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(54) Title: APPARATUS, SYSTEM, AND METHOD FOR CLEANING, HEALING, AND TISSUE REGENERATION

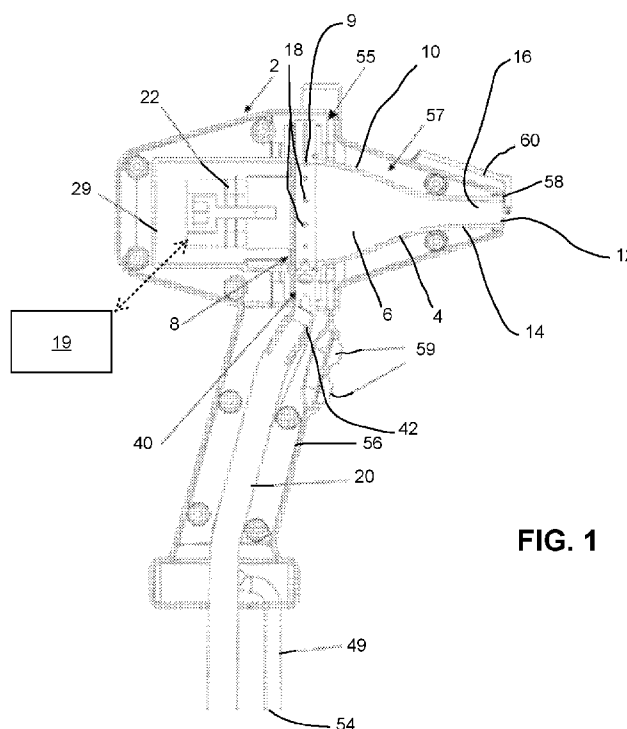


FIG. 1

(57) Abstract: An apparatus (2) includes a conical body (4) defining a chamber (6) configured to contain a liquid and having a nozzle (14) located at a front end of the conical body and configured to discharge a stream of the liquid, a rear wall (8) positioned at a rear of the conical body and at least partially defining the chamber, an inlet (18) in communication with the chamber for introducing the liquid into the chamber, an acoustic transducer (22) positioned at the rear wall, the acoustic transducer configured to generate acoustic energy and to introduce the acoustic energy into the liquid contained in the chamber, and an exhaust system including a vent (9) in communication with the chamber to remove a mixture of liquid and gas bubbles from the chamber, an exhaust leading away from the vent, and an outlet (54) in communication with the exhaust and configured to discharge the liquid and gas bubbles into or adjacent to the stream.



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- *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

(88) **Date of publication of the international search report:**
10 February 2022 (10.02.2022)

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2021/055238

A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)
B08B A61M B05B

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009 022857 A (MISHIRO SHOJI)	1, 3, 9, 10
	5 February 2009 (2009-02-05)	
Y	paragraph [0013] - paragraph [0015];	2, 28
A	figures 1, 4, 5	4

X	WO 2018/228848 A2 (UNIV SOUTHAMPTON [GB])	25-27
	20 December 2018 (2018-12-20)	
	cited in the application	
Y	paragraph [0037] - paragraph [0039];	28
	figure 1	

	-/--	

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

"E" earlier application or patent 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

8 October 2021

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20/12/2021

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2021/055238

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>MORTIMER B J P ET AL: "AN ELECTROMAGNETIC LIQUID SHOCK WAVE GENERATOR FOR THE PRODUCTION OF A PULSED WATER JET", THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA, AMERICAN INSTITUTE OF PHYSICS FOR THE ACOUSTICAL SOCIETY OF AMERICA, NEW YORK, NY, US, vol. 100, no. 6, 1 December 1996 (1996-12-01), pages 3548-3553, XP000679059, ISSN: 0001-4966, DOI: 10.1121/1.417331</p>	2
A	<p>figure 3</p>	26
A	<p>----- JP 2004 167377 A (COSMO HITEC CO LTD) 17 June 2004 (2004-06-17) abstract; figures 2,3</p>	1
A	<p>----- JP 2001 327900 A (EXCEL ENGINEERING KK) 27 November 2001 (2001-11-27) abstract; figures 1-7</p>	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2021/055238

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:
1-4, 9, 10, 25-28

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4, 9, 10, 25-28

Ultrasonic cleaning apparatus concavely-convexly curved chamber.

2. claims: 5, 11, 15 (completely); 12, 19, 20 (partially)

Ultrasonic cleaning apparatus with pump for drawing mixture from an exhaust vent.

3. claims: 6-8, 13, 14, 16-18, 21-24 (completely); 12, 19, 20 (partially)

Ultrasonic cleaning apparatus with inlet manifold.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2021/055238

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2009022857 A	05-02-2009	JP 4644229 B2 JP 2009022857 A	02-03-2011 05-02-2009

WO 2018228848 A2	20-12-2018	AU 2018285022 A1 CA 3066184 A1 CN 110891692 A EP 3634643 A2 GB 2563212 A US 2020164194 A1 WO 2018228848 A2	30-01-2020 20-12-2018 17-03-2020 15-04-2020 12-12-2018 28-05-2020 20-12-2018

JP 2004167377 A	17-06-2004	NONE	

JP 2001327900 A	27-11-2001	NONE	
