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(54) **BOAT PROPULSION DEVICE**

(57) The invention aims to provide shaft/propeller propulsion equipment in which the blades are interchangeable and attached to the actual propulsion shaft without screws and without adjustment between male and female cones. The invention is characterized in that the independent blades (2) are attached directly to lateral faces (6) of an end portion (3) of the propulsion shaft (4)

of the boat, by means of a male/female coupling that includes male elements and female elements arranged on the lateral faces (6) of the end portion (3) and also on front faces (12) of securing heads (9) for securing the independent blades (2). The invention also includes means for axially retaining the independent blades (2) with respect to the end portion (3) of the propulsion shaft (4).

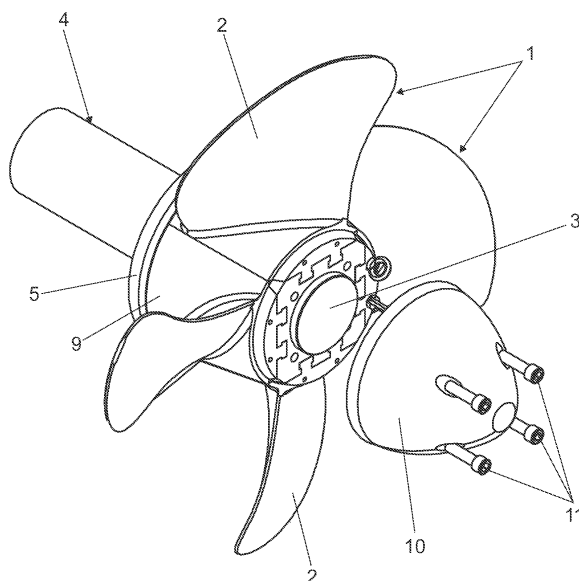


FIG. 1

Description

OBJECT OF THE INVENTION

[0001] The present invention, as expressed in the heading of this specification, relates to a vessel propulsion device of the type used to give movement to ships and which typically has a propeller diameter between 900 and 7,000 mm.

[0002] The object of the invention is to provide shaft / propeller propulsion equipment in which the blades are interchangeable and fixed to the propulsion shaft without screws and without adjustment between male and female cones. This assembly eliminates the localized stresses normally found around the set screws of the blades and in the cone adjustment, in addition to increasing the robustness of the unit and saving assembly, dismantling and adjustment time. This invention also reduces the number of components in the unit, making it simpler and more compact.

[0003] The invention is thus included in the field of the naval industry and, more particularly, in the field of machinery and accessories for the mobilization of boats and / or naval propulsion.

BACKGROUND OF THE INVENTION

[0004] Typically in fixed pitch propulsion with interchangeable blades of the vessel propellers said propulsion consists of the functional combination of a shaft, a hub, several blades and a series of fixing elements. Through this hub, the propeller receives the movement with the collaboration of the corresponding transmission, and the corresponding engine. A plurality of blades is also assembled to this hub by screws, distributed in its periphery.

[0005] In principle, the propeller is fixed to the propulsion shaft by an adjustment between two cones, male and female, to which it is necessary to add the assembly of blades to the hub through several screws and pins, which involves several problems which mainly centre on the following aspects:

- Localized stresses are generated in the through holes of said screws, due to their tightening.
- The blades are weakened by the execution of the necessary through holes for these screws.
- The assembly and dismantling of the propeller and blades is slow and laborious, as it is necessary to adjust two cones and assemble and dismantle a considerable number of screws.
- Numerous implements and tools are necessary in the assembly and dismantling operations, which are expensive and often hard to find.
- Typically, the assembly screws must be welded by their heads to avoid their loss, for which reason this work and equipping is necessary in the place of assembly.

- To guarantee the sealing of the unit, in conventional propellers it is necessary in many cases to place rubber seals or similar to avoid any liquid from entering the holes, which also leads to a greater structural complexity and greater assembly and dismantling time.
- The propeller is commonly joined to the shaft by hydraulic draft, which introduces stresses in the assembly whilst needing very expensive pressure equipment.

[0006] On the other hand, Utility Model number 200900787, property of the same holder of this Utility Model, is known.

DESCRIPTION OF THE INVENTION

[0007] In order to achieve the objectives and avoid the drawbacks mentioned in the previous sections, the invention proposes a propulsion device for vessels characterized in that the end portion of the propulsion shaft incorporates means for directly and radially fixing thereon a series of independent blades forming the propeller, so that said fixing means are not performed by screwing but by a male / female coupling, for which purpose the end portion of the propulsion shaft adopts a prismatic configuration, the number of faces whereof coincides with the number of blades included in the propeller (generally four), incorporating on each one of said lateral faces longitudinal guides for male / female coupling by longitudinal slide. The blades are directly fixed to the propulsion shaft through a complementary rib of said slide or longitudinal groove.

[0008] Said grooves end in a base flange by way of annular extension which acts as buffer for the blade assembly, which will be perfectly fixed and adjusted by a cap on the opposite face. This cap will be fixed to the end portion of the propulsion shaft by threading or through one or several screws easily extracted from the stern face.

[0009] Groove and rib can configure a dovetail coupling, a T-section coupling or any other that guarantees stability of the blades when operating.

[0010] The unit described is complemented with said cap which, once the blades are mounted on the shaft, is screwed to the latter forming the means for axially retaining said blades, easily detachable.

[0011] This male / female assembly, i.e. without screws, eliminates said localized stresses, normally found in the through holes of conventional set screws due to their tightening.

[0012] The grooves enable a fast changing of the blades by simply dismantling the cap that closes the unit.

[0013] As there are no threaded holes for fixing the blades, neither can they be damaged, as occurs in conventional fixed pitch propellers with interchangeable blades.

[0014] Since 95 % of the propeller repair operations

have the blades as the object, and barely 5 % the hub, as the propeller of this equipment has detachable blades, these blades hardly ever need repaired as they are replaceable.

[0015] In the event of damage to any of the blades, they can be replaced without resorting to the dry dock or shipyard, since the dismantling and assembly process is extremely simple and can be performed with the vessel afloat.

[0016] The blades can be easily assembled "in situ", which has a positive impact on the transport, storage and handling costs with respect to a standard fixed pitch propeller.

[0017] The design of the new device of the invention avoids the adjustment between propeller hub and propulsion shaft due the fact that, in this case, it is the propulsion shaft that directly houses the blades. With this in no case shall adjustment be necessary between the male (shaft) and female (propeller) cones, unavoidable in the conventional assembly.

[0018] Below, to facilitate a better understanding of this specification, and forming an integral part thereof, figures are attached wherein the object of the invention has been represented with an illustrative and non-limiting character.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Figure 1.- Shows a perspective view of the vessel propulsion device, object of the invention. The device is established in correspondence with the end portion of the propulsion shaft that receives the movement from a vessel engine.

Figure 2.- Shows a sectioned elevational view of that represented in the previous figure.

Figure 3.- Shows a front view of the device of the invention.

Figure 4.- Shows a front view of the end portion of the propulsion shaft as well as part of one of the propeller blades.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Considering the numbering adopted in the figures, the vessel propulsion device is determined from a propeller (1) which has several independent blades (2) which are directly fixed to the end portion (3) of a propulsion shaft (4) which rotates propelled by the vessel engine.

[0021] Said end portion (3) of the propulsion shaft (4) comprises a prismatic structure with a base flange (5) for axially retaining in one direction, which serves as buffer element of the blades (2) when they are coupled to the different lateral faces (6) of the end portion (3) of the propulsion shaft (4).

[0022] Therefore, the fixing of the independent blades

(2) to the end portion (3) of the propulsion shaft (4) is performed by means of a male / female coupling through grooves (7) and ribs (8) which may be arranged indistinctly on said lateral faces of the end portion (3) and heads (9) of the independent blades (2).

[0023] Normally, the grooves (7) are arranged longitudinally on the lateral faces (6) of the end portion (3) of the propulsion shaft (4), whilst the ribs (8) will be arranged on the heads (9) of the independent blades (2) forming the propeller (1).

[0024] The axial fixing of the blades (2) to avoid them coming out of their location outwards is performed by a front cap (10) which comprises a unit adjusted and axially immobilized completing a hydrodynamic geometry.

[0025] Said front cap (10) is fixed to the end portion (3) of the propulsion shaft (4) by screws (11), although it could also be directly fixed by threading.

[0026] In this invention, the end portion (3) of the propulsion shaft (4) has the special characteristic that, on each of its lateral faces (6) in parallel arrangement to its propulsion shaft (4), it incorporates one or several grooves (7) in dovetail (or another configuration) designed to receive complementary ribs (8) to those each independent blade (2) is provided with in its head (9).

[0027] Although a dovetail configuration has been represented and is being described for these male / female coupling means, it is evident that the coupling can be performed with any other type of grooves and ribs, such as, for example, T-shaped elements and, in general, by any type of restricted mouth groove.

[0028] Finally, on the end of the propulsion shaft (4) and opposite the base flange (5) which acts as buffer of the unit, i.e. on the attack base for the independent blades (2), the cap (10) is mounted, so that after the assembly of the independent blades (2), it is solidly joined to the propulsion shaft (4) by directly threading to the propulsion shaft (4) or array of screws (11) as previously stated, compacting all the assembly and immobilizing the heads (9) of said blades (2) in axial direction, in collaboration with the base flange (5) of the propulsion shaft (4).

[0029] Logically, planar surfaces are established on the head (9) of each independent blade (2) and on both sides of the respective rib (8), for a perfect adaptation to the lateral faces (6) of the end portion (3) of the propulsion shaft (4).

[0030] The ribs (8) are arranged on the front faces (12) of the heads (9) of the independent blades (2), front faces (12) which are complementary to the lateral faces (6) of the end portion (3), with the faces contacting with one another.

Claims

- 1. VESSEL PROPULSION DEVICE**, comprising a propeller formed by several independent blades equipped with a fixing head, **characterized in that** the independent blades (2) are fixed directly to lateral

faces (6) of an end portion (3) of a propulsion shaft (4) of the vessel by means of a male / female coupling that includes male elements and female elements arranged on the lateral faces (6) of the end portion (3) and also on front faces (12) of the fixing heads (9) of the independent blades (2), also including means for axially retaining the independent blades (2) with respect to the end portion (3) of the propulsion shaft (4).

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2. **VESSEL PROPULSION DEVICE**, according to claim 1, **characterized in that** the lateral faces (6) of the end portion (3) of the propulsion shaft (4) and complementary faces (12) of the heads (9) of the independent blades (2) have planar surfaces that contact with one another.

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3. **VESSEL PROPULSION DEVICE**, according to any one of the preceding claims, **characterized in that** the female elements comprise longitudinal grooves (7) in dovetail form arranged on the lateral faces (6) of the end portion (3) of the propulsion shaft (4) whilst the male elements comprise ribs (8) in dovetail form which come from the front faces (12) of the heads (9) of the independent blades (2).

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4. **VESSEL PROPULSION DEVICE**, according to any one of the preceding claims, **characterized in that** the means for axially retaining the independent blades (2) comprise a base flange (5) by way of annular extension solidly joined to the end portion (3) and a front cap (10) which is fixed in correspondence with the free end of that end portion (3) of the propulsion shaft (4).

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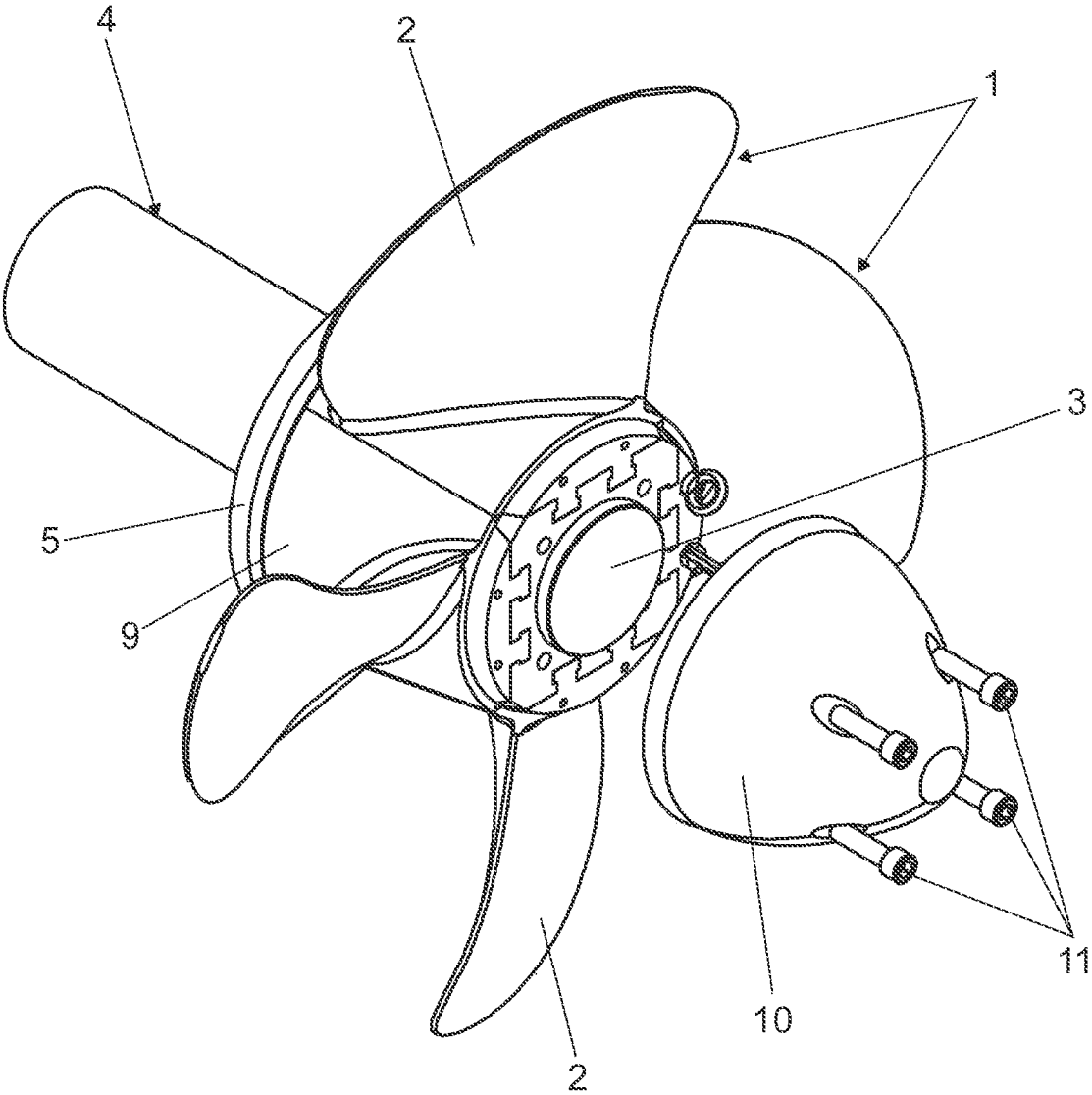
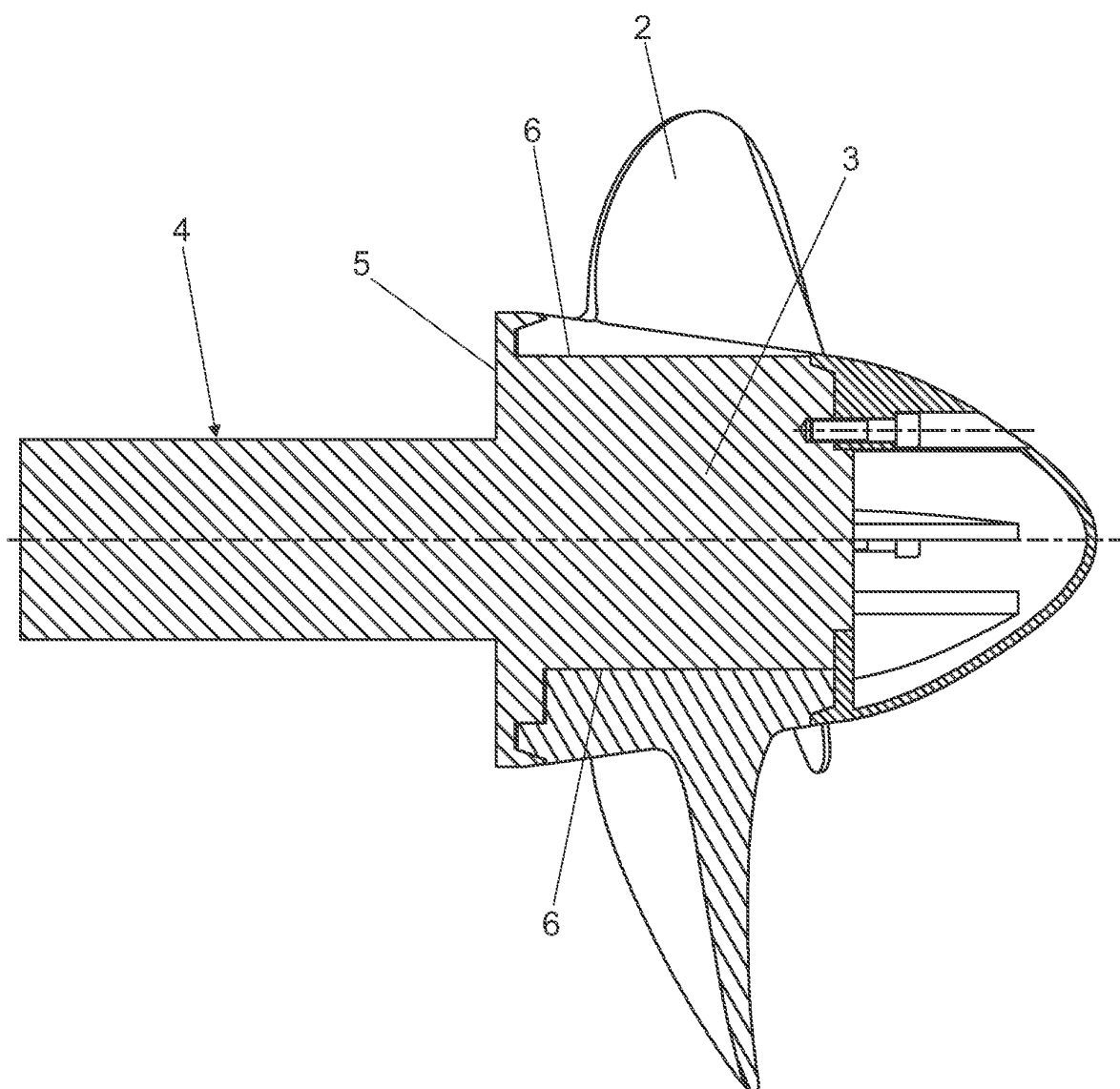


FIG. 1



A-A
FIG. 2

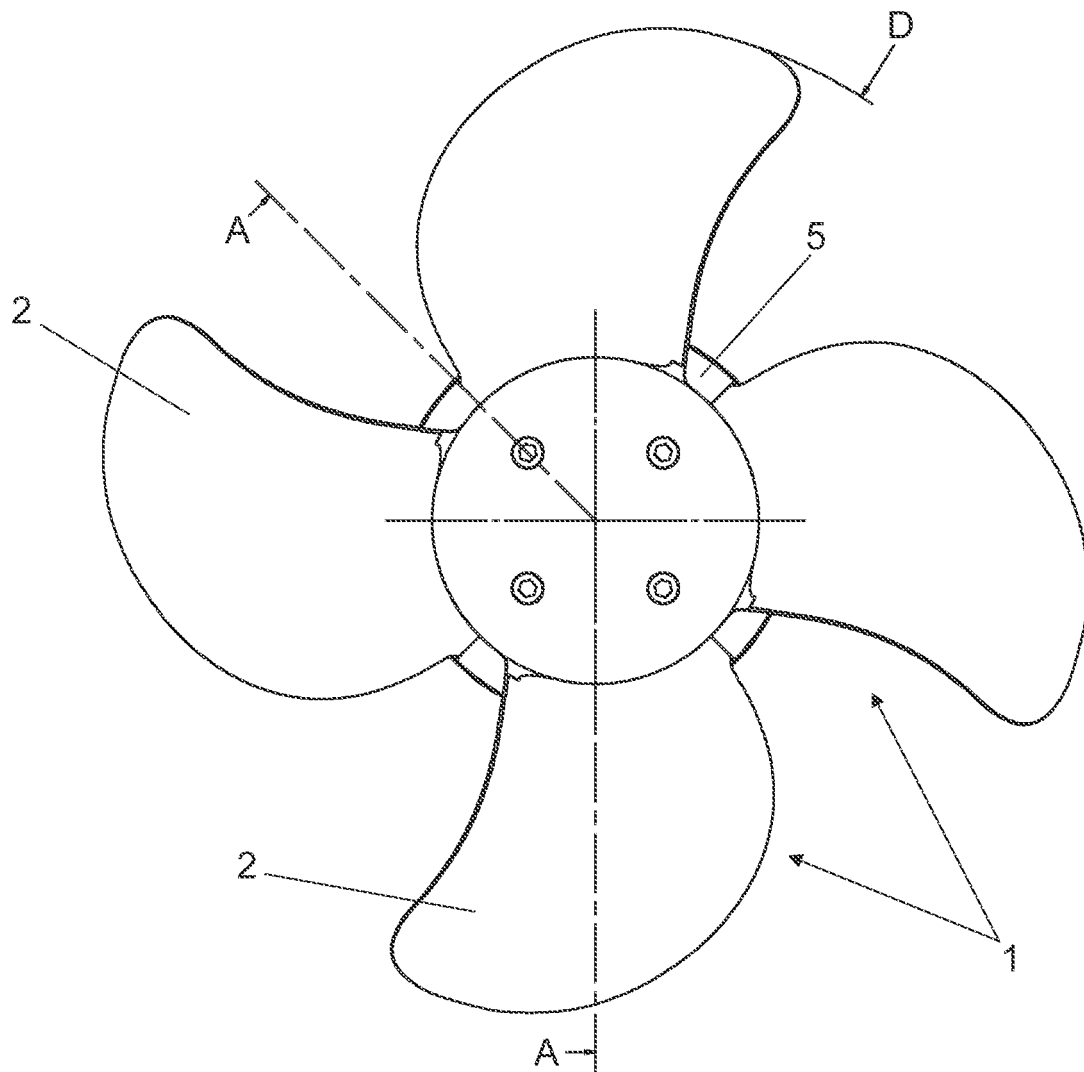


FIG. 3

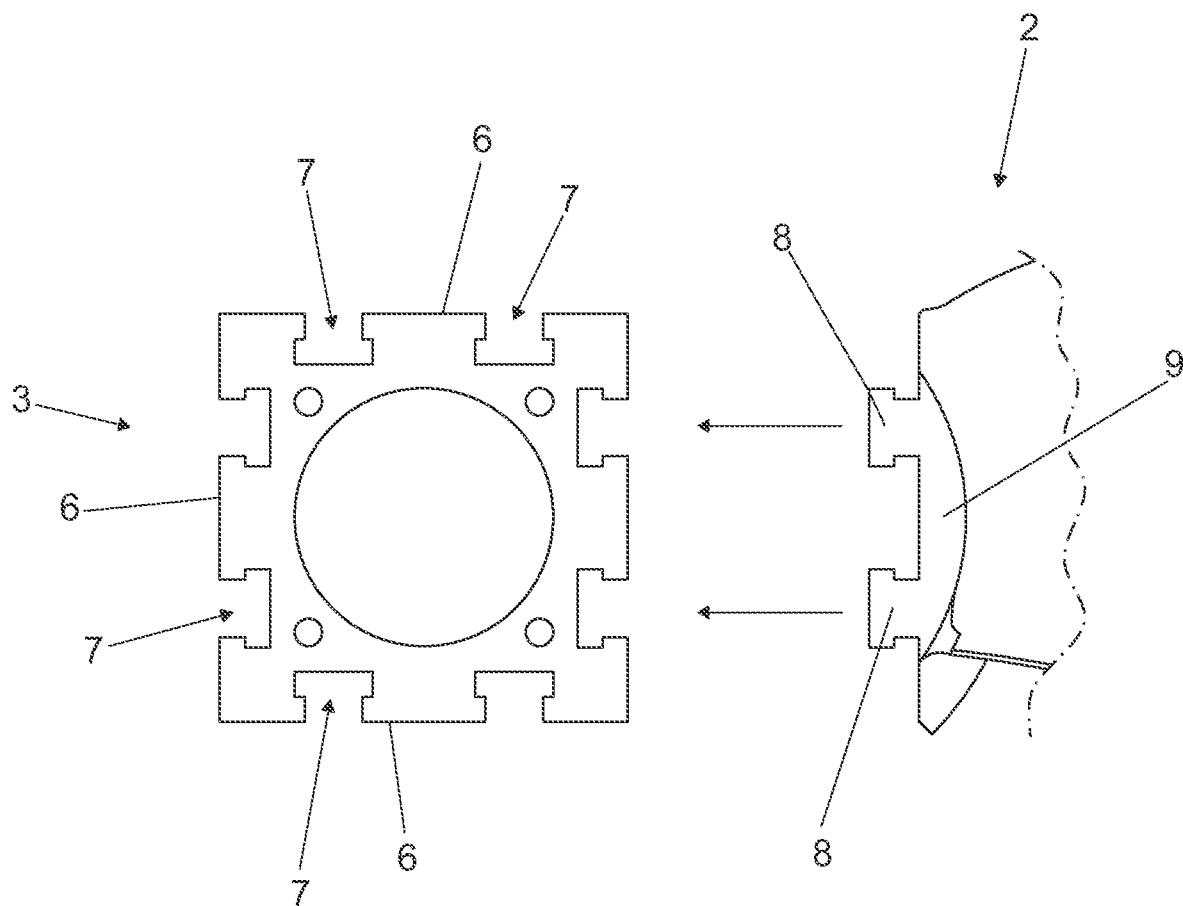


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ ES 2010/070145

A. CLASSIFICATION OF SUBJECT MATTER

B63H 1/20 (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)

B63H

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)

INVENES,EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 191127295 A (HEATHCOTE THOMAS ALMA; WEATHERBY RICHARD) 10.10.1912, figures.	1-4
X	GB 352782 A (EUGEN REINTJES) 16.07.1931, figures.	1-4
X	US 5180286 A (DEAN et al.) 19.01.1993, figures.	1,3,4
X	US 4930987 A (STAHL et al.) 05.06.1990, figures.	1 y 4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document 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)	"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
"O" document referring to an oral disclosure use, exhibition, or other means	"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 documents, such combination being obvious to a person skilled in the art
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search

26.May.2010 (26.05.2010)

Date of mailing of the international search report

(28/05/2010)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2010/070145

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
GB 191127295 A	10.10.1912	NONE	-----
GB 352782 A	16.07.1931	NONE	-----
US 5180286 A	19.01.1993	NONE	-----
US 4930987 A	05.06.1990	NONE	-----

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 200900787 A [0006]