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Description

The invention relates to a boat drive having an electric motor that drives a propeller, and having a control device for controlling the electric motor, wherein the control device can be brought into a neutral position in which the propeller is not driven, and wherein the control device can be brought into at least one operating position in which the propeller is rotated.

Outboard motors for boats are often controlled by means of a tiller attached to the outboard motor. The engine speed is usually varied by turning the twist grip on the tiller. In internal combustion motors, the transmission of force from the motor to the propeller is interrupted at idle, usually by means of a centrifugal clutch. This is necessary in order that the propeller does not immediately begin to rotate, and thereby drive the boat, when the motor starts. Only when the motor's rotational speed is increased by turning the throttle grip is the force from the motor transmitted to the propeller and the boat driven by the rotation of the propeller.

Because internal combustion motors can only turn in one direction, the direction of rotation of the propeller must be changed by means of a reversing gear. Using a shift lever, the propeller can be switched back and forth between its two directions of rotation. Thus the propeller can rotate forwards in one position of the shift lever, and in reverse in the other position of the shift lever, without the need for the internal combustion motor to change its direction of rotation. To change the propeller's direction of rotation, it is only necessary to throttle back and then, when the motor is at idle, change the position of the shift lever of the reversing gear.

In the case of an outboard with an electric motor, the shifter for forward and reverse gears can be dispensed with. The propeller's direction of rotation can be governed by the direction of the current. An idle mode and a centrifugal clutch are also unnecessary, since when the propeller is not in motion the electric motor is also at a standstill. This also means, however, that if the throttle is unintentionally opened, without further precautions the propeller begins to rotate.

Electric motors deliver high torque even at low rotational speeds. Particularly in the case of high-performance electric outboard motors, there is a risk that inadvertent twisting of the throttle grip will set the boat in uncontrolled motion.

5 US 2010/048068 A1 discloses a power supply system for a boat with three internal combustion motors.

EP 1 961 656 A1 discloses a boat drive having an electric motor that drives a propeller, and having a control device for controlling the electric motor.

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EP 2 891 605 A1 discloses a boat drive having an electric motor, wherein a throttle grip fixing mechanism is provided.

The object of the present invention is therefore to improve an electric boat drive  
15 such that unintended opening of the throttle is prevented.

This object is achieved by a boat drive according to claim 1.

The boat drive according to the invention has an electric motor that drives a  
20 propeller. To control the electric motor, a control device is provided, which can be brought into a neutral position and into at least one operating position. In the neutral position of the control device, the propeller is not driven, that is to say the propeller does not rotate. If, on the other hand, the control device is in the operating position, the propeller is rotated by the electric motor. According to the invention, an unlocking device is provided  
25 which ensures that the propeller only begins to rotate if the unlocking device is actuated and at the same time the control device is in the operating position.

Thus, according to the invention, it is necessary to perform two actions that are independent of each other: one is that the control device must be brought out of the  
30 neutral position into the operating position, and the other is that the unlocking device must be actuated. If only one of these two actions is performed, the propeller is not caused to rotate. This prevents the boat from being unintentionally set in motion. This can be achieved, for example, by it only being possible to bring the control device into the

operating position if the unlocking device has previously been actuated, or by the control device remaining ineffective if the unlocking device has not been actuated in direct conjunction with the control device.

5           In a preferred embodiment of the invention, the control device possesses, along with the neutral position, a first operating position and a second operating position. In the first operating position, the propeller is rotated in a first direction, and in the second operating position the propeller is rotated in the opposite direction (hereinafter also referred to as the “second direction”). By selection of the operating position of the control  
10       device, the propeller is rotated in one or the other direction, enabling the selection of either forward or reverse travel.

          The terms “neutral position”, “first operating position” and “second operating position”, along with any further positions, are to be understood as general designations  
15       of different operating modes of the control device. These operating modes or positions can be set by mechanical adjustment of the control device or a part of the control device, for example by moving a control lever or turning a twist grip. It is, however, also possible to bring the control device to the desired operating mode by other means. In general terms, a signal is transmitted to the control device, which has an effect on the operating  
20       mode. Besides the mechanical interaction with the control device described above, this can occur, for example, electrically, electronically, by radio transmission, by means of Bluetooth, or by any other wireless transmission means. In the following, the terms “operating position” and “operating mode” will be used with the same meaning.

25           In one embodiment, the boat drive comprises a tiller, and the control device is provided on the tiller.

          To shift from the neutral position to the operating position, it is necessary according to the invention to perform two actions that are independent of each other, namely the  
30       control device must be brought into the operating position and in addition the unlocking device must be actuated. It has been found that in this manner the boat can be prevented from being unintentionally set in motion. The control device and the unlocking device can be, but do not have to be, separated from each other. It is, for example, possible to install

the control device such that it can be operated by hand, while the unlocking device is actuated by a foot control, or the control device is operated by a foot control and the unlocking device by hand. In another embodiment, the unlocking device is provided on the tiller, preferably together with the control device. It has been found that operation of both the control device and the unlocking device with the same hand does not result in any reduction in safety, but provides a significant increase in ease of operation for the boat's driver, and is therefore regarded as a preferred embodiment.

For reasons of ease of operation, it has also been found advantageous for the control device to be implemented as a hand throttle lever or twist grip.

In this case, in a further embodiment, the twist grip is brought from the initial neutral position into the operating position by turning, wherein, by turning the twist grip in a first direction, the propeller is rotated in a first direction. For example, by turning the twist grip clockwise, forward movement of the boat can be initiated.

It is advantageous to implement the twist grip further such that by turning the twist grip in the opposite, second direction the propeller is rotated in the opposite, second direction. In the above example, turning the twist grip anti-clockwise would thus set the boat in reverse motion.

In a further preferred embodiment, the control device locks in the neutral position. This represents an additional safety feature, since the control device must be actively brought from the neutral position into the operating position, and cannot unintentionally slip into the operating position. If in this case the control device is designed as a twist grip, it is advantageously configured such that, in the neutral position, the part of the twist grip that can be turned is locked in the fixed part of the twist grip in a form-fit, force-fitting or material-fitting manner.

According to the invention, in order to set the propeller in motion, the control device must be brought from the neutral position into the operating position, and at the same time the unlocking device must be actuated. This protection against inadvertently setting the boat in motion can be designed in a preferred embodiment such that the

control device can only be moved out of the neutral position if, simultaneously or beforehand, the unlocking device is also or has also been actuated. For example, the control device may only be moved out of the lock in the neutral position if a mechanical unlocking device is actuated, for example by pressing a mechanical unlocking button or displacing an unlocking slider. The unlocking device may have a mechanical design, as described by way of example above. An electronic unlocking device may, however, also be provided. Thus, unlocking can take place by, for example, actuation of an electrical switch or a contact sensor.

In another embodiment, while the control device may also be brought out of the neutral position into the operating position without actuation of the unlocking device, the propeller is only set into rotary motion when the unlocking device is also actuated. Failing this, displacement of the control device into the operating position has no effect.

It is essential to the invention that the boat driver does not unintentionally operate the throttle and cause the propeller to rotate. For this purpose, as described, two independent actions are required, namely actuation of both the control device and the unlocking device. After the propeller has been intentionally set in motion, it is no longer essential for safety reasons to continue to operate the control device and the unlocking device together. Hence in one embodiment the control device and/or the unlocking device are configured such that, after the control device has been brought into the operating position, it holds the unlocking device mechanically in the unlocked position.

In another embodiment, the unlocking device must be actuated only until the control device has been brought into the operating position. According to the invention, a timing element is provided, which requires the control device and the unlocking device to be simultaneously actuated for a certain time period in order to cause the propeller to rotate and maintain the rotary movement. After this period has passed, a further actuation of the unlocking device is no longer necessary. In order to continue rotation of the propeller, it is necessary only to hold the control device in the corresponding operating position.

In a further embodiment, when the direction of rotation of the propeller is changed, the control device passes through the neutral position. In order then to start rotation in the other direction, the simultaneous actuation of the unlocking device and the control device is again necessary.

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The invention is particularly suitable for a boat drive which is designed as an electric outboard motor.

10 The problem initially described above, namely that the propeller starts to rotate unintentionally, represents a safety risk above all in the case of high-performance drives. The invention is thus particularly advantageous when the boat drive has an output of more than 4 kW, more than 6 kW or more than 8 kW.

**Patentkrav**

- 1.** Båddrev med en elektromotor, der driver en propel, og med en styreindretning til styring af elektromotoren, idet styreindretningen kan bringes i en nulstilling, i hvilken propellen ikke drives, og idet styreindretningen kan bringes i mindst en  
5 driftsstilling, i hvilken propellen drejes, idet en frigørelsesindretning er tilvejebragt, og idet propellen kun begynder at dreje, når frigørelsesindretningen aktiveres og styreindretningen samtidig er i driftsstillingen,  
**kendetegnet ved**  
en timer, der kræver samtidig aktivering af styreindretningen og  
10 frigørelsesindretningen i et bestemt tidsrum for at få propellen til at dreje og opretholde drejebevægelsen.
- 2.** Båddrev ifølge krav 1, **kendetegnet ved, at** styreindretningen har en første driftsstilling, i hvilken propellen drejes i en første retning, og at styreindretningen  
15 har en anden driftsstilling, i hvilken propellen drejes i en modsat, anden retning.
- 3.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** styreindretningen er tilvejebragt på en rorpind.
- 20 **4.** Båddrev ifølge krav 3, **kendetegnet ved, at** frigørelsesindretningen er tilvejebragt på rorpinden.
- 5.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** styreindretningen er udformet som et gashåndtag eller drejehåndtag.  
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- 6.** Båddrev ifølge krav 5, **kendetegnet ved, at** drejehåndtaget kan bringes fra nulstillingen via drejning til driftsstillingen, idet, ved at dreje drejehåndtaget i en første retning, drejes propellen i en første retning.
- 30 **7.** Båddrev ifølge krav 6, **kendetegnet ved, at** ved at dreje drejehåndtaget i den modsatte, anden retning, drejes propellen i den modsatte, anden retning.

- 8.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** styreindretningen går i indgreb i nulstillingen.
- 9.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** styreindretningen kun kan bringes fra nulstillingen til driftsstillingen, når frigørelsesindretningen aktiveres samtidig.
- 10.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** styreindretningen, efter den er bragt i driftsstillingen, holder frigørelsesindretningen i den ulåste position.
- 11.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** båddrevet er udformet som en udenbordsmotor.
- 12.** Båddrev ifølge et af de foregående krav, **kendetegnet ved, at** båddrevet har en effekt på mere end 4 kW, mere end 6 kW eller mere end 8 kW.