the rudder trunk 9 to the ship structure or the watercraft body (not shown here), in particular the structure of the stern. Usually these connecting means are welded to the watercraft body or parts of the ship structure.

In addition to the usual rudder trunks made of steel, which are connected to the ship structure by means of welding, a rudder trunk is already known from EP 2 033 891 B1 which is not connected to the ship structure by means of welding but is inserted in a so-called trunk tube and then cast or bonded. In this case, the rudder trunk is not made of steel but from a fibre composite material.

Embodiments~~It is the object~~ of the invention seek to provide a device for manoeuvring a watercraft and a method for producing a device for manoeuvring a watercraft, where the fabrication expenditure for the rudder trunk is reduced compared with known rudder trunks and the installation process is simplified.

~~This object is solved by a device for manoeuvring a watercraft according to the features of claim 1 and a method for producing a manoeuvring device for a watercraft according to the features of claim 17.~~

According to a first aspect of the present invention, there is provided a device for manoeuvring a watercraft comprising a rudder trunk and a receiving shaft, wherein a first part of the rudder trunk is disposed in the receiving shaft in such a manner that there is an intermediate space between the first part of the rudder trunk and a wall of the receiving shaft, and a second part of the rudder trunk projects from the receiving shaft, wherein the intermediate space is filled with a connecting means at least in certain areas and wherein the connecting means clamps the first part of the rudder trunk over a clamping height, wherein the connecting means connects the first part of the rudder trunk to the wall of the receiving shaft, wherein the connecting means is disposed at least in a lower end region of the clamping height and in an upper end region of the clamping height, wherein the connecting means is disposed surrounding an entire circumference of the first part of the rudder trunk and wherein the length ratio between the clamping height and the second part of the rudder trunk is at least 1, preferably between 1 and 3, particularly preferably between 1 and 2, and wherein a

wall thickness of the rudder trunk in the upper end region of the clamping height comprises a lower thickness than in the lower end region of the clamping height.

According to a second aspect of the present invention, there is provided a method for manufacturing a manoeuvring device for a watercraft, comprising the following steps:

a) inserting a rudder trunk into a receiving shaft , wherein a first part of the rudder trunk is disposed in the receiving shaft and a second part of the rudder trunk projects from the receiving shaft ,

b) aligning the rudder trunk in the receiving shaft in such a manner that an intermediate space extends between the first part of the rudder trunk and the wall of the receiving shaft, wherein the intermediate space surrounds an entire circumference of the first part of the trunk,

c) introducing a connecting means into the intermediate space in such a manner that the connecting means is introduced against the gravitational force and that the connecting means completely, i. e. over an entire circumference of the first part of the trunk , connects the first part of the rudder trunk over a clamping height to the wall of the receiving shaft , wherein the connecting means is disposed at least in a lower end region and in an upper end region of the clamping height, wherein before introducing the connecting means the intermediate space between the first part of the rudder trunk and the wall of the receiving shaft is sealed in the lower end region of the clamping height with at least one means for sealing and,
wherein a wall thickness of the rudder trunk in the upper end region of the clamping height comprises a lower thickness than in the lower end region of the clamping height.

According to this, the device designated above for manoeuvring a watercraft comprises a rudder trunk and a receiving shaft. A first part, the upper part, of the rudder trunk is disposed in the receiving shaft and a second part, the lower part, of the rudder trunk projects downwards from the receiving shaft. The terms “top“ or “upper” and “bottom” or “lower” relate to the state of the rudder trunk when built into a watercraft. In this context the rudder trunk is disposed in such a manner that there is an intermediate space between the first

part or the upper part of the rudder trunk and the wall of the receiving shaft. The intermediate space is filled at least in certain areas with a connecting means, where the connecting means clamps the first part of the rudder trunk over a clamping height. In this case, the connecting means connects the first part or the upper part of the rudder trunk over the entire circumference of the first part of the rudder trunk to the wall of the receiving shaft, where the connecting means is disposed at least in the lower end region and in the upper end

According to embodiments of the invention, the length ratio of the clamping height to the second part of the rudder trunk is at least 1. Consequently, the region of the rudder trunk which is clamped in the receiving shaft or connected to the wall of the receiving shaft by the connecting means is at least as long as the part of the rudder trunk projecting downwards from the receiving shaft. Preferably the clamping height is at least the same length and at most three times as long as the downward-projecting part of the rudder trunk. It is further preferred that the ratio of the clamping height to the second part of the rudder trunk is between 1 and 2. in this case, the clamping height is at least as long as the second part of the rudder trunk, but at most twice as long as the second part of the rudder trunk.

In particular, the provision of the connecting means in the lower end region of the clamping height and in the upper end region of the clamping height and the length ratio according to embodiments of the invention of the clamping height to the part of the rudder trunk projecting downwards from the receiving shaft, the second part of the rudder trunk, has the advantage that the fabrication expanditure of the rudder trunk can be reduced appreciably compared with conventional rudder trunks. Apart from the connecting means for connecting the rudder trunk to the wall of the receiving shaft, no further devices are required to connect the rudder trunk to the ship structure. The receiving shaft is already provided or incorporated in the ship structure or in the region of the watercraft body provided for this purpose at the shipyard based on the dimensions of the rudder trunk according to embodiments of the invention. Furthermore, the installation process is consequently simplified. For example, in contrast to known rudder trunks, in the device according to embodiments of the invention, the rudder trunk no longer needs to be provided so early for installation in the rudder system. In the device according to embodiments of the invention, for example, it is sufficient to supply the dimensions and tolerances of the rudder trunk and merely provide the receiving shaft in the stern section at the shipyard at the time of construct of the stern structure. The actual installation of the rudder trunk can be accomplished by the device according to embodiments of the invention at a later time.

The connecting means preferably comprises means for adhesive bonding. As a result, the rudder trunk is adhesively bonded to the wall of the receiving shaft. The rudder trunk is therefore in adhesive connection with the wall of the receiving shaft. The connecting means can consist of any connecting means which has adhesive properties. It could here comprise a resin or an epoxide-based casting material. For example, the connecting means could also comprise an epoxide resin such as Epocast or another assembly adhesive such as, for example, Belzona®. The connecting means is preferably mixed from a resin and a hardener. Consequently, the connecting means comprises a two-component system. It is particularly preferred that the connecting means consists of Belzona® 5811. Belzona® 5811 has sufficiently good adhesive properties so that by using Belzona® 5811 as connecting means, a suitable sealing of the gap or the intermediate space between rudder trunk and the wall of the receiving shaft, in particular in the upper and lower end regions of this intermediate space is given. The connecting means therefore preferably has such high adhesive properties that the device according to embodiments of the invention does not tend to gap corrosions in the region of the intermediate space between rudder trunk and the wall of the receiving shaft and as a result, the connecting means already serves as a seal against seawater.

It is further preferred that the connecting means is disposed continuously over the entire clamping height. Consequently, in this embodiment no intermediate space or free space is provided between the lower end region and the upper end region of the clamping height which is not filled by the connecting means. The first part of the rudder trunk is therefore completely surrounded, i. e. over the entire circumference of the first part of the rudder trunk, by the connecting means over the entire clamping height and as a result completely connected to the wall of the receiving shaft over the entire clamping height.

It is also preferred that the intermediate space between the first part of the rudder trunk and the wall of the receiving shaft has a constant clearance at least over half of the clamping height. It is particularly preferred that the intermediate space between the first part of the rudder trunk and the wall of the receiv-

It is further preferred that the rudder trunk does not have any fastening means projecting outwards from the rudder trunk, in particular fastening plates, fastening ribs or struts, for connecting the rudder trunk to the watercraft or in the receiving shaft, or to the wall of the receiving shaft. In contrast to rudder trunks known from the prior art, the rudder trunk according to embodiments of the invention therefore has no plates or ribs or other outwardly projecting fastening means. The rudder trunk consequently consists merely of a tube, preferably a steel tube. Such a simple structure is not possible in known rudder trunks.

Preferably the receiving shaft is configured substantially as a tube or in a tubular manner at least in the entire region of the clamping height. Consequently, the rudder trunk in the region of the clamping height is disposed in a tube, i.e. the receiving shaft or in a tubular receiving shaft. Outside the region of the clamping height, in particular in the region above the clamping height, the receiving shaft can have any shape. For example, in this region above the clamping height the receiving shaft can be formed by a rectangular shape or by at least four surfaces disposed at an angle to one another. Furthermore, it would be possible that the receiving shaft is formed in this region by a hollow body having any shaping.

It is also preferred that the receiving shaft or the wall of the receiving shaft is firmly connected and preferably welded to the watercraft body or to the ship structure. The receiving shaft is therefore already provided at an appropriate location in the watercraft body during fabrication of the stern section. The receiving shaft can be fabricated as a separate component, then inserted and connected to the watercraft body or alternatively formed by special shaping of the plates or struts of the watercraft body in the stern section through the body of the watercraft or through the plates or strut. Preferably the wall of the receiving shaft is connected to the watercraft body in such a manner and through the connecting means to the rudder trunk that the receiving shaft is watertight.

It is further preferred that at least one means for sealing is provided between the first part of the rudder trunk, i.e. the part of the rudder trunk which is disposed in the receiving shaft, and the wall of the receiving shaft in the lower end

It is also preferred that both the rudder trunk and the wall of the receiving shaft comprise steel or particularly preferably consist of steel. In principle, the rudder trunk and the wall of the receiving shaft could consist of different materials. For example, it would be feasible that the rudder trunk consists of a fibre composite material, where the wall of the receiving shaft comprises steel or consists of steel or another suitable material.

There is disclosed a~~The~~ method ~~according to the invention~~ for manufacturing a manoeuvring device for a watercraft, comprises the following steps:

1. inserting a rudder trunk into a receiving shaft, wherein a first part of the rudder trunk is disposed in the receiving shaft and a second part of the rudder trunk projects from the receiving shaft,
2. aligning the rudder trunk in the receiving shaft in such a manner that an intermediate space extends between the first part of the rudder trunk and the wall of the receiving shaft, wherein the intermediate space surrounds the entire circumference of the first part of the trunk,
3. introducing a connecting means into the intermediate space in such a manner that the connecting means is introduced against the gravitational force and that the connecting means completely, i. e. over the entire circumference of the first part of the trunk, connects the first part of the rudder trunk over a clamping height to the wall of the receiving shaft, wherein the connecting means is disposed at least in the lower end region and in the upper end region of the clamping height.

After inserting the rudder trunk in the receiving shaft, the rudder trunk is aligned by means of measuring devices and by means of alignment devices in the receiving shaft. In order to be able to move the rudder trunk freely during the alignment process, it is, for example suspended on steel cables or chains. The measuring device can, for example, comprise laser-optical alignment systems or other measuring systems. For the actual alignment, for example, adjusting units which can be connected to the ship structure or the hull under the