

PATENT COOPERATION TREATY

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PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**
(PCT Rule 43*bis*.1)

To:

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Date of mailing
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Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2019/052043

International filing date (day/month/year)
20.09.2019

Priority date (day/month/year)
30.11.2018

International Patent Classification (IPC) or both national classification and IPC
INV. G01F23/72 A62C13/00

Applicant
CARRIER CORPORATION

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 usually 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:



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Date of completion of this opinion

see form
PCT/ISA/210

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Box No. I Basis of the 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 (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 43bis.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:

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)	Yes: Claims	<u>1-16</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-16</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-16</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 CN 204 671 797 U (HEFEI YUANKANG ENVIRONMENT SCIENCE & TECHNOLOGY CO LTD) 30 September 2015 (2015-09-30)

D2 WO 2017/209170 A1 (MURATA MANUFACTURING CO [JP]) 7 December 2017 (2017-12-07)

D3 US 5 421 193 A (CARLIN JOHN A [US] ET AL) 6 June 1995 (1995-06-06)

D4 US 4 627 283 A (NISHIDA KATSUHIKO [JP] ET AL) 9 December 1986 (1986-12-09)

2 **D1** is regarded as being the prior art closest to the subject-matter of **claim 1**, and discloses:

A fire suppressant storage device (*D1': Abstract*) comprising:
a tank (*D1': "extinguishing chemical storage bottle" in Abstract*) having a first port (*D1': implicit in "storage bottle" in Abstract*), ~~a second port~~, and an interior (*D1': interior of the "storage bottle" in Abstract*) for storing fire suppressant;
a discharge assembly (*D1': implicit in "fire extinguishing storage bottle" in Abstract*) mounted to the first port and comprising:
a discharge valve (*D1': implicit feature of an extinguisher in Abstract*); and
~~a discharge conduit at least partially within the interior and having:~~
~~an interior; and~~
~~an exterior; and~~
a liquid level measurement assembly (*Fig. 1*) ~~mounted to the second port~~ and comprising:
a tube (*11 in Fig. 1*) at least partially within the interior and having:
an interior sealed relative to the surrounding tank interior (*implicit in Fig. 1*); and
an exterior;
a float (*14 in Fig. 1*) surrounding the tube and having one or more magnets (*D1': "magnetic rings fills cursory 14" on page 2*) and having a range of motion; and
~~a plurality of magnetic field sensors along a carrier within the tube interior, the carrier extending from a proximal end to a distal end, wherein the plurality of~~

~~magnetic field sensors comprise:
a first plurality of one dimensional sensors; and
at least two three-dimensional sensors distally of the first plurality.~~

The subject-matter of **claim 1** therefore differs from this known device of **D1** in that:

- i) the storage device has a second port;
 - ii) there is a discharge conduit at least partially within the interior;
 - iii) the liquid level measurement assembly is mounted to the second port;
 - iv) a plurality of magnetic field sensors along a carrier within the tube interior, the carrier extending from a proximal end to a distal end, wherein the plurality of magnetic field sensors comprise:
a first plurality of one dimensional sensors; and
at least two three-dimensional sensors distally of the first plurality;
- and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to determine the quantity of fire suppressant in the storage device.

The solution to this problem proposed in **claim 1** of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

D1 proposes readily a device and a method for the skilled person in order to solve the objective technical problem posed. However, in the device of **D1** there is no plurality of sensors to detect the position of the float, therefore **D1** does not hint the skilled person to include a plurality of sensor in order to determine the level of suppressant in the storage tank. Furthermore **D1** is silent about giving any details on which ports of the storage tank the liquid level measuring device is mounted, therefore there is no second port mentioned. Even if forming a second port on the tank for the level measurement device would be a design option for the person skilled in the art, it would still represent a burden on the skilled person as there is no explicit hint in **D1** to include this feature.

D2 discloses a level measurement device (*Fig. 1*) that has a float (*20 in Fig. 1*). The device comprises a plurality of magnetic field sensors (*5 in Fig. 2*) to detect the position of a float with a magnet (*2A and 2B in Fig. 2*). The plurality of magnetic sensors are placed along a carrier within the tube interior (*the element on which 5 in Fig. 2 are placed is placed within the tube 10 in Fig. 1*). The plurality of magnetic field sensors comprise at least two three-dimensional

sensors (*Fig.4*). **D2** is silent about having a first plurality of one dimensional sensors together with having at least two three dimensional sensors. Furthermore **D2** relates to a level measurement device applied for fuel tanks with gasoline inside, therefore does not give any hint to apply such a device in a fire extinguishing equipment. The person skilled in the art would therefore not find the device of **D2** when faced with the objective technical problem posed, furthermore would not combine one dimensional and three dimensional magnetic field sensors into the device as there is no such a hint in neither **D1** nor in **D2**.

D3 discloses a level measurement device (*Fig.2*) with a float (*700 in Fig.1*) wherein the float position (*Fig.7C and Fig.7D*) is determined by means of a three dimensional magnetic field sensor (*200 and 220 in Fig.3, 202, 204 and 222, 224 in Fig.7B*). **D3** does not disclose a tube but a bar (*110 in Fig.7C*) and so there is no carrier within a tube interior that would comprise a plurality of magnetic field sensors. The magnetic field sensors (*200 and 220 in Fig.3*) of **D3** are enclosing the float from exterior. Furthermore **D3** does not disclose the combination of a first plurality of one dimensional magnetic field sensors and at least two three dimensional magnetic field sensors.

D4 discloses a level measurement device (*Fig.1*) with a magnetic float (*9 in Fig.1*) a carrier with a plurality of magnetic field sensors (*5 and 10 in Fig.1*). **D4** does not disclose a tube with an interior that includes the carrier, as well as **D4** discloses a plurality of one dimensional magnetic field sensors only, therefore there is no hint to include also at least two three dimensional magnetic field sensors. The device of **D4** is to be implemented into a fuel tank of a vehicle, so there is no hint for the skilled person to consider this device to be implemented into a fire extinguishing device.

Hence, based on the device of **D1**, the person skilled in the art would not arrive at the combination of features of the subject-matter of **claim 1** by applying the teaching of **D2**, **D3**, or **D4**.

- 3 **Claims 2-9** are dependent on one or more independent claims whose subject-matter is considered as being new and inventive, as discussed above, and as such said dependent claims also meet the requirements of the PCT with respect to novelty and inventive step.

4 The subject-matter of **claim 10** also seem to involve an inventive step in the sense of Article 33(3) PCT.

D1 is regarded as being the prior art closest to the subject-matter of **claim 10**, and discloses::

A method for ~~remanufacturing~~ a fire suppressant storage device ~~from a first configuration to a second configuration, the fire suppressant storage device having in the first condition:~~

a tank (*D1*: "extinguishing chemical storage bottle" in Abstract) having a first port (*D1*: implicit in "storage bottle" in Abstract), a ~~second port~~, and an interior (*D1*: interior of the "storage bottle" in Abstract) for storing fire suppressant; a discharge assembly (*D1*: implicit in "fire extinguishing storage bottle" in Abstract) mounted to the first port and comprising:

a discharge valve (*D1*: implicit in "fire extinguishing storage bottle" in Abstract); and

~~a discharge conduit at least partially within the interior and having:~~

~~an interior; and~~

~~an exterior; and~~

a liquid level measurement assembly (*Fig. 1*) ~~mounted to the second port and comprising:~~

a tube (*11 in Fig. 1*) at least partially within the interior and having:

an interior sealed (*implicit in Fig. 1*) relative to the surrounding tank interior; and an exterior;

a float (*14 in Fig. 1*) surrounding the tube; and

a magnetic member (*13 in Fig. 1*) axially moveable within the tube interior,

the method comprising:

~~removing the magnetic member;~~

~~inserting into the tube a carrier (150) bearing a plurality of magnetic field sensors (152, 154), the carrier extending from a proximal end (156) to a distal end (158) and electronically coupling the plurality of magnetic field sensors to an electronics module (166), during the inserting one or more of the magnetic field sensors passing through the float; and~~

~~using said passing to calibrate the electronics module.~~

The subject-matter of **claim 10** therefore differs from this known device of **D1** in that:

v) the method is directed for a remanufacturing and not for level measurement;

ii) there is a discharge conduit at least partially within the interior;

iii) the liquid level measurement assembly is mounted to the second port;

vi) removing the magnetic member;

inserting into the tube a carrier bearing a plurality of magnetic field sensors, the carrier extending from a proximal end to a distal end and electronically coupling the plurality of magnetic field sensors to an electronics module, during the inserting one or more of the magnetic field sensors passing through the float; and

using said passing to calibrate the electronics module.

and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to improve the determining of the quantity of fire suppressant in the storage device.

The solution to this problem proposed in **claim 10** of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Regarding features *ii* and *iii* the same reasoning applies as given for **claim 1**.

Feature *vi* involves the characteristics of feature *iv* which were found to be inventive over **D1** based on the reasoning given for **claim 1**, namely the carrier bearing a plurality of magnetic field sensors which is used as a liquid level measurement device. Furthermore, none of the cited documents provide any hint for the person skilled in the art to remove the magnetic element (*13 in Fig. 1*) of the device of **D1** and insert a carrier bearing a plurality of magnetic field sensors instead, thus transforming or as here stated, remanufacturing an existing fire extinguishing device into a new configuration wherein the level measurement device is replaced by the one according to the present invention.

- 5 **Claims 11-16** are dependent on one or more independent claims whose subject-matter is considered as being new and inventive, as discussed above, and as such said dependent claims also meet the requirements of the PCT with respect to novelty and inventive step.