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(54) **WATER RESCUE VEHICLE AND RESCUE METHOD**

(57) The present invention relates to a self-propelled aquatic rescue vehicle (1), formed by a main body (101) consisting of a U-shaped bow portion (2), from which two flap portions (3) project laterally, at the distal ends (4) where propelled turbines (5) are found and a support/sliding membrane (6), in the interior space of the U-shaped body, which is able to receive the body of a human being on the surface of the water.

A method of rescuing a group of human beings, in which such an aquatic rescue vehicle (1) intervenes, self-propelled, is also part of the present invention.

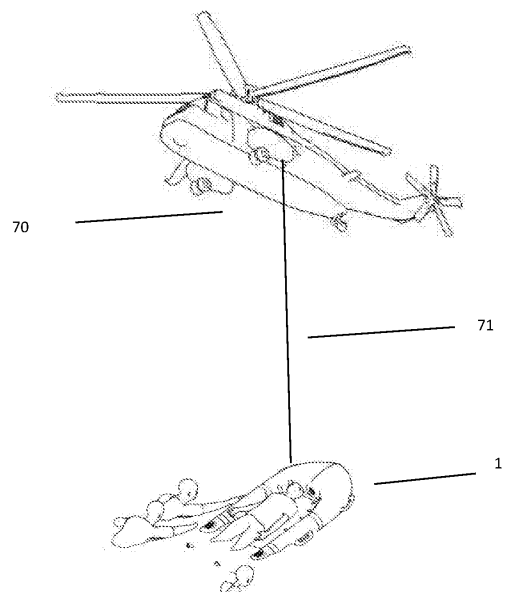


Fig. 7

Description

[0001] The present invention relates to an aquatic rescue vehicle, self-propelled by turbines, arranged at the distal ends of a substantially U-shaped body and a rescue method in which such a vehicle intervenes.

Background

[0002] Self-propelled U-shaped rescue vehicles have been shown to be particularly effective in rescue operations for victims in seas, rivers or reservoirs of dams and are currently a highly sought-after alternative by the market to traditional rescue means, namely lifebuoys.

[0003] The speed of the intervention and the rescue coupled with the possibility of remotely controlling the rescue means are the reasons for the aforementioned demand that is registered either by the owners of recreational boats or professionals or by the maritime authorities or the concessionaires of bathing areas.

[0004] The vehicle described and disclosed in EP 3041733 B1 is considered the state of the art closest to the present invention. A U-shaped vehicle self-propelled by turbines arranged at the distal ends of the flaps is disclosed. However, the most critical part of the rescue, which is the deposition of the human being in the vehicle and its removal from the water, as well as the speed of the rescue, are aspects not considered in the state of the art of the applicant's knowledge and the object of the present invention.

Object of the invention

[0005] The present invention aims to provide this type of rescue vehicles with greater operability and safety.

[0006] It was found that an important factor in rescue operations is the removal of the human being that is injured or in distress from the aquatic environment. It is the object of the present invention to provide a self-propelled water vehicle in which the approach and deposition or self-deposition of the injured person in the rescue vehicle, as well as the rapid removal of the immersed part of the injured person from the water is effectively achieved.

[0007] Rescues take place under the most varied sea conditions and a rescue vehicle must respond to the most demanding rescue conditions, namely sea conditions with strong waves and surf that offer strong resistance to the progression of a vehicle travelling on the water surface. It is intended with this invention to reduce the friction or resistance to the progression of the U-shaped vehicle on the water surface in order to achieve higher operating speeds and a longer battery life.

[0008] Another objective of the invention is to facilitate the access of a user, who may be a lifeguard, an accident victim or both, to the vehicle, preventing entry into the vehicle from being hampered by any obstacle such as a boat's rail.

[0009] The invention also intends to be a methodology

for rescuing the crew of a vessel that has to be evacuated. Traditionally the crew of a struggling sailboat is rescued by aerial means, for example a helicopter, by launching a cable from an aerial means, directly to the deck where the people to be rescued are located. The crew will then cling to the cable to be lifted into the air. It appears that in choppy sea conditions, rescue through this process is challenging due to the difficulty of aligning the helicopter with the cable and the vessel. The present invention allows the crew to be rescued by the same cable, suspended from the air, not over the vessel that has to be evacuated, but over the rescue vehicle, whose geographical position is controlled remotely from the helicopter. It is thus easier to align the helicopter with the rescue vehicle and the castaways, as their position is controlled remotely since they are attached to the rescue vehicle and its position is controlled from the air.

[0010] According to the present invention, a water rescue vehicle is provided, as defined in claim 1.

[0011] For a better understanding of the present invention, a preferred embodiment is now described, purely as a nonlimiting example, with reference to the accompanying drawings, in which:

- Figure 1 shows a schematic top view of a water rescue vehicle according to the invention;
- Figure 2 shows a schematic two-dimensional top view of the water rescue vehicle, according to the invention;
- Figure 3 shows a schematic sectional view of the water rescue vehicle according to the invention;
- Figure 4 shows a schematic sectional view of the water rescue vehicle, according to the invention with a human in a supine position;
- Figure 5 shows a schematic sectional view of the water rescue vehicle, according to the invention with a human being in the ventral position;
- Figure 6 shows a schematic sectional view of the water rescue vehicle, according to the invention, with two humans;
- Figure 7 shows a schematic view of a scenario for rescuing a number of humans in the water.

[0012] With reference to these figures, an aquatic rescue vehicle is shown, according to the invention.

[0013] In particular, Figure 1 shows a rescue vehicle in the aquatic environment 1, self-propelled.

[0014] The invention comprises a main body 101, constituted by a U-shaped bow portion 2, from which two flap portions 3 are projected laterally at the distal ends 4, from which propulsion turbines 5 are housed.

[0015] Not shown in the figures, is how the main body

also houses electric batteries, which can be charged by induction.

[0016] The interior space of the U-shaped body is occupied by a support/slide membrane 6, able to receive the body of a human being on the surface of the water.

[0017] It is a primary objective of the invention to facilitate human entry into the rescue vehicle and provide for its rapid removal from the water. The objective is achieved by varying the specific volume of the different parts of the vehicle in such a way that the median longitudinal plane of the vehicle, coinciding with the longitudinal plane formed by the support/sliding membrane (A, A'), is oblique to the mean plane of the water surface (B, B'). In this way, the castaway who approaches the vehicle not only does not find any impediment to entering it, but also benefits from a slightly inclined flat surface that requires less effort to approach by a user. In addition, when the propulsion starts, the vehicle presents a positive incidence angle towards the water surface, which causes a force to be withdrawn from the human body still immersed, in the initial moments of a rescue, to allow, in the moments following on from this, a displacement with much less friction than with a U-shaped vehicle without a membrane. In this way, i) it is able to relieve the tension of the rescue in the initial moments, because the entire body of the castaway is removed from the water with the help of the vehicle's own propulsion and ii) it has a speed of displacement that allows a greater number of displacements for the same time of battery discharge. It is the positive angle of incidence, combined with the position of the membrane 6, which allows a displacement, by sliding, similar to that of a water skate, faster and with less friction compared to similar rescue vehicles of the state of the art.

[0018] According to the invention, the specific volume of the bow portion 2, is greater than the specific volume of the distal end portions 4, of the side flaps 3, the vehicle assuming, when willing to float on the water surface, a position in which, the longitudinal plane formed by the support/sliding membrane 6, is oblique with respect to the plane of the water surface, with the distal end portions 4 of the side flaps 3, from semi-submerged to fully submerged in the water and the bow portion 2, total to partially emerged.

[0019] Advantageously, the rescue vehicle has a volume such that, when the vehicle moves to the surface of the water, the head of the vehicle user, which is positioned close to the bow, is protected from water, in order to facilitate breathing.

[0020] Preferably, the rescue vehicle according to the invention has handles 8, on the entire periphery of the vehicle.

[0021] According to one aspect of the invention, the support/sliding membrane 6 is made of a material belonging to the group of materials consisting of flexible, rigid and semi-rigid materials.

[0022] The rescue vehicle of the invention provides that the supporting/sliding membrane is detachable, by

means of rings/stretchers 601. According to another option for embodiment of the invention, the support/slide membrane is integral with the main body of the vehicle.

[0023] Advantageously, the vehicle of the invention has speed controllers on the main body of the vehicle (not shown) in the form of buttons or levers. It can also be controlled remotely from a remote control that communicates with the vehicle via the control/communication module 7.

[0024] In a possible embodiment of the invention, the self-propelled aquatic rescue vehicle is inflatable. On the other hand, it can be manufactured in flexible, rigid or semi-rigid material.

[0025] Advantageously, the self-propelled aquatic rescue vehicle incorporates a GPS-like geographical location system.

[0026] Also, an advantage in the aquatic rescue vehicle, the vehicle's batteries can be charged by induction.

[0027] In fig. 2 the vehicle of the invention is shown as a plan: the U-shaped bow portion 2 is rounded to overcome the progression in the aquatic environment and the distal extremity portions 4, on the side flaps 3, are presented with a greater specific volume than that of the bow portion, and the turbines 5 that are housed there contribute to this difference in the specific volume.

[0028] Figs. 3 to 6 show the vehicle of the invention when occupied by one or two human beings (10, 11, 12), the oblique positioning of the longitudinal plane of the membrane (A, A') being visible in relation to the plane of the water surface (B, B') which remains substantially identical in either situation, as well as whether the vehicle is at rest or in motion. This is achieved by balancing the specific volume of the different portions of the vehicle, taking into account the buoyancy.

[0029] The invention allows the execution of a rescue method especially useful when it comes to rescue a group of human beings in difficulties in the aquatic environment, as illustrated in Fig. 7. The motivation for the invention came from rescuing the crew of sailboats in distress in the high seas. In fact, in these cases, it is often difficult to place a rescue cable suspended from aerial means on a sailboat in distress at sea. This is due to the fact that the sea, in altering conditions, permanently modifies the vessel's relative position, a circumstance which adds to the difficulty of the constantly changing position of the mast. In these conditions the vehicle of the invention lends itself to the execution of a rescue method that comprises the following steps:

- provides a rescue vehicle 1, with a number of handles 8, floating on the surface of the water,
- allows castaways on the surface of the water to cling to the handles 8 of the rescue vehicle,
- aligns the rescue cable 71 arranged from an air rescue means with the rescue vehicle 1,
- corrects, in real time, the alignment of the rescue vehicle with the cable placed from the air through the remote control that communicates with the elec-

- tronic telecommunications module 7, proceeds to the rescue.

[0030] Finally, it is clear that the water rescue vehicle described and illustrated here as well as the rescue method can be modified and varied without departing from the scope of protection of the present invention, as defined in the appended claims.

Claims

1. Rescue vehicle in aquatic environment (1), self-propelled, composed by:

- a main body (101) consisting of a U-shaped bow portion (2), from which two flap portions (3) protrude laterally, at the distal ends (4) where propulsion turbines are housed (5),
- a support/slide membrane (6), in the interior space of the U-shaped body, able to receive the body of a human being on the surface of the water,

characterised by,

the specific volume of the bow portion (2) being greater than the specific volume of the distal end portions (4) of the side flaps (3), the vehicle assuming, when willing to float on the water surface, a position in which, the longitudinal plane formed by the support/sliding membrane (6), is oblique with respect to the water surface plane, with the distal end portions (4) of the side flaps (3), from semi-submerged to fully submerged in the water and the bow portion (2) totally to partially emerged.

2. Self-propelled aquatic rescue vehicle (1), according to claim 1, **characterised by** the bow portion (2) that has a volume such that, when the vehicle travels on the water surface, the head of the vehicle user, which is positioned close to the bow, is protected from water, in order to facilitate breathing.
3. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the preceding claims, **characterised by** having handles (8) in the entire periphery of the vehicle.
4. Self-propelled aquatic rescue vehicle (1), according to any of the preceding claims, **characterised by** the support/sliding membrane (6) that is made of a material belonging to the group of materials consisting of flexible, rigid and semi-rigid materials.
5. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the preceding claims, **characterised by** the support/sliding membrane that is detachable, by rings/tensioners (601).

6. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the previous claims, **characterised by** the support/slide membrane that is integral with the main body of the vehicle.

7. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the previous claims, **characterised by** having speed controllers in the main body of the vehicle.

8. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the preceding claims, **characterised by** being remotely controllable from a remote control that communicates with the vehicle through the control/communication module (7).

9. Self-propelled aquatic rescue vehicle (1), according to any of the preceding claims, **characterised by** being inflatable.

10. Self-propelled aquatic rescue vehicle (1), according to any of the preceding claims, **characterised by** being made of a material belonging to the group of materials consisting of flexible, rigid and semi-rigid materials.

11. Rescue vehicle in aquatic environment (1), self-propelled, according to any of the previous claims, **characterised by** the electronics/control module that integrates a GPS-like geographical location system.

12. Self-propelled aquatic rescue vehicle (1), according to any of the preceding claims, **characterised by** the self-propelled aquatic rescue vehicle (1) batteries that are charged by induction.

13. Method of rescuing a number of human beings in an aquatic environment **characterised by**:

- providing a rescue vehicle (1) as described in claim 3, floating on the surface of the water,
- allowing castaways on the surface of the water to cling to the handles of the rescue vehicle,
- aligning the rescue cable (71) arranged from an aerial rescue vehicle with the rescue vehicle (1),
- correcting, in real time, the alignment of the rescue vehicle (1) with the cable arranged from the air through the remote control that communicates with the electronic telecommunications module (7),
- proceeding to the rescue.

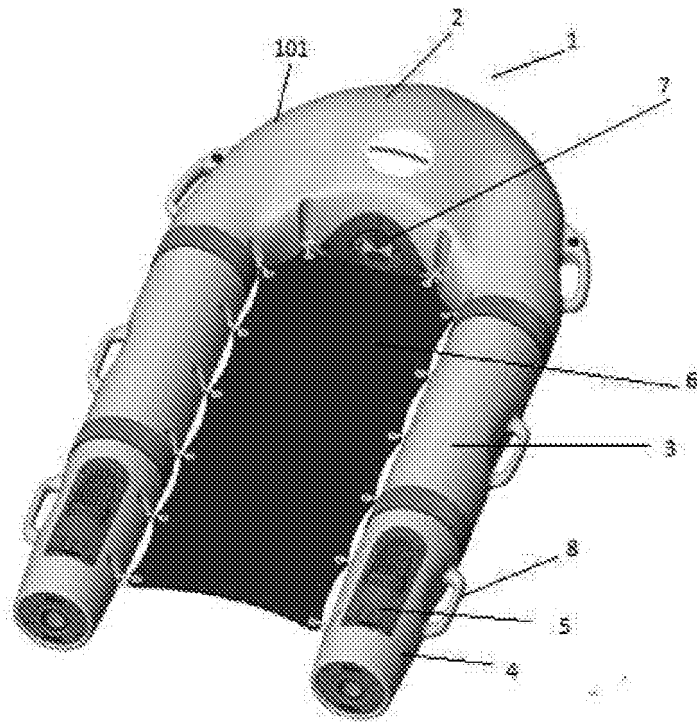


Fig. 1

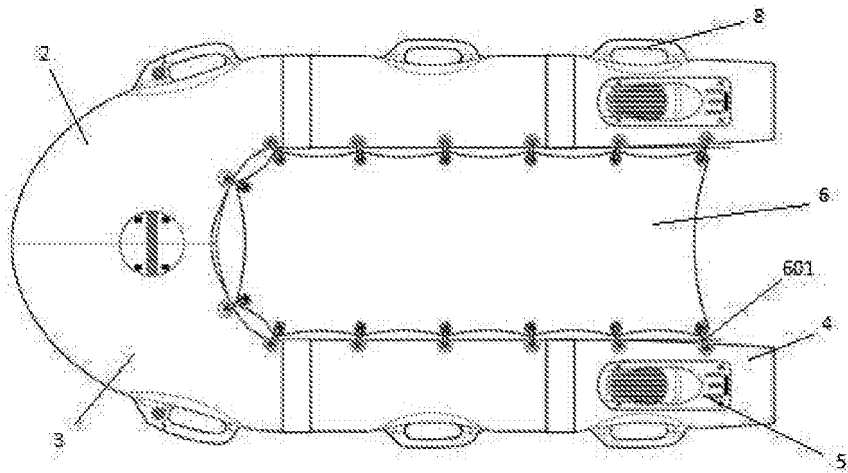


Fig. 2

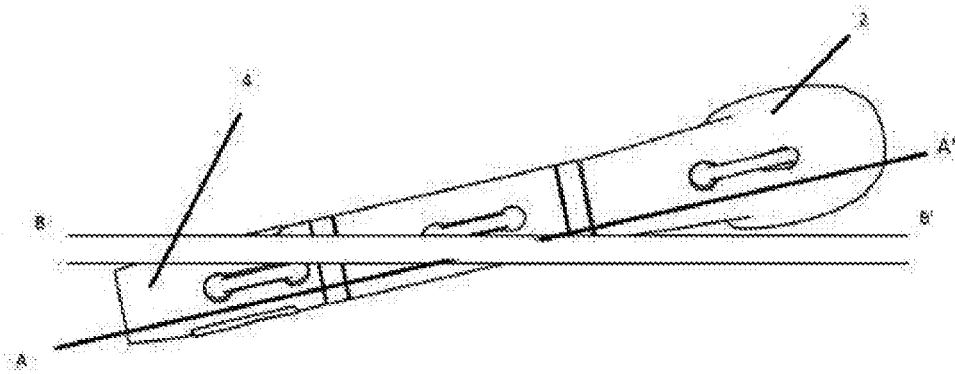


Fig. 3

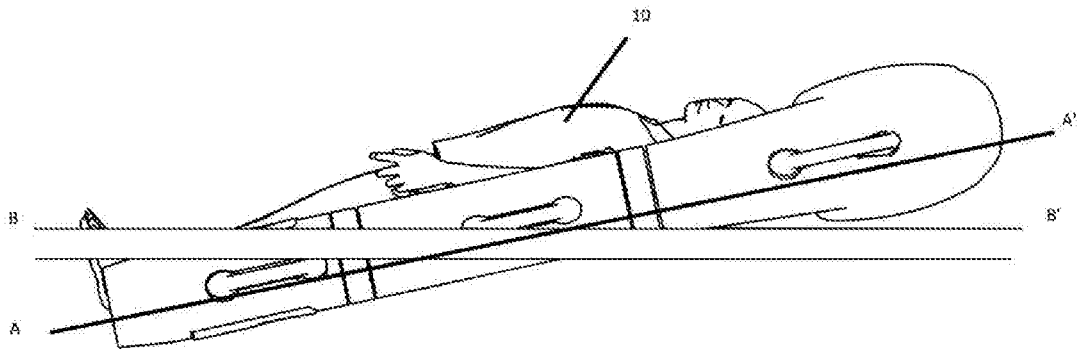


Fig. 4

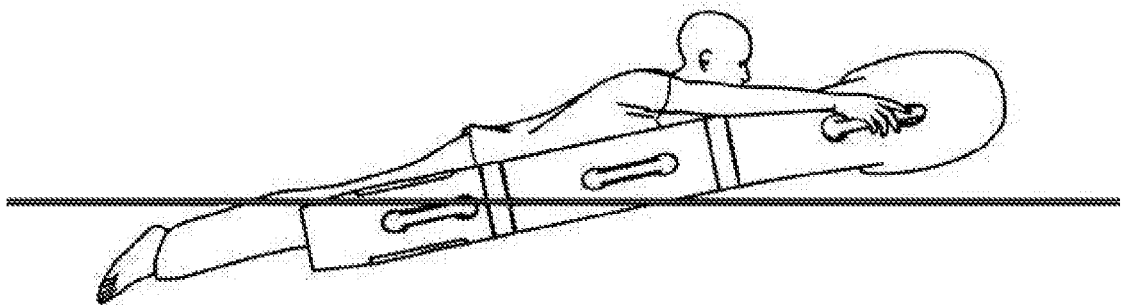


Fig. 5

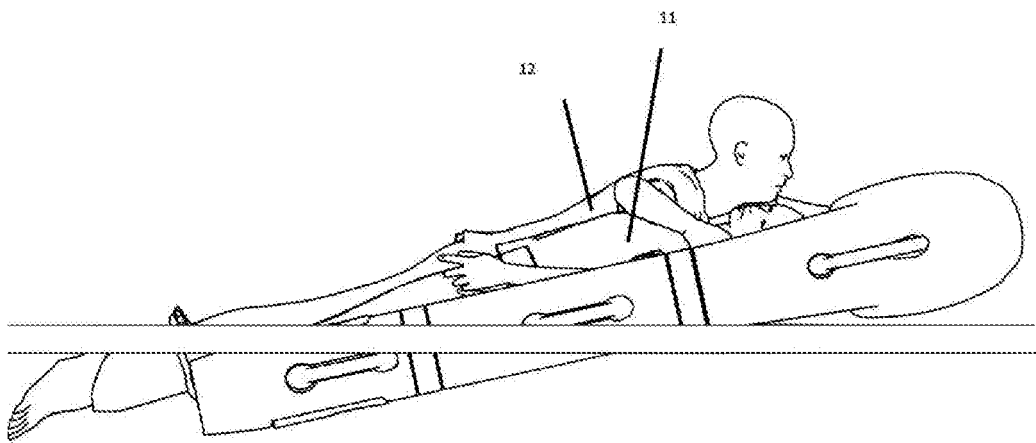


Fig. 6

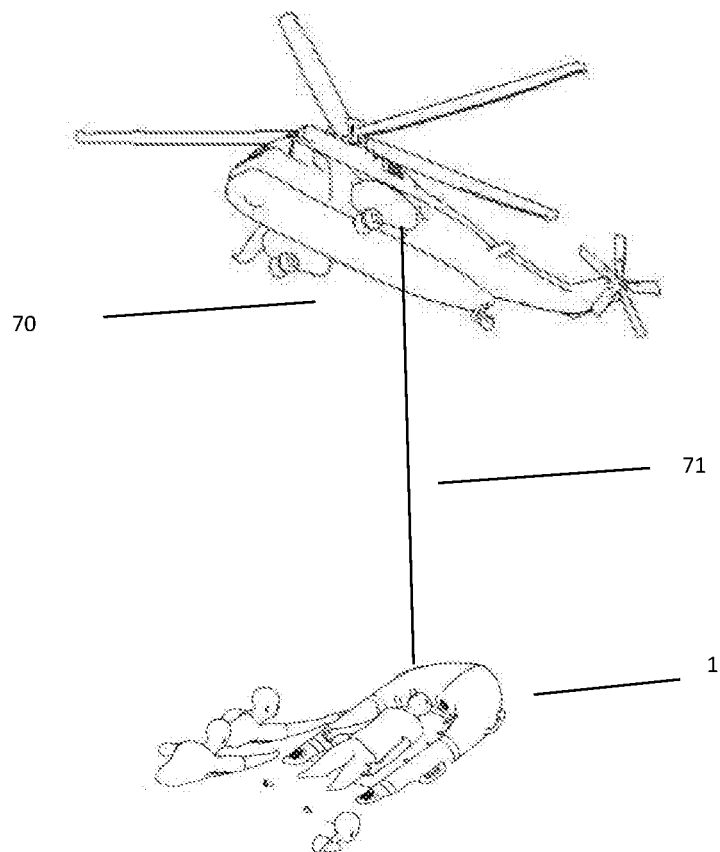


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2020/050443

<p>A. CLASSIFICATION OF SUBJECT MATTER INV. B63H25/46 B63H21/17 B63C9/04 ADD.</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>															
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) B63H B63C</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p>															
<p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EP0-Internal</p>															
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p>															
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>CN 207 536 109 U (OCEANBOTTECH SHANGHAI CO LTD) 26 June 2018 (2018-06-26) figures 1-6 paragraph [0055]</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>----- KR 2013 0022348 A (LEE SANG CHUL [KR]) 6 March 2013 (2013-03-06) figures 2, 6</td> <td>1-12</td> </tr> <tr> <td>Y</td> <td>----- KR 2019 0115575 A (TONGMYONG UNIV INDUSTRIAL ACADEMIC COOPERATION FOUNDATION [KR]) 14 October 2019 (2019-10-14) figure 2b paragraph [0058]</td> <td>1-12</td> </tr> <tr> <td></td> <td>----- -/-</td> <td></td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	CN 207 536 109 U (OCEANBOTTECH SHANGHAI CO LTD) 26 June 2018 (2018-06-26) figures 1-6 paragraph [0055]	1-12	Y	----- KR 2013 0022348 A (LEE SANG CHUL [KR]) 6 March 2013 (2013-03-06) figures 2, 6	1-12	Y	----- KR 2019 0115575 A (TONGMYONG UNIV INDUSTRIAL ACADEMIC COOPERATION FOUNDATION [KR]) 14 October 2019 (2019-10-14) figure 2b paragraph [0058]	1-12		----- -/-	
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Y	CN 207 536 109 U (OCEANBOTTECH SHANGHAI CO LTD) 26 June 2018 (2018-06-26) figures 1-6 paragraph [0055]	1-12													
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p>															
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>															
<p>Date of the actual completion of the international search 22 September 2020</p>	<p>Date of mailing of the international search report 20/11/2020</p>														
<p>Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016</p>	<p>Authorized officer Freire Gomez, Jon</p>														

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2020/050443

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.:
1-12

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.

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2020/050443

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 207 595 219 U (SUZHOU DONGZHU LONGWANG FIRE CONTROL APPLIANCE CO LTD) 10 July 2018 (2018-07-10) figures 1, 2 paragraph [0008] -----	1-12
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2020/050443

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Form PCT/ISA/210 (patent family annex) (April 2005)

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-12

Rescue vehicle with inductively rechargeable batteries.

2. claim: 13

Method of remotely correcting the alignment of a rescue vehicle relative to a cable hanging from a helicopter in real time.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3041733 B1 [0004]