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☒ Claim(s) : paged to paged
☒ Drawing(s) : paged to paged
☒ Abstract : paged to paged

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Submarine Vessel

Description

The invention relates to a submarine vessel--in particular, a submarine drone--with a propulsion unit that comprises a plurality of individual means of propulsion operating in a pre-determined direction of propulsion, and with a mechanism for steering the submarine vessel.

A submarine vessel with a conventional design usually has two rudder flaps that form a steering mechanism. One of the rudder flaps operates in the vertical direction to bring about directional changes of the hull in the pitch plane, and the other rudder flap operates in the yawing plane to be able to carry directional changes toward starboard or port.

The high production costs because of the expensive rudder-flap constructions and poor maneuverability at low speeds are the drawbacks in these familiar submarine vessels.

Moreover, submarine vessels with additional vertical propulsion or with additional combined vertical and transverse propulsion are generally known. Hereby improved maneuverability at low speeds is attained, but the maneuverability in the vertical direction proved to be unsatisfactory at high speeds. In addition, also for these familiar submarine vessels, the high production costs for the vertical and transverse propulsion have a disadvantageous effect.

The production costs of submarine vessels weigh heavily--in particular, for one-way drones for eliminating mines because, with the mine, the drone is destroyed.

Therefore, it is the task of the invention to create a submarine vessel that distinguishes itself by low production costs and good maneuverability properties at almost all--and, in particular, low--speeds.

This problem is solved, according to the invention, in a submarine vessel of the type mentioned in the beginning in that the steering mechanism of the submarine vessel consists of a control mechanism that controls, individually, the propulsion output of the means of propulsion.

The advantages of the invention lie, in particular, in that neither rudder flaps nor vertical or transverse propulsions are necessary for steering the submarine vessel.



Steering the submarine vessel takes place exclusively by controlling the propulsion output of the means of propulsion.

The propulsion unit can be constructed from identical standard components, so the submarine vessel according to the invention can be produced at low production costs. Control of the propulsion output of each individual means of propulsion provides very good maneuverability, also at low speeds--which is important, in particular, for destruction of underwater mines. Advantageously, each of the means of propulsion operates in the forward direction of the submarine vessel.

It is particularly preferred that the propulsion unit comprise four means of propulsion, each of which--placed at a 90° angle around the longitudinal axis of the submarine vessel--is arranged at the stern of the submarine vessel.

In this instantly particularly preferred embodiment of the present invention, the submarine vessel runs a straight-ahead course if all the means of propulsion have the same propulsion output. Course corrections in the pitch plane or yawing plane can be performed in a simple manner--for instance, by lowering or increasing the propulsive force of the respective means of propulsion in the corresponding plane.

It is particularly preferred that means of propulsion are formed by propellers that, in pairs, are driven in counter-rotation. Propeller drives are inexpensive propelling means whose counter-rotating propulsion in pairs causes the propeller effects to balance each other out without influence by the control mechanism.

If the means of propulsion are formed by propellers, the steering mechanism of the submarine vessel advantageously controls the speed of the propellers, in propulsion units. Influencing the speed of the propellers is the simplest method of individually controlling the propulsion output of the means of propulsion.

Alternatively to this, it is also possible to control the blade angle of the propeller wings, or even reverse the direction of propulsion of the means of propulsion and, with one propeller, the direction of rotation. By these measures, the maneuverability of the submarine vessel at low speeds can be further improved.

In an alternative embodiment of the invention, the propulsion unit comprises three means of propulsion, each of which--placed at a 120° angle around the longitudinal axis of the submarine vessel--is arranged on the stern of the submarine vessel. Compared to the arrangement of four means of propulsion, one means of propulsion is saved in this embodiment and, thus, the production costs of the submarine vessel are further reduced.



In the following, an embodiment of the invention is described, using the drawings. Shown are:

Fig. 1 A side view of a submarine vessel;

Fig. 2 A view of the stern of a submarine vessel.

In Figures 1 and 2, a submarine vessel (1)--in the embodiment, a submarine drone--is represented in a side view and a view of the stern.

On the bow, the submarine vessel (1) contains a sensor unit (2)--for instance, a sonar or camera--by which anchor-cable mines or not-completely sunken ground mines can be detected. Furthermore, a propulsion unit (3) is provided that comprises means of propulsion (5) on the stern (7) of the submarine vessel that, in the represented embodiment, have been developed as propellers. The means of propulsion (5) are controlled by a mechanism (4) for steering the submarine vessel, to execute course directions.

In particular, in Fig. 2 it can be recognized that, in each case, the means of propulsion (5)--in each case, placed at a 90° angle around the longitudinal axis of the submarine vessel (1)--are arranged on the stern (7) of the submarine vessel.

The counter-rotating directions of rotation in pairs of the means of propulsion are indicated by the arrows. To reciprocally balance out the propeller effects, two of the propellers are developed for rotating clockwise and two for rotating counter-clockwise.

For the stabilization of the submarine vessel, it is advisable to provide control surfaces (8) that ensure good forward running of the submarine vessel (1).

The steering device of the submarine vessel controls the propulsion output of the individual means of propulsion (5). For a course change in the yawing plane to starboard, the propulsion output of the two starboard-side means of propulsion (5) is reduced and the propulsion output of the port-side means of propulsion (5) is increased. Analogously to this, the propulsion output of the lower two or the upper two means of propulsion (5) can be controlled, to cause course changes of the submarine vessel in the pitch plane.





Patent claims

1. A submarine vessel--in particular, a submarine drone--with a propulsion unit (3) that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a mechanism for steering the submarine vessel, characterized in that the mechanism (4) for steering the submarine vessel (1) consists of a control device that controls the propulsion output of the means of propulsion (5).
2. Submarine vessel according to claim 1, characterized in that, in each case, the means of propulsion (5) operate in the forward direction.
3. Submarine vessel according to claim 1 or 2, characterized in that the propulsion unit (3) comprises three means of propulsion.
4. Submarine vessel according to claim 3, characterized in that each of the means of propulsion (5)--placed at a 120° angle around the longitudinal axis (6) of the submarine vessel (1)--is arranged on the stern (7) of the submarine vessel (1).
5. Submarine vessel according to one of the preceding claims, characterized in that the propulsion unit (3) comprises four means of propulsion (5).
6. Submarine vessel according to claim 5, characterized in that each of the means of propulsion (5)--placed at a 90° angle around the longitudinal axis (6) of the submarine vessel (1)--is arranged on the stern (7) of the submarine vessel (1).
7. Submarine vessel according to one of the preceding claims, characterized in that the means of propulsion (5) are formed by propellers.
8. Submarine vessel according to claim 7, characterized in that the means of propulsion (5) are propellers that, in pairs, are driven in counter-rotation.
9. Submarine vessel according to claim 7 or 8, characterized in that the mechanism (4) for steering the submarine vessel (1) controls the speed of the propellers.
10. Submarine vessel according to one of the claims 7-9, characterized in that the mechanism (4) for steering the submarine vessel (1) controls the blade angle of the propeller wings.





11. Submarine vessel according to one of the preceding claims, characterized in that the direction of propulsion of the means of propulsion (5) is reversible.
12. Submarine vessel according to one of the claims 7-11, characterized in that the mechanism (4) for steering the submarine vessel controls the direction of rotation of the propellers.

Abstract

The invention relates to a submarine vessel--in particular, a submarine drone--with a propulsion unit (3) that comprises a plurality of individual means of propulsion (5) operating in a pre-determined direction of propulsion, and with a mechanism (4) for steering the submarine vessel. The invention consists in that the mechanism (4) for steering the submarine vessel (1) consists of a control mechanism that controls the propulsive output of the means of propulsion (5).

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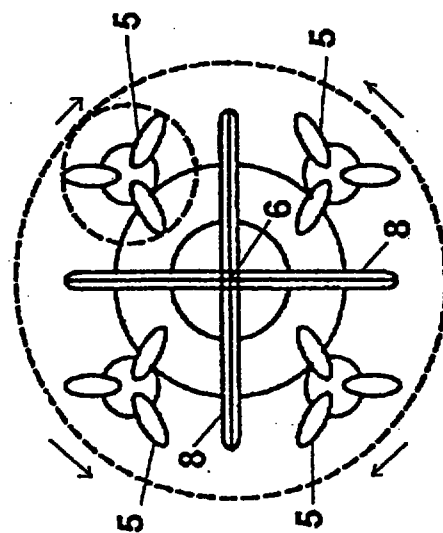
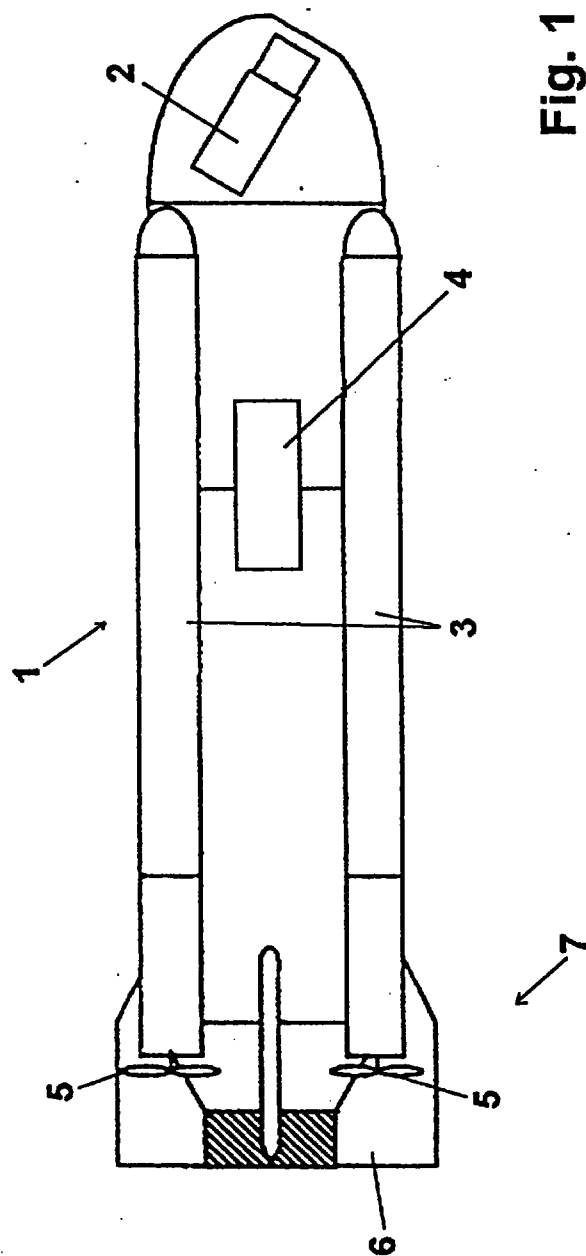
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Abstract

The invention relates to a submarine vessel--in particular, a submarine drone--with a propulsion unit (3) that comprises a plurality of individual means of propulsion (5) operating in a pre-determined direction of propulsion, and with a mechanism (4) for steering the submarine vessel. The invention consists in that the mechanism (4) for steering the submarine vessel (1) consists of a control mechanism that controls the propulsive output of the means of propulsion (5)'.

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Submarine Vessel

Description

The invention relates to a submarine vessel--in particular, a submarine drone--with a propulsion unit that comprises a plurality of individual means of propulsion operating in a pre-determined direction of propulsion, and with a mechanism for steering the submarine vessel.

A submarine vessel with a conventional design usually has two rudder flaps that form a steering mechanism. One of the rudder flaps operates in the vertical direction to bring about directional changes of the hull in the pitch plane, and the other rudder flap operates in the yawing plane to be able to carry directional changes toward starboard or port.

The high production costs because of the expensive rudder-flap constructions and poor maneuverability at low speeds are the drawbacks in these familiar submarine vessels.

Moreover, submarine vessels with additional vertical propulsion or with additional combined vertical and transverse propulsion are generally known. Hereby improved maneuverability at low speeds is attained, but the maneuverability in the vertical direction proved to be unsatisfactory at high speeds. In addition, also for these familiar submarine vessels, the high production costs for the vertical and transverse propulsion have a disadvantageous effect.

The production costs of submarine vessels weigh heavily--in particular, for one-way drones for eliminating mines because, with the mine, the drone is destroyed.

Therefore, it is the task of the invention to create a submarine vessel that distinguishes itself by low production costs and good maneuverability properties at almost all--and, in particular, low--speeds.

This problem is solved, according to the invention, in a submarine vessel of the type mentioned in the beginning in that the steering mechanism of the submarine vessel consists of a control mechanism that controls, individually, the propulsion output of the means of propulsion.

The advantages of the invention lie, in particular, in that neither rudder flaps nor vertical or transverse propulsions are necessary for steering the submarine vessel.

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Steering the submarine vessel takes place exclusively by controlling the propulsion output of the means of propulsion.

The propulsion unit can be constructed from identical standard components, so the submarine vessel according to the invention can be produced at low production costs. Control of the propulsion output of each individual means of propulsion provides very good maneuverability, also at low speeds--which is important, in particular, for destruction of underwater mines. Advantageously, each of the means of propulsion operates in the forward direction of the submarine vessel.

It is particularly preferred that the propulsion unit comprise four means of propulsion, each of which--placed at a 90° angle around the longitudinal axis of the submarine vessel--is arranged at the stern of the submarine vessel.

In this instantly particularly preferred embodiment of the present invention, the submarine vessel runs a straight-ahead course if all the means of propulsion have the same propulsion output. Course corrections in the pitch plane or yawing plane can be performed in a simple manner--for instance, by lowering or increasing the propulsive force of the respective means of propulsion in the corresponding plane.

It is particularly preferred that means of propulsion are formed by propellers that, in pairs, are driven in counter-rotation. Propeller drives are inexpensive propelling means whose counter-rotating propulsion in pairs causes the propeller effects to balance each other out without influence by the control mechanism.

If the means of propulsion are formed by propellers, the steering mechanism of the submarine vessel advantageously controls the speed of the propellers, in propulsion units. Influencing the speed of the propellers is the simplest method of individually controlling the propulsion output of the means of propulsion.

Alternatively to this, it is also possible to control the blade angle of the propeller wings, or even reverse the direction of propulsion of the means of propulsion and, with one propeller, the direction of rotation. By these measures, the maneuverability of the submarine vessel at low speeds can be further improved.

In an alternative embodiment of the invention, the propulsion unit comprises three means of propulsion, each of which--placed at a 120° angle around the longitudinal axis of the submarine vessel--is arranged on the stern of the submarine vessel. Compared to the arrangement of four means of propulsion, one means of propulsion is saved in this embodiment and, thus, the production costs of the submarine vessel are further reduced.

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In the following, an embodiment of the invention is described, using the drawings. Shown are:

Fig. 1 A side view of a submarine vessel;

Fig. 2 A view of the stern of a submarine vessel.

In Figures 1 and 2, a submarine vessel (1)--in the embodiment, a submarine drone--is represented in a side view and a view of the stern.

On the bow, the submarine vessel (1) contains a sensor unit (2)--for instance, a sonar or camera--by which anchor-cable mines or not-completely sunken ground mines can be detected. Furthermore, a propulsion unit (3) is provided that comprises means of propulsion (5) on the stern (7) of the submarine vessel that, in the represented embodiment, have been developed as propellers. The means of propulsion (5) are controlled by a mechanism (4) for steering the submarine vessel, to execute course directions.

In particular, in Fig. 2 it can be recognized that, in each case, the means of propulsion (5)--in each case, placed at a 90° angle around the longitudinal axis of the submarine vessel (1)--are arranged on the stern (7) of the submarine vessel.

The counter-rotating directions of rotation in pairs of the means of propulsion are indicated by the arrows. To reciprocally balance out the propeller effects, two of the propellers are developed for rotating clockwise and two for rotating counter-clockwise.

For the stabilization of the submarine vessel, it is advisable to provide control surfaces (8) that ensure good forward running of the submarine vessel (1).

The steering device of the submarine vessel controls the propulsion output of the individual means of propulsion (5). For a course change in the yawing plane to starboard, the propulsion output of the two starboard-side means of propulsion (5) is reduced and the propulsion output of the port-side means of propulsion (5) is increased. Analogously to this, the propulsion output of the lower two or the upper two means of propulsion (5) can be controlled, to cause course changes of the submarine vessel in the pitch plane.

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Patent claims

1. A submarine vessel--in particular, a submarine drone--with a propulsion unit (3) that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a mechanism for steering the submarine vessel, characterized in that the mechanism (4) for steering the submarine vessel (1) consists of a control device that controls the propulsion output of the means of propulsion (5).
2. Submarine vessel according to claim 1, characterized in that, in each case, the means of propulsion (5) operate in the forward direction.
3. Submarine vessel according to claim 1 or 2, characterized in that the propulsion unit (3) comprises three means of propulsion.
4. Submarine vessel according to claim 3, characterized in that each of the means of propulsion (5)--placed at a 120° angle around the longitudinal axis (6) of the submarine vessel (1)--is arranged on the stern (7) of the submarine vessel (1).
5. Submarine vessel according to one of the preceding claims, characterized in that the propulsion unit (3) comprises four means of propulsion (5).
6. Submarine vessel according to claim 5, characterized in that each of the means of propulsion (5)--placed at a 90° angle around the longitudinal axis (6) of the submarine vessel (1)--is arranged on the stern (7) of the submarine vessel (1).
7. Submarine vessel according to one of the preceding claims, characterized in that the means of propulsion (5) are formed by propellers.
8. Submarine vessel according to claim 7, characterized in that the means of propulsion (5) are propellers that, in pairs, are driven in counter-rotation.
9. Submarine vessel according to claim 7 or 8, characterized in that the mechanism (4) for steering the submarine vessel (1) controls the speed of the propellers.
10. Submarine vessel according to one of the claims 7-9, characterized in that the mechanism (4) for steering the submarine vessel (1) controls the blade angle of the propeller wings.

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11. Submarine vessel according to one of the preceding claims, characterized in that the direction of propulsion of the means of propulsion (5) is reversible.
12. Submarine vessel according to one of the claims 7-11, characterized in that the mechanism (4) for steering the submarine vessel controls the direction of rotation of the propellers.

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ABSTRACT

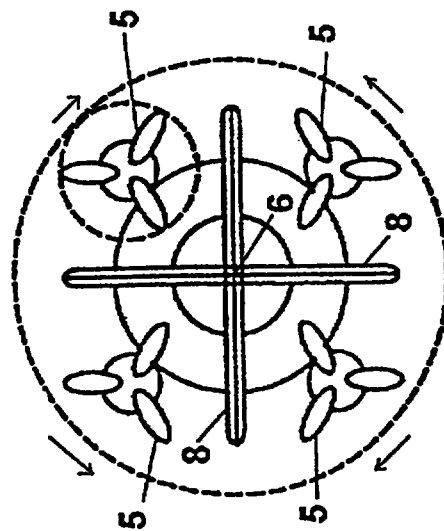
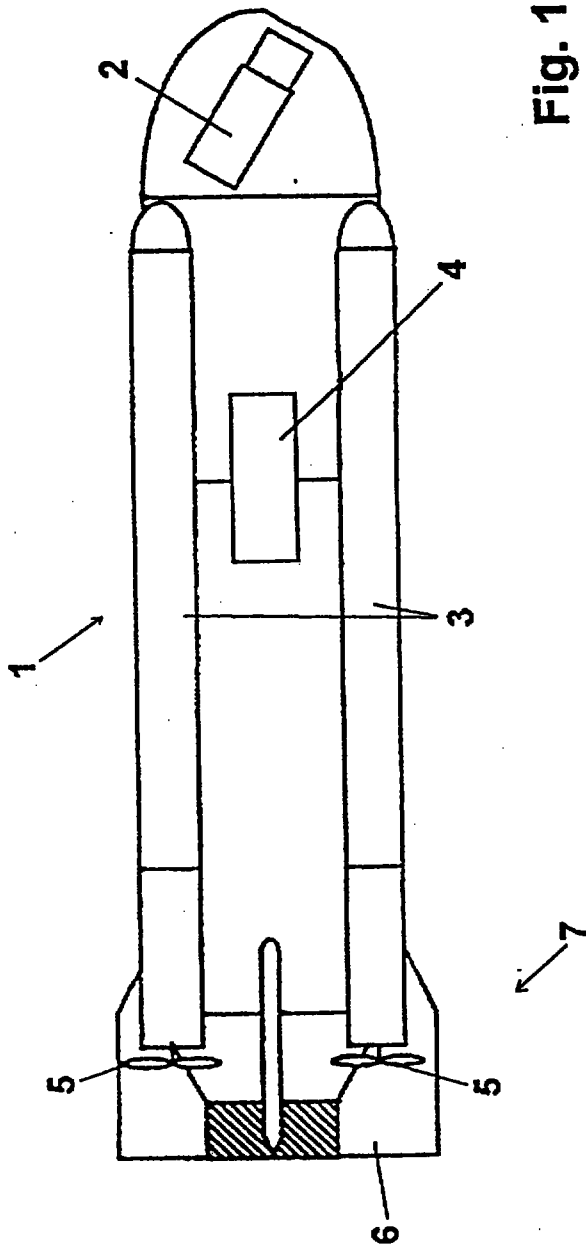
SUBMARINE VESSEL

The invention relates to a submarine vessel--in particular, a submarine drone--with a propulsion unit (3) that comprises a plurality of individual means of propulsion (5) operating in a pre-determined direction of propulsion, and with a mechanism (4) for steering the submarine vessel. The invention consists in that the mechanism (4) for steering the submarine vessel (1) consists of a control mechanism that controls the propulsive output of the means of propulsion (5).

Fig. 1

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- ☒ Claim(s) : paged 4 to paged 5
- ☐ Drawing(s) : paged to paged
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DATE OF RECEIPT **22 DEC 1997**

The invention relates to a submarine vessel, in particular a submarine drone, with a propulsion unit that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a means for steering the submarine vessel in pitch and yawing direction.

A submarine vessel with a conventional design usually has two rudder flaps that form a steering mechanism. One of the rudder flaps operates in the vertical direction to bring about directional changes of the hull in the pitch plane, and the other rudder flap operates in the yawing plane to be able to carry directional changes toward starboard or port.

The high production costs because of the expensive rudder-flap constructions and poor maneuverability at low speeds are the drawbacks in these familiar submarine vessels.

Moreover, submarine vessels with additional vertical propulsion or with additional combined vertical and transverse propulsion are generally known. Hereby improved maneuverability at low speeds is attained, but the maneuverability in the vertical direction proved to be unsatisfactory at high speeds. In addition, also for these familiar submarine vessels, the high production costs for the vertical and transverse propulsion have a disadvantageous effect.

The production costs of submarine vessels weigh heavily, in particular for one-way drones for eliminating mines because, with the mine, the drone is destroyed.

From EP-A-O 215 629, it is known a means for steering a submarine vessel wherein variable-incidence propeller wings are arranged on a propulsion ring provided concentrically with respect to the longitudinal axis of the vessel. For steering the vessel, the variable-incidence propeller wings are swivelled around swivel axes being perpendicular with respect to the longitudinal axis of the vessel. Such means for steering the submarine vessel is complicated and expensive for production.

Therefore, it is the object of the present invention to provide a submarine vessel that distinguishes itself by low production costs and good maneuverability properties at almost all and, in particular, low speeds.

The above object is achieved in the submarine vessel of the above kind in accordance with the invention such that the means for steering the submarine vessel consists of a control device that controls the propulsion output of the means of propulsion only for keeping or changing the course in the pitch or yawing plane.

The advantages of the invention lie, in particular, in that neither rudder flaps nor vertical or transverse propulsions are necessary for steering the submarine vessel. Steering the submarine vessel takes place exclusively by controlling the propulsion

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output of the means of propulsion. The propulsion unit can be constructed from identical standard components, so the submarine vessel according to the invention can be produced at low production costs. Control of the propulsion output of each individual means of propulsion provides very good maneuverability, also at low speeds which is important, in particular, for destruction of underwater mines.

Advantageously, each of the means of propulsion operates in the forward direction of the submarine vessel.

It is particularly preferred that the propulsion unit comprise four means of propulsion, each of which, placed at a 90° angle around the longitudinal axis of the submarine vessel, is arranged at the stern of the submarine vessel. In this instantly particularly preferred embodiment of the present invention, the submarine vessel runs a straight-ahead course if all the means of propulsion have the same propulsion output. Course corrections in the pitch plane or yawing plane can be performed in a simple manner, for instance, by lowering or increasing the propulsive force of the respective means of propulsion in the corresponding plane.

It is particularly preferred that means of propulsion are formed by propellers that, in pairs, are driven in counter-rotation. Propeller drives are inexpensive propelling means whose counter-rotating propulsion in pairs causes the propeller effects to balance each other out without influence by the control mechanism.

If the means of propulsion are formed by propellers, the steering means of the submarine vessel advantageously controls the speed of the propellers, in propulsion units. Influencing the speed of the propellers is the simplest method of individually controlling the propulsion output of the means of propulsion.

In an alternative embodiment of the invention, the propulsion unit comprises three means of propulsion, each of which, placed at a 120° angle around the longitudinal axis of the submarine vessel, is arranged on the stern of the submarine vessel. Compared to the arrangement of four means of propulsion, one means of propulsion is saved in this embodiment and, thus, the production costs of the submarine vessel are further reduced.

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In the following, an embodiment of the invention is described, using the drawings. Shown are:

Fig. 1 A side view of a submarine vessel;

Fig. 2 A view of the stern of a submarine vessel.

In Figures 1 and 2, a submarine vessel (1), in the embodiment a submarine drone, is represented in a side view and a view of the stern.

On the bow, the submarine vessel (1) contains a sensor unit (2) for instance, a sonar or camera by which anchor-cable mines or not-completely sunken ground mines can be detected. Furthermore, a propulsion unit (3) is provided that comprises means of propulsion (5) on the stern (7) of the submarine vessel that, in the represented embodiment, have been developed as propellers. The means of propulsion (5) are controlled by a mechanism (4) for steering the submarine vessel, to execute course directions.

In particular, in Fig. 2 it can be recognized that, in each case, the means of propulsion (5), in each case placed at a 90° angle around the longitudinal axis of the submarine vessel (1), are arranged on the stern (7) of the submarine vessel.

The counter-rotating directions of rotation in pairs of the means of propulsion are indicated by the arrows. To reciprocally balance out the propeller effects, two of the propellers are developed for rotating clockwise and two for rotating counter-clockwise.

For the stabilization of the submarine vessel, it is advisable to provide control surfaces (8) that ensure good forward running of the submarine vessel (1).

The steering device of the submarine vessel controls the propulsion output of the individual means of propulsion (5). For a course change in the yawing plane to starboard, the propulsion output of the two starboard-side means of propulsion (5) is reduced and the propulsion output of the port-side means of propulsion (5) is increased. Analogously to this, the propulsion output of the lower two or the upper two means of propulsion (5) can be controlled, to cause course changes of the submarine vessel in the pitch plane.

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Patent claims

1. A submarine vessel, in particular a submarine drone, with a propulsion unit (3) that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a means for steering the submarine vessel in pitch and yawing direction, characterized in that the means (4) for steering the submarine vessel (1) consists of a control device that controls the propulsion output of the means of propulsion (5) only for maintaining or changing the course in the pitch or yawing plane.
2. Submarine vessel according to claim 1, characterized in that, in each case, the means of propulsion (5) operate in the forward direction.
3. Submarine vessel according to claim 1 or 2, characterized in that the propulsion unit (3) comprises three means of propulsion.
4. Submarine vessel according to claim 3, characterized in that each of the means of propulsion (5), placed at a 120° angle around the longitudinal axis (6) of the submarine vessel (1), is arranged on the stern (7) of the submarine vessel (1).
5. Submarine vessel according to anyone of the preceding claims, characterized in that the propulsion unit (3) comprises four means of propulsion (5).
6. Submarine vessel according to claim 5, characterized in that each of the means of propulsion (5) placed at a 90° angle around the longitudinal axis (6) of the submarine vessel (1) is arranged on the stern (7) of the submarine vessel (1).

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7. Submarine vessel according to anyone of the preceding claims, characterized in that the means of propulsion (5) are formed by propellers.

8. Submarine vessel according to claim 7, characterized in that the means of propulsion (5) are propellers that, in pairs, are driven in counter-rotation.

9. Submarine vessel according to claim 7 or 8, characterized in that the means (4) for steering the submarine vessel (1) controls the speed of the propellers.

10. Submarine vessel according to anyone of the claims 7 to 9, characterized in that the means (4) for steering the submarine vessel (1) controls the blade angle of the propeller wings.

11. Submarine vessel according to anyone of the preceding claims, characterized in that the direction of propulsion of the means of propulsion (5) is reversible.

12. Submarine vessel according to anyone of the claims 7 to 11, characterized in that the means (4) for steering the submarine vessel controls the direction of rotation of the propellers.

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DATE OF RECEIPT		15 MAY 1998

The invention relates to a submarine vessel, in particular a submarine drone, with a propulsion unit that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a means for steering the submarine vessel in pitch and yawing direction.

A submarine vessel with a conventional design usually has two rudder flaps that form a steering mechanism. One of the rudder flaps operates in the vertical direction to bring about directional changes of the hull in the pitch plane, and the other rudder flap operates in the yawing plane to be able to carry directional changes toward starboard or port.

The high production costs because of the expensive rudder-flap constructions and poor maneuverability at low speeds are the drawbacks in these familiar submarine vessels.

Moreover, submarine vessels with additional vertical propulsion or with additional combined vertical and transverse propulsion are generally known. Hereby improved maneuverability at low speeds is attained, but the maneuverability in the vertical direction proved to be unsatisfactory at high speeds. In addition, also for these familiar submarine vessels, the high production costs for the vertical and transverse propulsion have a disadvantageous effect.

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Therefore, it is the object of the present invention to provide a submarine vessel that distinguishes itself by low production costs and good maneuverability properties at almost all and, in particular, low speeds.

The above object is achieved in the submarine vessel of the above kind in accordance with the invention such that the means for steering the submarine vessel consists of a control device that controls the propulsion output of the means of propulsion only for keeping or changing the course in the pitch or yawing plane.

The advantages of the invention lie, in particular, in that neither rudder flaps nor vertical or transverse propulsions are necessary for steering the submarine vessel. Steering the submarine vessel takes place exclusively by controlling the propulsion

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output of the means of propulsion. The propulsion unit can be constructed from identical standard components, so the submarine vessel according to the invention can be produced at low production costs. Control of the propulsion output of each individual means of propulsion provides very good maneuverability, also at low speeds which is important, in particular, for destruction of underwater mines.

Advantageously, each of the means of propulsion operates in the forward direction of the submarine vessel.

It is particularly preferred that the propulsion unit comprise four means of propulsion, each of which, placed at a 90° angle around the longitudinal axis of the submarine vessel, is arranged at the stern of the submarine vessel. In this instantly particularly preferred embodiment of the present invention, the submarine vessel runs a straight-ahead course if all the means of propulsion have the same propulsion output. Course corrections in the pitch plane or yawing plane can be performed in a simple manner, for instance, by lowering or increasing the propulsive force of the respective means of propulsion in the corresponding plane.

It is particularly preferred that means of propulsion are formed by propellers that, in pairs, are driven in counter-rotation. Propeller drives are inexpensive propelling means whose counter-rotating propulsion in pairs causes the propeller effects to balance each other out without influence by the control mechanism.

If the means of propulsion are formed by propellers, the steering means of the submarine vessel advantageously controls the speed of the propellers, in propulsion units. Influencing the speed of the propellers is the simplest method of individually controlling the propulsion output of the means of propulsion.

In an alternative embodiment of the invention, the propulsion unit comprises three means of propulsion, each of which, placed at a 120° angle around the longitudinal axis of the submarine vessel, is arranged on the stern of the submarine vessel. Compared to the arrangement of four means of propulsion, one means of propulsion is saved in this embodiment and, thus, the production costs of the submarine vessel are further reduced.

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In the following, an embodiment of the invention is described, using the drawings. Shown are:

Fig. 1 A side view of a submarine vessel;

Fig. 2 A view of the stern of a submarine vessel.

In Figures 1 and 2, a submarine vessel (1), in the embodiment a submarine drone, is represented in a side view and a view of the stern.

On the bow, the submarine vessel (1) contains a sensor unit (2) for instance, a sonar or camera by which anchor-cable mines or not-completely sunken ground mines can be detected. Furthermore, a propulsion unit (3) is provided that comprises means of propulsion (5) on the stern (7) of the submarine vessel that, in the represented embodiment, have been developed as propellers. The means of propulsion (5) are controlled by a mechanism (4) for steering the submarine vessel, to execute course directions.

In particular, in Fig. 2 it can be recognized that, in each case, the means of propulsion (5), in each case placed at a 90° angle around the longitudinal axis of the submarine vessel (1), are arranged on the stern (7) of the submarine vessel.

The counter-rotating directions of rotation in pairs of the means of propulsion are indicated by the arrows. To reciprocally balance out the propeller effects, two of the propellers are developed for rotating clockwise and two for rotating counter-clockwise.

For the stabilization of the submarine vessel, it is advisable to provide control surfaces (6) that ensure good forward running of the submarine vessel (1).

The steering device of the submarine vessel controls the propulsion output of the individual means of propulsion (5). For a course change in the yawing plane to starboard, the propulsion output of the two starboard-side means of propulsion (5) is reduced and the propulsion output of the port-side means of propulsion (5) is increased. Analogously to this, the propulsion output of the lower two or the upper two means of propulsion (5) can be controlled, to cause course changes of the submarine vessel in the pitch plane.

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Patent claims

1. A submarine vessel, in particular a submarine drone, with a propulsion unit (3) that comprises a plurality of individual means of propulsion operating in a predetermined direction of propulsion, and with a means for steering the submarine vessel in pitch and yawing direction, characterized in that the means (4) for steering the submarine vessel (1) consists of a control device that controls the propulsion output of the means of propulsion (5) only for maintaining or changing the course in the pitch or yawing plane.
2. Submarine vessel according to claim 1, characterized in that, in each case, the means of propulsion (5) operate in the forward direction.
3. Submarine vessel according to claim 1 or 2, characterized in that the propulsion unit (3) comprises three means of propulsion.
4. Submarine vessel according to claim 3, characterized in that each of the means of propulsion (5), placed at a 120° angle around the longitudinal axis (6) of the submarine vessel (1), is arranged on the stern (7) of the submarine vessel (1).
5. Submarine vessel according to anyone of the preceding claims, characterized in that the propulsion unit (3) comprises four means of propulsion (5).
6. Submarine vessel according to claim 5, characterized in that each of the means of propulsion (5) placed at a 90° angle around the longitudinal axis (6) of the submarine vessel (1) is arranged on the stern (7) of the submarine vessel (1).

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7. Submarine vessel according to anyone of the preceding claims, characterized in that the means of propulsion (5) are formed by propellers.

8. Submarine vessel according to claim 7, characterized in that the means of propulsion (5) are propellers that, in pairs, are driven in counter-rotation.

9. Submarine vessel according to claim 7 or 8, characterized in that the means (4) for steering the submarine vessel (1) controls the speed of the propellers.

10. Submarine vessel according to anyone of the claims 7 to 9, characterized in that the means (4) for steering the submarine vessel (1) controls the blade angle of the propeller wings.

11. Submarine vessel according to anyone of the preceding claims, characterized in that the direction of propulsion of the means of propulsion (5) is reversible.

12. Submarine vessel according to anyone of the claims 7 to 11, characterized in that the means (4) for steering the submarine vessel controls the direction of rotation of the propellers.

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