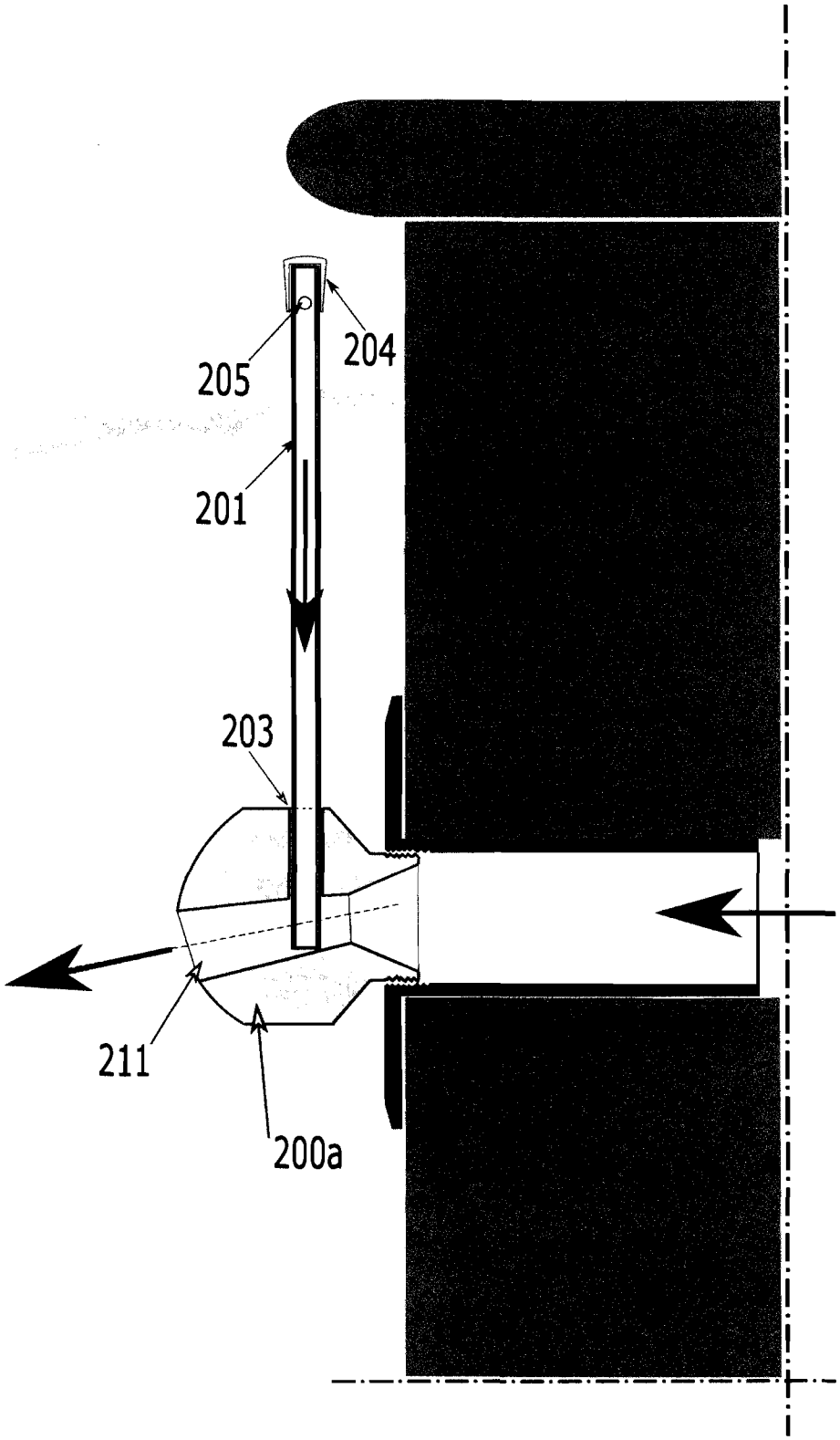
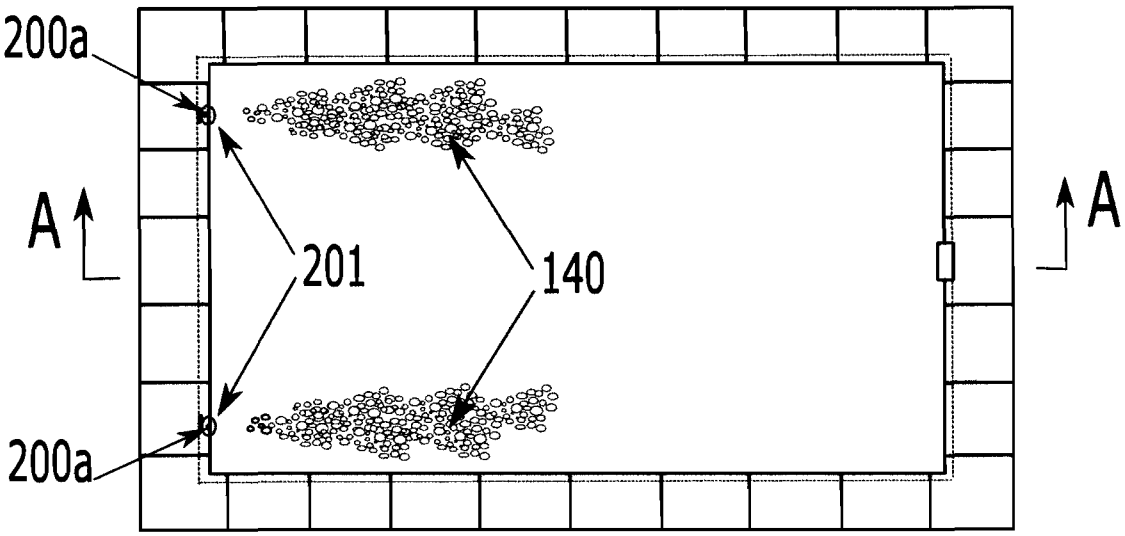


Fig.2D



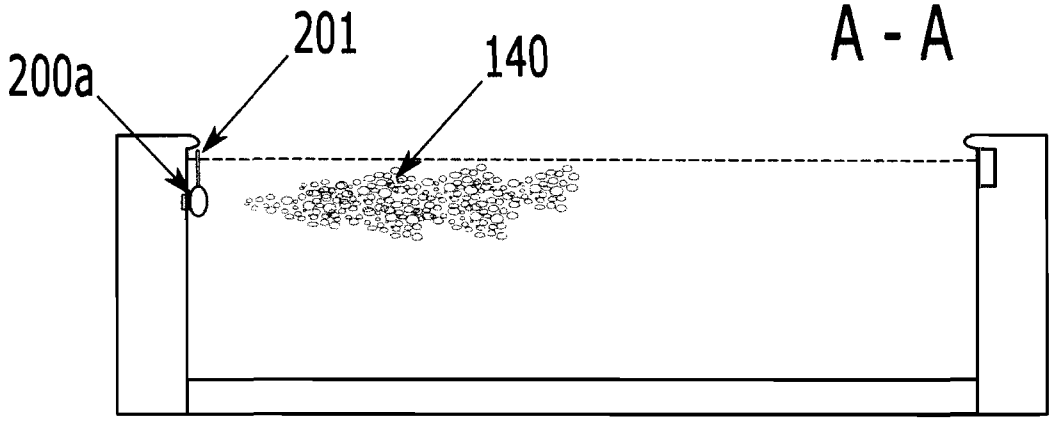


Fig.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/RO 2020/000009

A. CLASSIFICATION OF SUBJECT MATTER

E04H 4/12 *(2006.01)*
B01F 3/04 *(2006.01)*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04H 4/00, E04H 4/12, B01F 3/00, B01F 3/04, B01F 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSearch (RUPTO Internal), USPTO, PAJ, Espacenet, Information Retrieval System of FIPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CA 2027297 A1 (HOULE MARIO) 11.04.1992, claims, abstract, drawings	1-8
A	US 5172432 A (BELAND FERNAND) 22.12.1992, drawings	1-8
A	CH 561059 A5 (STEJSKAL ALFRED E) 30.04.1975, drawings	1-8
A	US 3577571 A (MARINE SWIMMING POOL EQUIPMENT CO) 04.05.1971, drawings	1-8
A	WO 2016/181209 A1 (INTEX MARKETING LTD et al.) 17.11.2016, drawings	1-8
A	FR 2760356 A1 (ROUMAGNAC MAX), 11.09.1998, drawings	1-8

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 November 2020 (12.11.2020)	26 November 2020 (26.11.2020)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer A. Burdakova Telephone No. 8(495)531-65-15