

PATENT COOPERATION TREATY

From the:
INTERNATIONAL SEARCHING AUTHORITY

To:

IP GATEWAY PATENT & TRADE MARK
ATTORNEYS PTY LTD
Suite 9a Springwood Chambers
3360 Pacific Highway
SPRINGWOOD, Queensland 4127
Australia

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing (*day/month/year*)
24 December 2018

Applicant's or agent's file reference
P1967WO0-AQU

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/AU2018/051066

International filing date (*day/month/year*)
28 September 2018

Priority date (*day/month/year*)
29 September 2017

International Patent Classification (IPC) or both national classification and IPC
B01F 3/04 (2006.01) F16K 24/06 (2006.01) F16K 31/12 (2006.01) F16K 15/00 (2006.01)

Applicant
AQUATEC MAXCON PTY LTD

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606,
AUSTRALIA
Email address: pct@ipaustalia.gov.au

Date of completion of this opinion
24 December 2018

Authorised Officer
Dominique Wisniewski
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. +61262850725

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/AU2018/051066

Box No. I **Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:
 - The international application in the language in which it was filed
 - A translation of the international application into, , which is the language of a translation furnished for the purposes of international search (under Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account **the rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/AU2018/051066

Box No. IV **Lack of unity of invention**

1. In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- paid additional fees
 - paid additional fees under protest and, where applicable, the protest fee
 - paid additional fees under protest but the applicable protest fee was not paid
 - not paid additional fees
2. This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- complied with
 - not complied with for the following reasons:

See Supplemental Box for Details

4. Consequently, this opinion has been established in respect of the following parts of the international application:
- all parts
 - the parts relating to claims Nos.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International Application No.

PCT/AU2018/051066

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 8-17, 21-25, 31-32, 42, 47, 49-50	YES
	Claims 1-7, 18-20, 26-30, 33-41, 43-46, 48	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-50	NO
Industrial applicability (IA)	Claims 1-50	YES
	Claims NONE	NO

2. CITATIONS AND EXPLANATIONS:

CITATIONS

D1: GB 2537893 A (FLOWTHROUGH LTD) 02 November 2016
D2: US 20040164433 A1 (JAGER) 26 August 2004
D3: CN 103118991 A (KUBOTA KK) 22 May 2013
D4: US 6406005 B1 (LAWSON et al.) 18 June 2002
D5: US 20170210652 A2 (FRANKEL et al.) 27 July 2017
D6: US 3736953 A (VAALBURG) 05 June 1973
D7: GB 1337110 A (PEGLERS LIMITED) 14 November 1973
D8: CN 106870806 A (LIUZHOU JINGYANG ENERGY-SAVING TECH RES DEV CO LTD) 20 June 2017

NOVELTY (N)

Claims 1-5, 7, 20 and 26-28 are not novel in light of each of D1 and D2, claims 6 and 18 are not novel in light of D1, and claim 19 is not novel in light of D2. Therefore the claims do not comply with PCT Article 33(2).

Regarding claims 1 and 26-28:

D1 discloses an elongate diffuser (fig. 8a, 530) comprising:

- a diffuser base comprising a diffuser body (fig. 4, 132),
- a membrane (fig. 4, 142) attached to the diffuser body,
- wherein the membrane is connected to the diffuser body so that introduction of gas at a working pressure into the diffuser displaces part of the membrane from contact with the diffuser body to provide an elongate sealed compartment (fig. 4, 136) between the membrane and a surface provided mainly or wholly by the diffuser body (page 5, lines 29-36),
- the compartment having a first and second lateral side interface regions (fig. 4, 152 on right and left side) where the membrane contacts the diffuser body, and a laterally intermediate region (fig. 4, 132) where the membrane is spaced apart from the diffuser body,
- gas can pass from the compartment through the membrane for aeration of a fluid in which the diffuser is immersed (page 6, lines 34-38),
- wherein the diffuser body surface which bounds the compartment comprises a recessed portion which is recessed away from the membrane between the first lateral interface region and the second lateral interface region (page 7, lines 18-21 and fig. 4, 132), compared to a planar surface (fig. 1c) extending between the first lateral side interface region and the second lateral side interface region, to thereby provide the compartment with larger transverse cross sectional size than would be provided by a planar surface extending from the first lateral side interface region to the second lateral interface region (clear when comparing fig. 1c and fig. 4).

D2 discloses an elongate diffuser (paragraphs 1 and 14) comprising:

- a diffuser base comprising a diffuser body (fig. 1, 1),
- a membrane (fig. 1, 2) attached to the diffuser body,
- gas is introduced into the diffuser, the membrane displaces from contact with the diffuser body (paragraphs 21-22) to form an elongate sealed compartment (fig. 1, space between 2 and 11), which has side interface regions (fig. 1, 8 right and left side) where the membrane contacts the diffuser body and a laterally intermediate region (fig. 1, 11) where the membrane is spaced apart from the diffuser body,
- gas passes through the membrane for aeration of a fluid (paragraph 21), and
- the diffuser body surface comprises a recessed portion (fig. 1, 11) which is recessed away from the membrane between the first lateral interface region and the second lateral interface region (paragraphs 21-22).

D2 does not explicitly compare the diffuser body with the recessed portion to a diffuser body with a planar surface, in order to show that the recessed portion provides a larger transverse cross sectional size than would be provided by a planar surface. However it is considered that this feature would be readily apparent to the PSA, and therefore inherently disclosed in D2.

Regarding claims 2-7, 18 and 20, D1 discloses the entire surface being recessed, having a uniform curvature and having a concave cross-section (fig. 4, 132), the membrane engaging the surface across the recessed region when no gas pressure is applied (fig. 3, 32), a single gas inlet (fig. 2a, 38) is provided into the compartment, the compartment is the only distribution channel for distributing gas along the length of the diffuser (page 6, lines 34-38), a non-return valve is provided in the gas inlet of the diffuser (page 7, line 5), and the diffuser is a fine bubble diffuser (page 6, lines 15-17).

Regarding claims 2-5, 7 and 19-20, D2 discloses at least 75% of the surface being recessed, having a uniform curvature and having a concave cross-section (fig. 1), the membrane engaging the surface across the recessed region when no gas pressure is applied (fig. 2), the compartment is the only distribution channel for distributing gas along the length of the diffuser (paragraph 21), the diffuser body underside provides a single open channel structure (fig. 1, 3), and the diffuser is a fine bubble diffuser (paragraph 21).

Claims 29-30 are not novel in light of D3 and therefore do not comply with PCT Article 33(2).

D3 discloses an elongate diffuser (fig. 1) and method of operating a diffuser, the diffuser comprising:

- a diffuser base comprising a diffuser body (fig. 2, 2) with a membrane (fig. 2, 3) attached,
- gas is introduced into the diffuser, the membrane is displaced from contact with the diffuser body (abstract) to form an elongate sealed compartment (fig. 2, space between 2 and 3),
- the membrane fits substantially unstressed on the base when no air gas pressure is provided to the diffuser (fig. 5a, 3),
- the membrane is displaced away from the base, without substantial stretching, at a first low level of gas pressure to form the sealed compartment (fig. 5b, 3 and page 18, third paragraph),
- the membrane is sufficiently stretched at a second higher level of gas pressure, to thereby open slits or apertures therein for formation of bubbles in the body of liquid (fig. 5c, 3 and page 18, fifth paragraph).

References to the body of the specification of D3 were made based on the English translation available from Espacenet.

Claims 33-41, 43-46 and 48 are not novel in light of D6 and therefore do not comply with PCT Article 33(2).

Regarding claim 33, D6 discloses a valve system comprising a purge control element (fig. 6, 52) movable between a first control position for closing a water outlet when there is little or no accumulated water to be purged, and a second control position for opening the outlet in response to the presence of water to be purged (column 2, lines 36-39), and a flow check valve (fig. 6, 10) through which water is, in use, purged, said flow check valve being a one-way valve which allows flow of water therethrough in the purging direction and in use substantially prevents flow of water therethrough in the reverse direction (column 2, lines 55-68).

Regarding claims 34-41, 43-46 and 48, D6 discloses the flow check valve being provided downstream of the water outlet (column 1, line 66 - column 2, line 2), the purge control element comprises a float (fig. 6, 52), the first control position corresponds to a non-floating position (column 2, lines 36-39), the water outlet comprises a seat (fig. 6, 28) engageable by the float, the water outlet comprises an inlet part (fig. 6, 14) of the flow check valve, the second control position corresponds to a floating position of the float (column 2, lines 36-39), the flow check valve comprises a flexible part deformable into an open configuration by upstream pressure (column 2, lines 54-62) and which remains closed when pressure is present downstream (column 2, lines 62-68), the flow check valve has a slot (fig. 6, 12) which is closed in the absence of pressure on either side of the valve and in the presence of pressure downstream (column 2, lines 62-68), the slot opens in the presence of pressure upstream (column 2, lines 54-62), the slot is provided by two opposed parts (fig. 6, 16) of the flow check valve, and the purge valve system comprises a float restraining member (fig. 6, 56) in a first position to retain the float in the non-floating position (column 2, lines 40-43).

Please note that I have construed claim 33 to be merely indicative that the purge valve system is intended for use in an air inlet pipe of an air diffuser, and therefore the purge valve system is not limited to that use.

INVENTIVE STEP (IS)

Given the above novelty objection, claims 1-7, 18-20, 26-30, 33-41, 43-46 and 48 do not involve an inventive step.

Claims 29-30 lack an inventive step in light of each of D1 and D4-D5, and claims 13 and 31 are not inventive in light of D1. Therefore the claims do not comply with PCT Article 33(3).

D1 discloses an elongate diffuser (fig. 8a, 530) and method of operating a diffuser, the diffuser comprising:

- a diffuser base comprising a diffuser body (fig. 4, 132) with a membrane (fig. 4, 142) attached,
- gas is introduced into the diffuser, the membrane is displaced from contact with diffuser body (page 5, lines 29-36) to form an elongate sealed compartment (fig. 4, 136),
- the membrane fits substantially unstressed on the base when no air gas pressure is provided to the diffuser (page 5, line 34 - page 6, line 6),
- the membrane is sufficiently stretched at a high level of gas pressure, to thereby open slits or apertures therein for formation of bubbles in the body of liquid (page 6, lines 18-21).

The above features are also disclosed in D4 and D5 (D4 column 1, lines 63-65; column 4, lines 17-18, 48-53; fig. 1, 1; D5 fig. 7, 210, 220; paragraph 30).

The claimed invention differs from D1 and D4-D5 in that the membrane is displaced away from the base, without substantial stretching, at a low level of gas pressure (compared to the high gas pressure).

It is clear when looking at the disclosures of D1 and D4-D5 that the membrane would not immediately move from an unstressed state at no air pressure, to a stretched state at high gas pressure. There would be a transition period when the membrane is beginning to inflate, a compartment has formed and the membrane is not completely stretched.

Including the feature of applying a low level of gas pressure to achieve the compartment without substantial stretching of the membrane is considered to be a mere workshop improvement. It is an arrangement that any competent worker in the art would be expected to make directly and without difficulty and by routine steps alone.

The claimed invention also differs from D5 in that the diffuser is elongate. D5 discloses a circular shaped diffuser instead (fig. 2). However this feature is considered to be a mere design choice, as it does not appear to have a material effect on the invention, and therefore cannot contribute to providing an inventive step.

D1 discloses the features of claim 1, which are imported into dependent claim 13. Claim 13 recites additional features similar in scope to claim 30, and so therefore claim 13 is not inventive in light of D1 for the same reasons discussed above. Regarding claim 31, D1 discloses operating a diffuser to aerate a liquid, as well as the features of claims 1, 29 and 30, which are imported into claim 31.

Claims 8-12, 14-17, and 21-24 lack an inventive step in light of each of D1 and D2, and therefore do not comply with PCT Article 33(3).

Neither D1 or D2 disclose a gas inlet provided at one end of the diffuser body, the interior compartment distributing gas between the inlet and the other end of the diffuser body where there is a gas outlet, the diffuser being at least 6 metres long, 10-20cm wide, a having a length to width ratio of at least 20, at one end of the diffuser base the membrane is sealed to the surface of the diffuser

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International Application No.

PCT/AU2018/051066

irrespective of whether the membrane is inflated, at least one end of the compartment is shaped to provide a smooth transition from a convex end to the recessed centre, an end piece is provided at one end of the diffuser body which partially blocks the recess, the diffuser is mounted to a support by two mounting plates which when used separately can engage with the diffuser body at a desired axial position, but when used together can only be disengaged from the diffuser body at predefined axial positions, can extend between the engaged side portions of the diffuser and can be retained in a fixed position relative to the diffuser, and the two plates can be connected together and are identical.

However these features are considered to be mere design choices, as they do not appear to have a material effect on the invention, and therefore cannot contribute to providing an inventive step.

Claim 25 lacks an inventive step when the disclosures of each of D1 and D2 are combined with the disclosure of D6, and therefore does not comply with PCT Article 33(3).

Each of D1 and D2 disclose an elongate diffuser as recited in claim 1.

The claimed invention differs from D1 and D2 in that the air inlet pipe of the diffuser provides a purge valve comprising a purge control element movable between a first control position for closing a water outlet when there is little or no accumulated water to be purged, and a second control position for opening the outlet in response to the presence of water to be purged, and a flow check valve through which water is, in use, purged, said flow check valve being a one-way valve which allows flow of water therethrough in the purging direction and in use substantially prevents flow of water therethrough in the reverse direction.

D6 discloses a valve system comprising a purge control element (fig. 6, 52) movable between a first control position for closing a water outlet when there is little or no accumulated water to be purged, and a second control position for opening the outlet in response to the presence of water to be purged (column 2, lines 36-39), and a flow check valve (fig. 6, 10) through which water is, in use, purged, said flow check valve being a one-way valve which allows flow of water therethrough in the purging direction and in use substantially prevents flow of water therethrough in the reverse direction (column 2, lines 55-68).

There is a motivation to combine disclosures of each of D1 and D2 with D6 because D1 and D2 both discuss improvements of a diffuser for aerating a body of water, and D6 is directed towards an improved check valve with durable construction.

The problem addressed by the specification is the need to provide improved means for a diffuser for the aeration of a fluid. With this problem in mind, the skilled addressee reading D1 and D2 would be likely to combine it with documents, such as D6, that provide details of well known process elements and equipment in order to achieve the same diffuser defined in the claimed invention.

Claim 32 lacks an inventive step in light of each of D1 and D3-D5 and therefore does not comply with PCT Article 33(3).

None of D1 and D3-D5 disclose operating a the diffuser at a first lower level of gas pressure which is also marginally greater than the fluid pressure immediately adjacent the diffuser, and then operating the diffuser at a second higher level of gas pressure which is at least 2 kPa greater than the fluid pressure immediately adjacent the diffuser. However this feature is considered to be a mere design choice, as it does not appear to have a material effect on the invention, and therefore cannot contribute to providing an inventive step.

Claims 42, 47, and 49-50 are not inventive in light of D6, and therefore do not comply with PCT Article 33(3).

D6 does not disclose the features of the flexible part of the flow check valve comprising an elastomer material, the flow check valve comprising a duck-bill valve, and moving the float restraining member by increasing the air pressure in the vessel or the air inlet pipe from which water is being purged.

However these features are considered to be common general knowledge in the art. They are well known choices available to the person skilled in the art in the area of valves used in water treatment systems, and therefore cannot contribute to providing an inventive step.

INDUSTRIAL APPLICABILITY (IA)

The invention defined in the claims is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT because it can be made by, or used in, industry.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International Application No.

Supplemental Box

PCT/AU2018/051066

Continuation of: **Box IV**

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

This Authority has found that there are different inventions based on the following features that separate the claims into distinct groups:

Group 1: claims 1-24 and 26-32 are directed to an elongate diffuser comprising a diffuser base and a membrane. The feature of the elongate diffuser comprising a diffuser base and a membrane is specific to this group of claims.

Group 2: claims 33-50 are directed to a purge valve system for use in an air inlet pipe of an air diffuser. The feature of the purge valve system is specific to this group of claims.

Claim 25 introduces features from group 2 and yet is additionally appended to claims in group 1.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

When there is no special technical feature common to all the claimed inventions there is no unity of invention.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions is a diffuser. However it is considered that this feature is generic in this particular art.

Therefore this common feature cannot be a special technical feature. Hence there is no special technical feature common to all the claimed inventions and the requirements for unity of invention are consequently not satisfied *a priori*.

It was considered that search and examination for the invention in group 2 would require more than negligible additional search and examination effort over that for the invention in group 1. An invitation to pay additional fees was issued, and all fees were paid by the applicant. Therefore all claims were searched and examined in this report.

This Authority has identified a further lack of unity within group 1 that separates claims 1-32 into distinct groups:

Group A: Claims 1-28 are directed to an elongate diffuser comprising a diffuser base comprising a diffuser body and a membrane, wherein the membrane is connected to the diffuser body so that introduction of gas at a working pressure into the diffuser displaces part of the membrane from contact with the diffuser body to provide an elongate sealed compartment between the membrane and a surface provided mainly or wholly by the diffuser body, and wherein a diffuser body surface which bounds the compartment comprises a recessed portion which is recessed away from the membrane. The feature of a diffuser body surface which bounds the compartment comprises a recessed portion which is recessed away from the membrane is specific to this group of claims.

Group B: Claims 29-32 are directed to a diffuser comprising a diffuser base and a membrane, where gas is introduced at a working pressure to flex the membrane and displace at least some of the membrane away from the base, to thereby form an interior compartment between the membrane and the base without substantial stretching of the membrane. The feature of the compartment forming without substantial stretching of the membrane is specific to this group of claims.

In the above groups of claims, the identified features may have the potential to make a contribution over the prior art but are not common to all the claimed inventions and therefore cannot provide the required technical relationship. The only feature common to all of the claimed inventions is a diffuser comprising a diffuser base comprising a diffuser body, a membrane attached to the diffuser body, wherein the membrane is connected to the diffuser body so that introduction of gas at a working pressure into the diffuser displaces part of the membrane from contact with the diffuser body to provide an elongate sealed compartment between the membrane and a surface provided mainly or wholly by the diffuser body. However this feature does not make a contribution over the prior art because it is disclosed in:

D1: GB 2537893 A (FLOWTHROUGH LTD) 02 November 2016 (fig. 4, 132, 136, 142, 152; fig. 8a, 530; page 5, lines 29-36; page 6, lines 34-38).

The above feature common to all the claims is also disclosed in D2-D5 (see "NOVELTY (N)" and "INVENTIVE STEP (IS)" in Box No. V).

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International Application No.

Supplemental Box

PCT/AU2018/051066

Therefore in the light of this document this common feature cannot be a special technical feature. Therefore there is no special technical feature common to claims 1-32 and the requirements for unity of invention are consequently not satisfied *a posteriori*.

It was considered that search and examination for the invention in group B would require negligible additional search and examination effort over that for the invention in group A, and therefore all of claims 1-32 have been searched and examined in this report.