(12) **Oversettelse av europeisk patentskrift**

(11) **NO/EP 3623276 B1**

NORGE

(19) NO

(51) Int Cl.

B63G 8/40 (2006.01)
B63G 8/04 (2006.01)

Patentstyret

(45)	Oversettelse publisert	2024.09.02
(80)	Dato for Den Europeiske Patentmyndighets publisering av det meddelte patentet	2024.06.12
(86)	Europeisk søknadsnr	19192029.7
(86)	Europeisk innleveringsdag	2019.08.16
(87)	Den europeiske søknadens Publiseringsdato	2020.03.18
(30)	Prioritet	2018.09.12, DE, 102018215489
(84)	Utpekte stater	AL ; AT ; BE ; BG ; CH ; CY ; CZ ; DE ; DK ; EE ; ES ; FI ; FR ; GB ; GR ; HR ; HU ; IE ; IS ; IT ; LI ; LT ; LU ; LV ; MC ; MK ; MT ; NL ; NO ; PL ; PT ; RO ; RS ; SE ; SI ; SK ; SM ; TR
(73)	Innehaver	thyssenkrupp Marine Systems GmbH, Werftstraße 112-114, 24143 Kiel, Tyskland thyssenkrupp AG, ThyssenKrupp Allee 1, 45143 Essen, Tyskland
(72)	Oppfinner	Dobrindt, Dirk, Unterstkoppel 52, 24222 Schwentinental, Tyskland
(74)	Fullmektig	ZACCO NORWAY AS, Postboks 488, 0213 OSLO, Norge

(54) Benevnelse **SUBMARINE WITH COVER OPENING DRIVE**

(56) Anførte publikasjoner

EP-B1- 1 798 145
DE-A1- 102009 004 056
DE-A1- 102010 048 629
DE-C- 301 345

Vedlagt foreligger en oversettelse av patentkravene til norsk. I hht patentloven § 66i gjelder patentvernet i Norge bare så langt som det er samsvar mellom oversettelsen og teksten på behandlingsspråket. I saker om gyldighet av patentet skal kun teksten på behandlingsspråket legges til grunn for avgjørelsen. Patentdokument utgitt av EPO er tilgjengelig via Espacenet (http://worldwide.espacenet.com), eller via søkemotoren på vår hjemmeside her: https://search.patentstyret.no/

Submarine with cover-opening drive

The invention relates to a submarine having an opening and a cover which closes the opening, wherein the cover can be rotated via a drive which is located on the axis of rotation of the cover.

An opening, within the context of the invention, is understood to mean a connection between the interior of the submarine, in particular the interior of the pressure hull of the submarine, and the water surrounding the latter, wherein the term opening can also cover the wall which encloses the actual through-passage. The wall can be a tube, for example a weapon barrel, a multifunction tube, an airlock, a stowage container, an exit for personal (hatch) and the like. A tube contains, in its interior, a storage chamber in which a weapon, for example a torpedo, equipment, divers or any other desired items can be accommodated. The tube can comprises a further opening in relation to the interior of the pressure hull, for example for a diver airlock or for reloading a weapon barrel. A multifunction tube can even accommodate a module which is connected to the interior of the pressure hull of the submarine for the entire duration of use. It is also possible, however, for a tube to comprise just one opening, for example in order to accommodate equipment which should be capable of being removed for example by divers when the submarine is in the submerged state.

However, the higher the level at which the opening is arranged, the more important it is to reduce weight, since otherwise the centre of gravity of the submarine is adversely affected. Accordingly, this is most important when the opening is arranged in the tower, in particular at the upper end of the tower. The higher the centre of gravity, the more unstable is the submarine.

Furthermore, the bearing locations of rod assemblies are in direct contact with seawater. The pushing movement which takes place there means that there is a high risk of dirt being taken in during the translatory movement. In addition, the cover, with a push rod, additionally has two points of rotation, which are likewise exposed to the seawater. In order to keep these in functional order, two separate supply lines for lubricating grease have to be installed, so as to ensure permanent operation.

DE 301 345 C discloses a hatch cover for submersibles with a swivel joint inside the boat.

DE 10 2010 048629 A1 discloses a lockable cover with a buoyancy-generating pocket.

DE 10 2009 004056 A1 discloses an airlock with an outer cover with a drive.

It is an object of the invention to provide an opening mechanism which is intended for opening and closing a cover of an opening and, even when arranged at a high level in a submarine, impairs the stability as little as possible.

This object is achieved by a submarine having the features specified in Claim 1. Advantageous developments can be gathered from the dependent claims, from the following description and from the drawings.

The submarine according to the invention comprises at least one first opening between the interior of the submarine and the water surrounding the latter. When the submarine is in the submerged state, the surroundings are constituted by water; when the submarine has surfaced, however, it is also possible for the opening to be arranged above the water level. The first opening is connected to a first cover. The first opening can be closed by the first cover. The first cover is mounted such that it can be rotated about a first axis of rotation.

The submarine comprises a first first rotational drive and a second first rotational drive, wherein the first first rotational drive and the second first rotational drive are arranged on the first axis of rotation. The first first rotational drive and the second first rotational drive are arranged on opposite sides of the first cover of the first axis of rotation. The first first rotational drive and the second first rotational drive are designed for rotating the first cover about the first axis of rotation and, for this purpose, are connected to the first opening and to the first cover.

A rotational drive can actively implement an opening movement and a closing movement of the cover. A rotational drive is actively capable of generating a specific

rotational movement. A rotational drive can be operated according to the invention, electrically, pneumatically or hydraulically.

The arrangement of two rotational drives on the axis of rotation achieves two significant things. On the one hand, all that is required is for control lines to be routed to the rotational drives. The previously customary rod assemblies and hydraulic cylinders are dispensed with, and weight is therefore reduced to a considerable extent. There is a disadvantage in that the first first rotational drive and the second first rotational drive are not located in the interior, and are therefore exposed to the ambient conditions, in particular seawater, for which reason such an arrangement has been avoided up until now. The increase in stability, however, has proven to be advantageous.

If use is made of a rotational drive, a rotational drive has just one sealing location, which is provided between the housing and the rotating shaft. This reduces the number of locations exposed to the effect of seawater. The rotational drive can be designed both hydraulically and electrically.

In a further embodiment of the invention, the normal to the first opening is at an angle of less than 45° in relation to the vertical, wherein the vertical is arranged at right angles to the longitudinal axis of the submarine. The normal to the first opening is preferably at an angle of less than 15° to the vertical, and it is particularly preferably the case that the normal to the first opening is arranged vertically.

In a further embodiment of the invention, the submarine comprises a tower, wherein the first opening is arranged in the region of the tower.

In a further embodiment of the invention, the first first rotational drive is connected to the first cover via a first first coupling and the second first rotational drive is connected to the first cover via a second first coupling. This embodiment is advantageous for the purpose of detaching a rotational drive in the event of the latter failing, so that the other, still functional rotational drive need not also provide the power for rotating the defective rotational drive.

In a further embodiment of the invention, the hydraulic rotational drive is designed such that the first first coupling is likewise supplied with power via the hydraulic circuit of the drive. If the drive fails, and the hydraulic circuit is short-circuited as a result, there is a decrease in the hydraulic pressure at the first first coupling and the latter is disengaged. It is preferably the case that a central shaft connects the axis of rotation of the cover to the rotational drive, no holding torque being maintained. This allows the cover to rotate freely.

In a further embodiment of the invention, the cross-sectional surface area of the first opening is located in a first plane, wherein the axis of rotation is located in the first plane.

In a further, alternative embodiment of the invention, the cross-sectional surface area of the first opening is located in a first plane, wherein the axis of rotation is arranged above the first plane.

In a further embodiment of the invention, the first opening comprises a first pressure-exerting ring for locking the first cover, wherein the first pressure-exerting ring comprises a cutout in the region of the first axis of rotation.

In a further embodiment of the invention, the first first rotational drive is driven hydraulically, pneumatically or electrically and the second first rotational drive is driven hydraulically, pneumatically or electrically. In the case of a hydraulic drive with hydraulic oil, it is also possible for the hydraulic oil to perform a lubricating function. Servomotors are preferred for electrically operated drives.

In a further embodiment of the invention, the first axis of rotation is arranged in the longitudinal direction of the submarine. This arrangement has proven to be advantageous for opening the cover when the submarine is travelling in the submerged state.

In a further embodiment of the invention, the submarine comprises at least one second opening in relation to the surroundings, wherein the second opening is connected to a second cover, wherein the second opening can be closed by the second cover. The second cover is mounted such that it can be rotated about a second axis of rotation.

The submarine comprises a first second rotational drive and a second second rotational drive, wherein the first second rotational drive and the second second rotational drive are arranged on the second axis of rotation. The first second rotational drive and the second second rotational drive are arranged on opposite sides of the second cover of the second axis of rotation. The first second rotational drive and the second second rotational drive are designed for rotating the second cover about the second axis of rotation and, for this purpose, are connected to the second opening and to the second cover.

Of course, it is also possible for a submarine to comprise more than two openings with opening mechanisms according to the invention.

In a further embodiment of the invention, the first opening and the second opening are arranged one behind the other in the longitudinal direction of the submarine and the direction of rotation of the first cover and the direction of rotation of the second cover run counter to one another.

The submarine according to the invention will be explained in more detail hereinbelow with reference to an exemplary embodiment illustrated in the drawings, in which:

Figure 1 shows a submarine having a first opening,
Figure 2 shows a cover in the open state, and
Figure 3 shows a cover in the closed state

Figure 1 shows a submarine 10 having a first opening. The first opening is closed by a first cover 30. The first opening is arranged such that it terminates at the upper end of the tower and connects the interior 20 of the submarine to the water surrounding the latter. For example, the opening can be a diver airlock in which, accordingly, diving equipment is stored for exit through the airlock or through which said equipment is discharged.

The first cover 30 is shown in the open position in Figure 2 and in the closed position in Figure 3. The cover 30 is fastened at the upper end of the first opening 22 and can be rotated about the axis of rotation 70 with the aid of the two rotational drives 60. In the

closed state, the cover 30 engages in the pressure-exerting ring 24 and is locked by rotation.

List of reference signs

10	Submarine
20	Interior of the submarine
22	Upper end of the first opening
24	Pressure-exerting ring
30	First cover
60	Rotational drive
70	Axis of rotation

Patentkrav

1. Undervannsbåt (10) med minst én første åpning mellom det indre av undervannsbåten (20) og det omgivende vannområdet, hvor den første åpningen er forbundet med et første lokk (30), hvor den første åpningen kan lukkes med det første lokket (30), hvor det første lokket (30) er montert dreibart om en første rotasjonsakse (70) , hvor undervannsbåten (10) har et første første rotasjonsdrev (60) hvor det første første rotasjonsdrevet (60) er anordnet på den første rotasjonsaksen (70), hvor det første første rotasjonsdrevet (60) er utført for å dreie det første lokket (30) om den første rotasjonsaksen (70) og er forbundet med den første åpningen og det første lokket (30) for dette formålet, hvor det første første rotasjonsdrevet (60) drives hydraulisk, pneumatisk eller elektrisk, karakterisert ved at undervannsbåten (10) har et andre første rotasjonsdrev (60), hvor det andre første rotasjonsdrevet (60) er anordnet på den første rotasjonsaksen (70), hvor det første første rotasjonsdrevet (60) og det andre første rotasjonsdrevet (60) er anordnet på motsatte sider av det første lokket (30) langs den første rotasjonsaksen (70), hvor det andre første rotasjonsdrevet (60) er utført for å dreie det første lokket (30) om den første rotasjonsaksen (70) og er forbundet med den første åpningen og det første lokket (30) for dette formålet, hvor det andre første rotasjonsdrevet (60) drives hydraulisk, pneumatisk eller elektrisk.

2. Undervannsbåt (10) ifølge krav 1, karakterisert ved at normalen til den første åpningen har en vinkel på mindre enn 45° på vertikalen.

3. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at undervannsbåten (10) har et tårn, hvor den første åpningen er anordnet i området ved tårnet.

4. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at det første første rotasjonsdrevet (60) er forbundet med det første lokket (30) via en første første kobling, hvor det andre første rotasjonsdrevet (60) er forbundet med det første lokket (30) via en andre første kobling.

5. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at den første åpningens tverrsnittsflate ligger i et første plan, hvor rotasjonsaksen (70) ligger i det første planet.

6. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at den første åpningen har en første pressring (24) for å låse det første lokket (30), hvor den første pressringen (24) har en utsparing i området ved den første rotasjonsaksen (70).

7. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at den første rotasjonsaksen (70) er anordnet i undervannsbåtens lengderetning.

8. Undervannsbåt (10) ifølge ett av de foregående krav, karakterisert ved at undervannsbåten (10) har minst én andre åpning mot omgivelsene, hvor den andre åpningen er forbundet med et andre lokk (50), hvor den andre åpningen kan lukkes med det andre lokket (50), hvor det andre lokket (50) er montert dreibart om en andre rotasjonsakse (70), hvor undervannsbåten (10) har et første andre rotasjonsdrev (60) og et andre andre rotasjonsdrev (60), hvor det første andre rotasjonsdrevet (60) og det andre andre rotasjonsdrevet (60) er anordnet på den andre rotasjonsaksen (70), hvor det første andre rotasjonsdrevet (60) og det andre andre rotasjonsdrevet (60) er anordnet på motsatte sides av det andre lokket (50) langs den andre rotasjonsaksen (70), hvor det første andre rotasjonsdrevet (60) og det andre andre rotasjonsdrevet (60) er utført for å dreie det andre lokket (50) om den andre rotasjonsaksen (70) og er forbundet med den andre åpningen og det andre lokket (50) for dette formålet.

9. Undervannsbåt (10) ifølge krav 8, karakterisert ved at den første åpningen og den andre åpningen er anordnet bak hverandre i undervannsbåtens (10) lengderetning og hvor rotasjonsretningen til det første lokket (30) og rotasjonsretningen til det andre lokket (50) er motsatte.

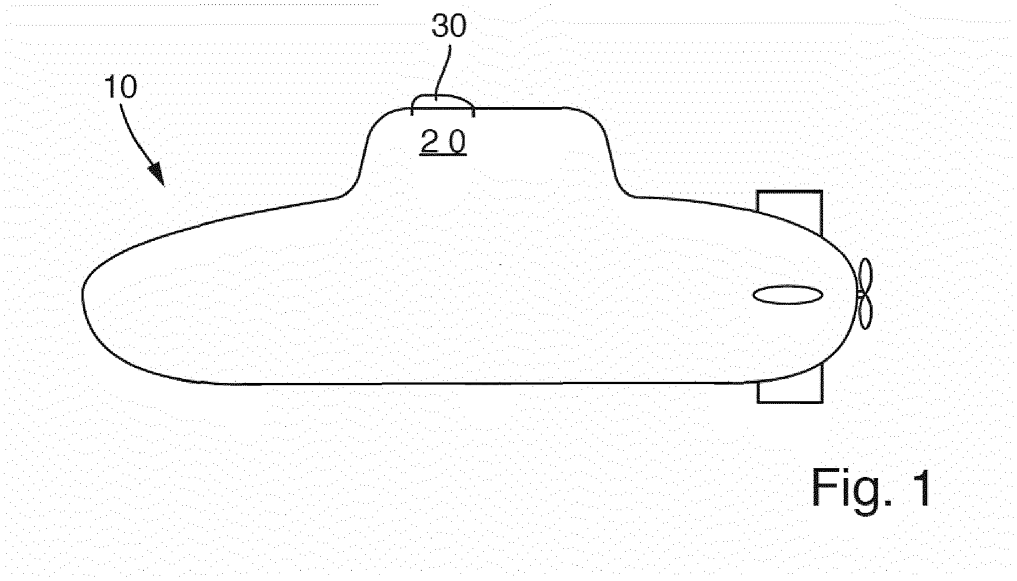

Fig. 1

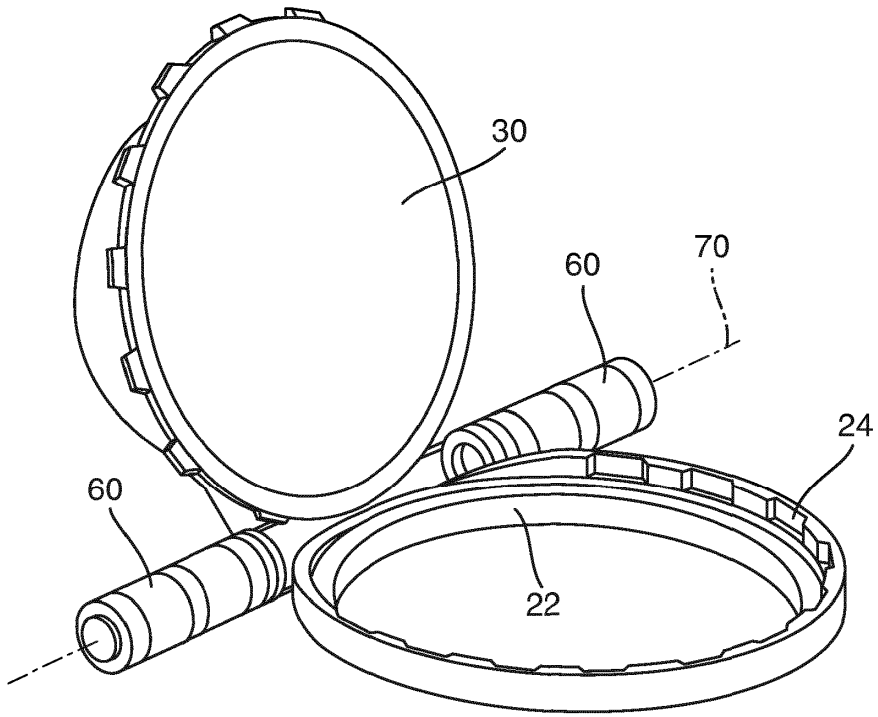

Fig. 2

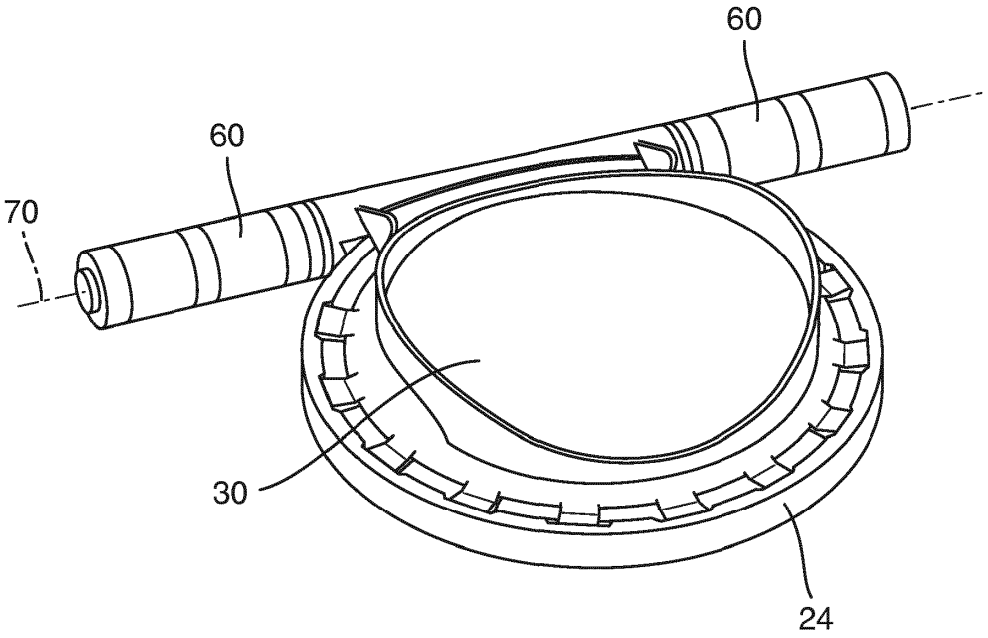

Fig. 3