(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 March 2023 (23.03.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/044359 A1

(51) International Patent Classification:
A62C 15/00 (2006.01) *A62C 3/02* (2006.01)
A62C 25/00 (2006.01) *A62C 5/00* (2006.01)

(21) International Application Number:
PCT/US2022/076451

(22) International Filing Date:
15 September 2022 (15.09.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/245,689 17 September 2021 (17.09.2021) US

(71) Applicant: **PYRONEMESIS, INC.** [US/US]; 5251 Olde Stage Road, Boulder, Colorado 80302 (US).

(72) Inventor: **WOLF, Stephen**; 5251 Olde Stage Road, Boulder, Colorado 80302 (US).

(74) Agent: **ASHUR, Dor**; Wilson Sonsini Goodrich & Rosati, 650 Page Mill Road, Palo Alto, California 94304 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:
— *with international search report (Art. 21(3))*

(54) **Title:** PORTABLE MISTING WATER-BASED FIRE EXTINGUISHER

(57) **Abstract:** Described are portable fire extinguishing systems for efficient and rapid fire suppression.

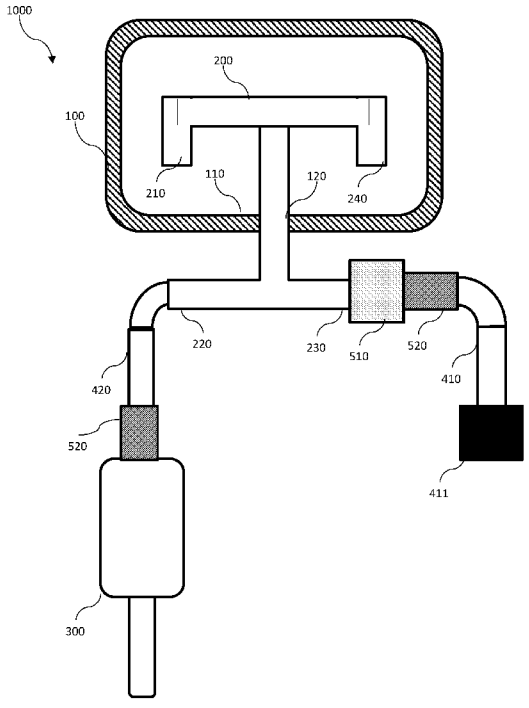

FIG. 2

WO 2023/044359 A1

PORTABLE MISTING WATER-BASED FIRE EXTINGUISHER

CROSS-REFERENCE

[0001] This application claims the benefit of U.S. Provisional Application No. 63/245,689, filed September 17, 2021, which is hereby incorporated by reference in its entirety herein.

BACKGROUND

[0002] Every year millions of acres of land are destroyed due to wildfires. In two of the past five years, wildfire destruction surpassed 10 million acres. Some years have seen the loss of over 40 million acres. Wildfire related loss of homes, farms, vehicles, animal and human life have all increased recently, due to drought, pest infestation, and climatic change.

SUMMARY

[0003] While many current fire extinguishing means exist, many lack the ability to efficiently extinguish large number of bush fires. The low exit velocities and high flow rates of current devices requires large volumes of dispersing agents, which limits portability. As such, the devices and systems herein propel smaller volumes of dispersing agents at higher speeds to more efficiently extinguish fires.

[0004] One aspect provided herein is a portable fire extinguishing system comprising: a dispersing agent tank having a first inner surface comprising a fill port; a pipe fitting fluidically coupled to the fill port, wherein a first termination of the pipe fitting is generally parallel to and offset from the first inner surface; a pressurizer fluidically coupled with a second termination of the fitting; and a fill hose fluidically coupled with a third termination of the fitting.

[0005] In some embodiments, the system further comprises a one-way check valve fluidically coupling the fill hose to the third termination of the pipe fitting. In some embodiments, the system further comprises a quick disconnect fluidically coupling the one-way check valve to the fill hose. In some embodiments, the system further comprises a quick disconnect fitting fluidically coupling the one-way check valve to the fill hose. In some embodiments, the system further comprises a feed hose fluidically coupling the pressurizer to the second termination of the pipe fitting. In some embodiments, the system further comprises a quick disconnect fitting fluidically coupling the feed hose to the pressurizer. In some embodiments, the pipe fitting further comprises a fourth termination that is generally parallel to and offset from the first inner surface. In some embodiments, the fill hose terminates in a female garden hose threaded coupling. In some embodiments, the dispersing agent tank further comprises: a waste belt; a backpack strap; a removable cap; or any combination thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The novel features of the disclosure are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present disclosure will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the disclosure are utilized, and the accompanying drawings of which:

[0007] FIG. 1 shows a first illustration of an exemplary portable fire extinguishing system; per one or more embodiments herein;

[0008] FIG. 2 shows a second illustration of an exemplary portable fire extinguishing system; per one or more embodiments herein;

[0009] FIG. 3 shows a first image of an exemplary portable fire extinguishing system; per one or more embodiments herein;

[0010] FIG. 4 shows a first image of an exemplary portable fire extinguishing system; per one or more embodiments herein;

[0011] FIG. 5 shows an image of a pipe fitting, fill hose, and feed hose of an exemplary portable fire extinguishing system; per one or more embodiments herein; and

[0012] FIG. 6 shows an image of a pipe fitting of an exemplary portable fire extinguishing system; per one or more embodiments herein.

DETAILED DESCRIPTION

[0013] Provided herein, per **FIGS. 1-6**, is an exemplary portable fire extinguishing system **1,000**. As shown in **FIG. 2**, the exemplary portable fire extinguishing system **1,000** comprises a dispersing agent tank **100**, a pipe fitting **200**, a pressurizer **300**, and a fill hose **410**.

[0014] In some embodiments, the dispersing agent tank **100** has a first inner surface **110**. In some embodiments, the first inner surface **110** comprises a fill port **120**. In some embodiments, the dispersing agent tank **100** further comprises a backpack **600**. In some embodiments, the backpack **600** comprises a waste belt **620**, a backpack strap **630**. a removable cap **610**, or any combination thereof. In some embodiments, the dispersing agent tank **100** is configured to contain a dispersing agent. In some embodiments, the dispersing agent comprises a surfactant.

[0015] In some embodiments, the pipe fitting **200** is fluidically coupled to the fill port **120**. In some embodiments, a first termination **210** of the pipe fitting **200** is generally parallel to and offset from the first inner surface **110**. In some embodiments, the pipe fitting **200** further comprises a fourth termination **240** that is generally parallel to and offset from the first inner

surface **110**. In some embodiments, the offset prevents foaming of the dispersing agent as it enters the dispersing agent tank **100**.

[0016] In some embodiments, the pressurizer **300** is fluidically coupled with a second termination **220** of the fitting. In some embodiments, the pressurizer **300** comprises a battery for portable able use. In some embodiments, the pressurizer **300** comprises a charging cable to power the battery. In some embodiments, the pressurizer **300** is a pressure washer. In some embodiments, the pressurizer **300** is configured to eject a fluid from the dispersing tank **100** at a rate of about 10 ml/min, 20 ml/min, 30 ml/min, 40 ml/min, 50 ml/min, 75 ml/min, 100 ml/min, 150 ml/min, 200 ml/min, 250 ml/min, 300 ml/min, 350 ml/min, 500 ml/min, 600 ml/min, 700 ml/min, 800 ml/min, 900 ml/min, or 1,000 ml/min. In some embodiments, the pressurizer **300** is configured to eject a fluid from the dispersing tank **100** at a rate of at least about 10 ml/min, 20 ml/min, 30 ml/min, 40 ml/min, 50 ml/min, 75 ml/min, 100 ml/min, 150 ml/min, 200 ml/min, 250 ml/min, 300 ml/min, 350 ml/min, 500 ml/min, 600 ml/min, 700 ml/min, 800 ml/min, 900 ml/min, 1,000 ml/min or more including increments therein. In some embodiments, the pressurizer **300** is configured to eject a fluid from the dispersing tank **100** at a rate of at most about 10 ml/min, 20 ml/min, 30 ml/min, 40 ml/min, 50 ml/min, 75 ml/min, 100 ml/min, 150 ml/min, 200 ml/min, 250 ml/min, 300 ml/min, 350 ml/min, 500 ml/min, 600 ml/min, 700 ml/min, 800 ml/min, 900 ml/min, or 1,000 ml/min.

[0017] In some embodiments, the fill hose **410** fluidically coupled with a third termination **230** of the fitting. In some embodiments, the fill hose **410** terminates in a female garden hose threaded coupling **411**.

[0018] In some embodiments, the system **1,000** further comprises a one-way check valve **510** fluidically coupling the fill hose **410** to the third termination **230** of the pipe fitting **200**. In some embodiments, the system **1,000** further comprises a quick disconnect **520** fluidically coupling the one-way check valve **510** to the fill hose **410**. In some embodiments, the system **1,000** further comprises a quick disconnect **520** fitting fluidically coupling the one-way check valve **510** to the fill hose **410**. In some embodiments, the system **1,000** further comprises a feed hose **420** fluidically coupling the pressurizer **300** to the second termination **220** of the pipe fitting **200**. In some embodiments, the system **1,000** further comprises a quick disconnect **520** fitting fluidically coupling the feed hose to the pressurizer **300**.

Terms and Definitions

[0019] Unless otherwise defined, all technical terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs.

[0020] As used herein, the singular forms “a,” “an,” and “the” include plural references unless the context clearly dictates otherwise. Any reference to “or” herein is intended to encompass “and/or” unless otherwise stated.

[0021] As used herein, the term “about” in some cases refers to an amount that is approximately the stated amount.

[0022] As used herein, the term “about” refers to an amount that is near the stated amount by 10%, 5%, or 1%, including increments therein.

[0023] As used herein, the term “about” in reference to a percentage refers to an amount that is greater or less the stated percentage by 10%, 5%, or 1%, including increments therein.

[0024] As used herein, the phrases “at least one”, “one or more”, and “and/or” are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions “at least one of A, B and C”, “at least one of A, B, or C”, “one or more of A, B, and C”, “one or more of A, B, or C” and “A, B, and/or C” means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

[0025] While preferred embodiments of the present disclosure have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the disclosure. It should be understood that various alternatives to the embodiments of the disclosure described herein may be employed in practicing the disclosure.

CLAIMS

WHAT IS CLAIMED IS:

1. A portable fire extinguishing system comprising:
   (a) a dispersing agent tank having a first inner surface comprising a fill port;
   (b) a pipe fitting fluidically coupled to the fill port, wherein a first termination of the pipe fitting is generally parallel to and offset from the first inner surface;
   (c) a pressurizer fluidically coupled with a second termination of the fitting; and
   (d) a fill hose fluidically coupled with a third termination of the fitting.
2. The system of claim 1, further comprising a one-way check valve fluidically coupling the fill hose to the third termination of the pipe fitting.
3. The system of claim 2, further comprising a quick disconnect fluidically coupling the one-way check valve to the fill hose.
4. The system of claim 1 or 2, further comprising a quick disconnect fitting fluidically coupling the one-way check valve to the fill hose.
5. The system of any one of claims 1-4, further comprising a feed hose fluidically coupling the pressurizer to the second termination of the pipe fitting.
6. The system of claim 5, further comprising a quick disconnect fitting fluidically coupling the feed hose to the pressurizer.
7. The system of any one of claims 1-6, wherein the pipe fitting further comprises a fourth termination that is generally parallel to and offset from the first inner surface.
8. The system of any one of claims 1-7, wherein the fill hose terminates in a female garden hose threaded coupling.
9. The system of any one of claims 1-8, wherein the dispersing agent tank further comprises:
   (a) a waste belt;
   (b) a backpack strap;
   (c) a removable cap; or
   (d) any combination thereof.

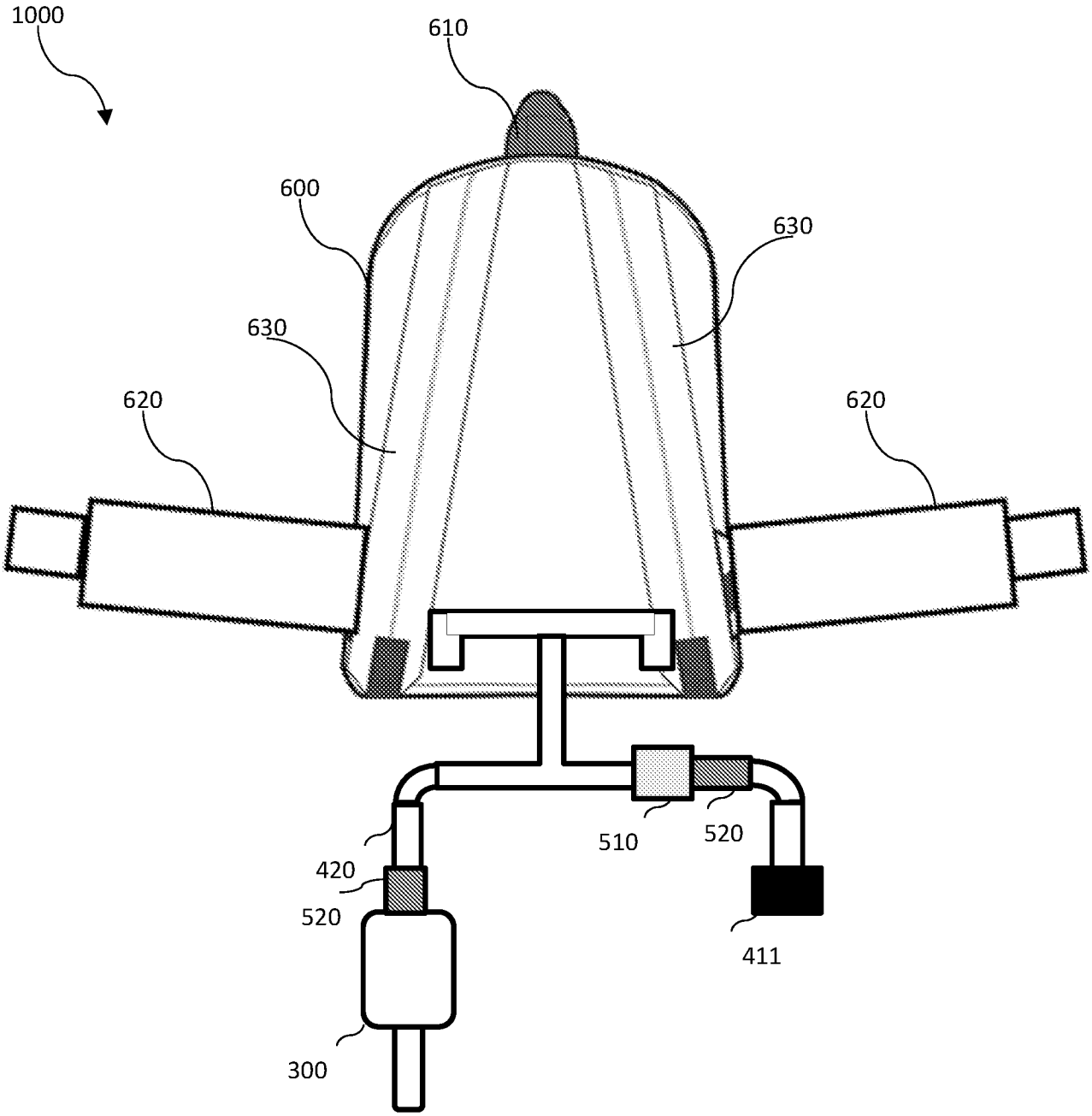

FIG. 1

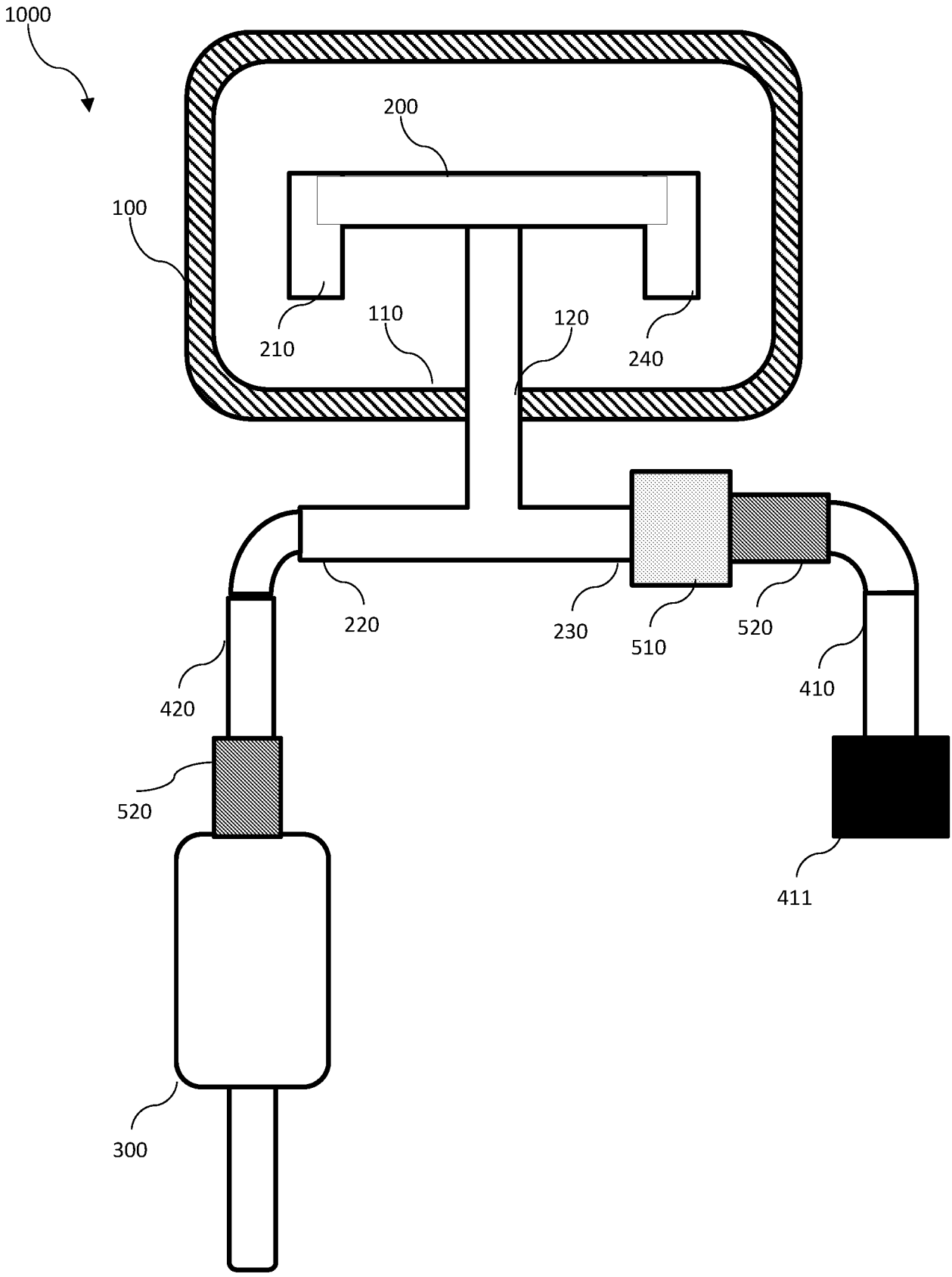
1000
200
100
210
110
120
240
220
230
510
520
520
410
420
520
411
300

FIG. 2

FIG. 3

FIG. 4

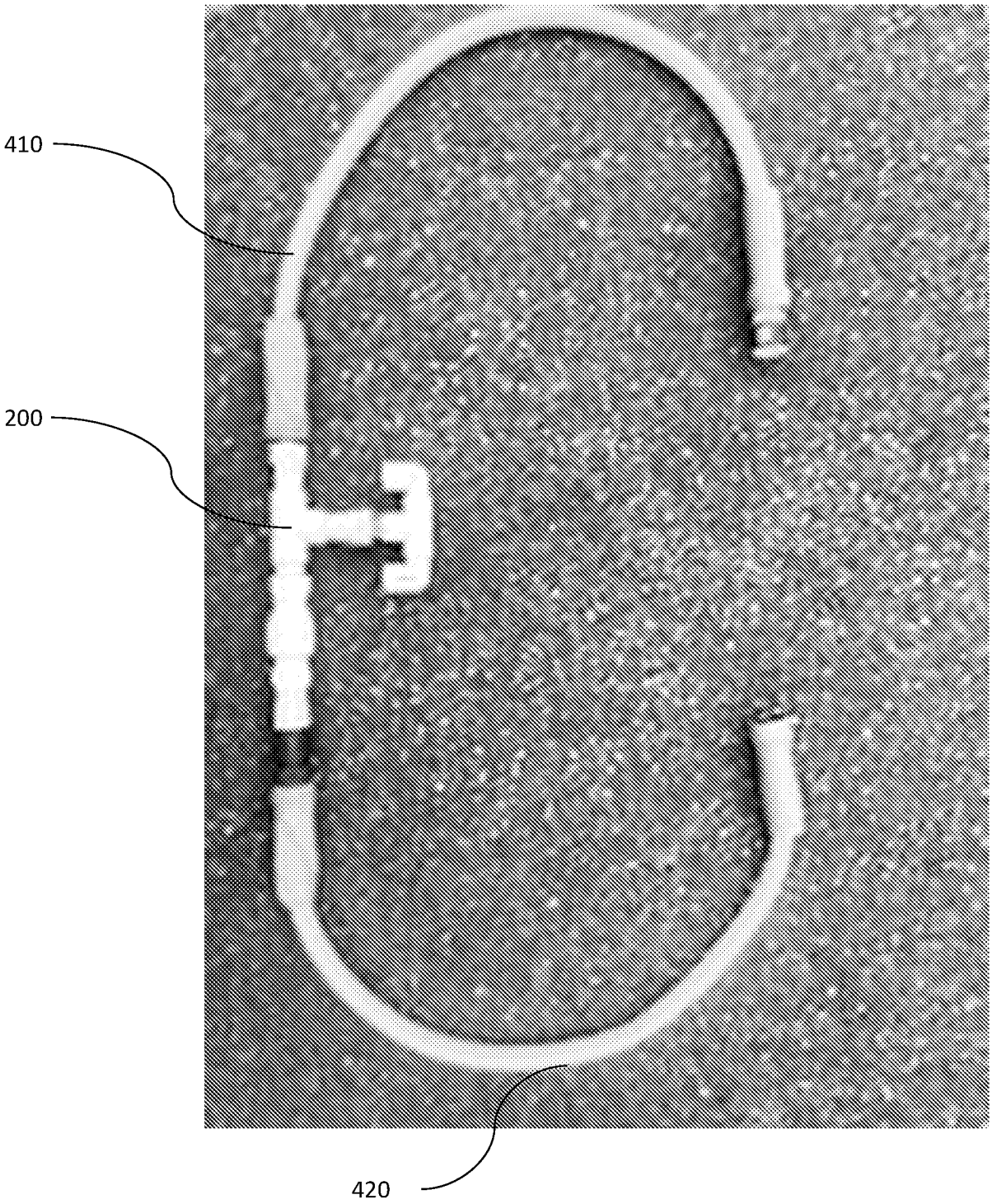

FIG. 5

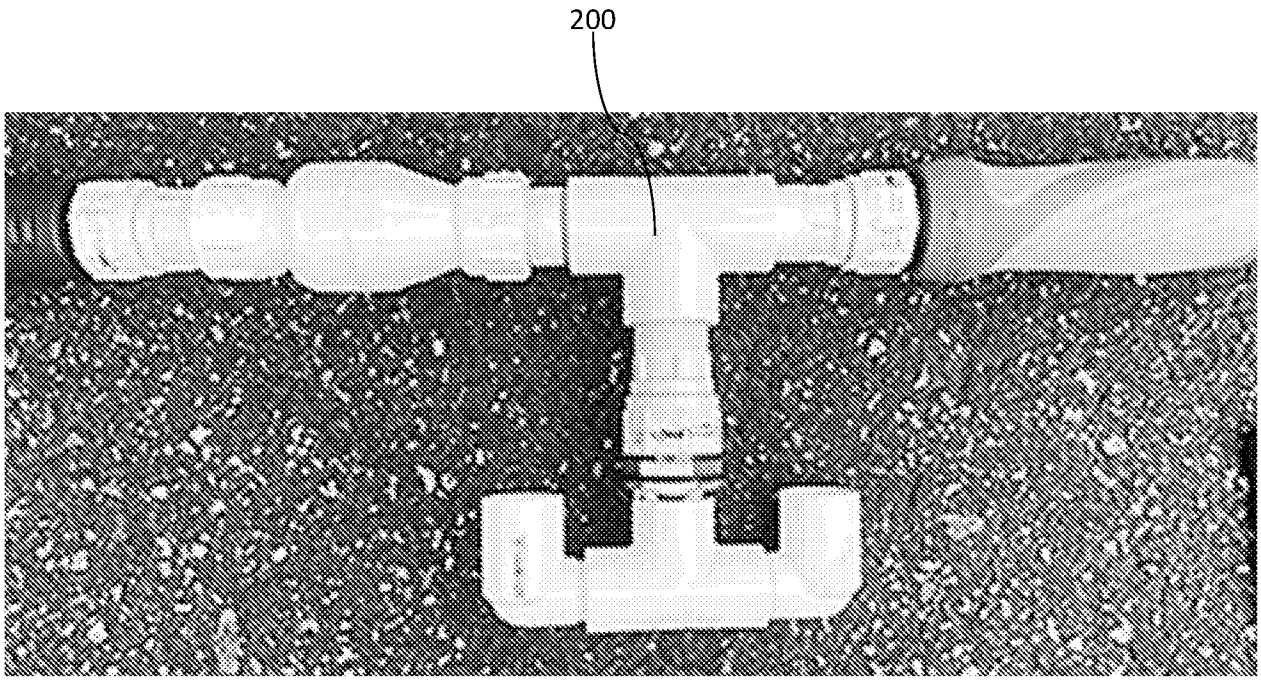

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2022/076451

A. CLASSIFICATION OF SUBJECT MATTER

A62C 15/00 (2006.01) A62C 25/00 (2006.01) A62C 3/02 (2006.01) A62C 5/00 (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)

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)

Databases: PATENW Espacenet, Google Patents
Keywords: (fill, refill, garden, hose, prevent, foam, backpack, pipe, tank, parallel, wall) and similar terms and/or combinations.
IPC/CPC Symbols: A62C15/00, A62C15/00, A62C25/00, A62C25/00, A62C3/02, A62C3/0292, A62C5/00, B05B7/24, B05B7/2405, B05B9/085, B08B3/026, B08B9/08
Applicant/Inventor names searched in DOCDB, DWPI and IP Australia internal databases.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C

[X] 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 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	Date of mailing of the international search report
31 October 2022	31 October 2022
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Ethan McFarland AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61 2 6222 3669

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation).	DOCUMENTS CONSIDERED TO BE RELEVANT	**PCT/US2022/076451**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010270041 A1 (GROONWALD) 28 October 2010 Abstract; Figures 1-3;	1-6, 8-9
X	US 6234409 B1 (ASLAKSON) 22 May 2001 Figures 1, 2, 5	1-6, 8-9
X	US 2016346803 A1 (CRAWFORD) 01 December 2016 Figures 3-7	1-9
A	US 3802511 A (GOOD, L) 09 April 1974 Column 5 lines 20-35	
A	WO 2009055588 A1 (ROYAL APPLIANCE MFG CO D B A et. al.) 30 April 2009 Figure 2 item 88	
A	WO 2019023044 A1 (MILWAUKEE ELECTRIC TOOL CORP) 31 January 2019 Figure 4 item 16	

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/US2022/076451**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	**Publication Date**	**Publication Number**	**Publication Date**
US 2010270041 A1	28 October 2010	US 2010270041 A1	28 Oct 2010
		US 7992648 B2	09 Aug 2011
		CA 2683263 A1	22 Oct 2010
		US 2012043097 A1	23 Feb 2012
		US 8776904 B2	15 Jul 2014
		WO 2010123520 A1	28 Oct 2010
US 6234409 B1	22 May 2001	US 6234409 B1	22 May 2001
		AU 6646098 A	20 Oct 1998
		US 6082631 A	04 Jul 2000
		US 2001022323 A1	20 Sep 2001
		WO 9842933 A2	01 Oct 1998
US 2016346803 A1	01 December 2016	US 2016346803 A1	01 Dec 2016
		US 9770732 B2	26 Sep 2017
		US 2018071760 A1	15 Mar 2018
		US 10099234 B2	16 Oct 2018
		US 2014252104 A1	11 Sep 2014
		WO 2014164770 A1	09 Oct 2014
US 3802511 A	09 April 1974	US 3802511 A	09 Apr 1974
WO 2009055588 A1	30 April 2009	WO 2009055588 A1	30 Apr 2009
		EP 2212029 A1	04 Aug 2010
		EP 2212029 B1	23 Oct 2019
		US 2009173753 A1	09 Jul 2009
		US 8141754 B2	27 Mar 2012
WO 2019023044 A1	31 January 2019	WO 2019023044 A1	31 Jan 2019
		EP 3641948 A1	29 Apr 2020
		US 2019030554 A1	31 Jan 2019

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.