Rudder with sliding swivel piston articulation

Field of application

This invention relates to a rudder for seagoing vessels with the characteristics indicated in the preamble of claim 1.

Prior art

A rudder for seagoing vessels with the characteristics of the preamble of claim 1 is known by the EP 0 811 552 A. This rudder consists of a main rudder and a fin forced guided by the main rudder, articulated thereon, fin which is provided with a sliding piston articulation made of a sliding bearing configured on the fin for a swivel piston, whereby the articulation bolt is also configured as a piston configured in a sliding bearing. Due to the fact that the articulation bolt is configured as a piston configured in a sliding bearing, it should be possible to minimize the wear of all the parts forming the whole system and an edge pressure developing inside the bearing and to connect all the parts with each other so that movements of the parts are possible with sufficient degrees of freedom.

A deviation of arising forces into the hull is not possible with this embodiment of the sliding swivel piston articulation so that no high wear reduction can be achieved.

Through this construction, degrees of freedom are created for the rudder or its movable parts which guarantee that no bearing surface is charged stronger than necessary by the effect of high charged edges.

Moreover this configuration allows movements which are obtained by the use of a hinged bolt between both pistons guided in cases so that movements in an angular range of ± 90° are possible, whereas the known systems are rigidly designed by the predetermined angle of 90°. Forces caused by a wall pressure onto the rudder and acting onto the system and arising bending moments will be compensated by the cylindrical piston configuration and jammings by the movable sliding swivel piston articulation. However, the disadvantage is that the system of the sliding swivel piston articulation with the biggest possible degrees of freedom can only absorb forces which can be tolerated with respect to the wear behaviour of the sliding bearings of the articulation bolt or of the swivel pin and a hinged bolt which connects the bolts. In particular for ships with bigger rudder installations, the bigger forces acting onto the system are so big that a ship rudder construction according to the embodied known solutions can only be used under conditions or can no longer be used.

The FR-A-1-382 764 discloses a steering rudder for ships in which the propeller is at least partially enclosed in a tunnel which acts as a nozzle, whereby the rudder blade of the steering rudder is placed behind the propeller and is configured in such a manner that the positions of maximal deflection of the rudder blade are limited in both directions by the striking of the front edge of the rudder blade to the wall of the tunnel. With such an arrangement of the steering rudder in ships in which the propeller is at least partially enclosed in a tunnel which acts as a nozzle and where the rudder blade of the steering rudder is placed behind the propeller, it should be achieved that the ships are steerable more easily, namely in particular for inland navigation ships which are combined to always bigger units and which are rigidly connected with each other.

From the DE 23 53 934 A, a ship rudder construction is known with a propeller at least partially provided with a casing with an auxiliary rudder, articulated on the rear edge of the main rudder, which is connected with an operating mechanism which contains a driving rod movable in a guide bush and which is rotatably connected with the hull in a surface plane approximately vertical to the axis about a pivot situated behind this surface plane. For this ship rudder construction, the guide bush is placed on the auxiliary rudder approximately horizontally and practically parallel to the rudder face, while the driving rod is positioned rotatable on an axis placed behind the rudder axis and has such a length that the cooperation between the driving rod and the guide bush works for a rudder steering lock of 90°. The guiding and positioning of the driving rod positioned at one end on the hull for steering the fin takes place by means of the guide bush which is fixed to the fin horizontally in the upper area of the fin and through which the driving rod passes. The guide bush as a sliding bearing shows a slide packing in its inner space. The driving rod is positioned in a practically horizontal surface plane rotatable on an axle muff (articulation bolt) which engages into an axle muff casing and which is locked at its free end by a locking bolt.

The ship rudder construction according to EP 0 051 822 A consists of a main rudder with an articulated and forced guided fin. The forced guided fin is configured with a sliding bearing for the swivel pin articulated at one end on the hull. The main rudder and the forced guided fin articulated on the main rudder are provided with a sliding swivel piston articulation made of a sliding bearing configured on the fin for a swivel piston. An articulation bolt fixed on the hull with its projecting end is thus positioned swivellable.

The GB-A-2 206 324 describes a rudder for water vehicles which is made of a rudder blade with a fin articulated thereon and a propeller associated to the rudder, placed on a drivable propeller axle, whereby the rudder spindle for the rudder blade is positioned in a central inner longitudinal bore hole of the rudder post bearing configured as cantilever beam by means of an inside bearing, while the rudder post bearing has on its outer wall face an outside bearing for bearing the rudder blade on the rudder post bearing. The rudder post bearing is fixed to the hull. A thrust bearing for the rudder post bearing is not provided for.

The GB-A-2 248 049 discloses a ship steering rudder which consists of a main rudder blade, which is fixed and held by appropriate means on the steering gear of the vehicle, and of an additional rudder blade, whereby the additional rudder blade is fixed by means of a hinge to the main rudder blade and is made of a controlling gear fixed to the hull which fixes the relative angular postion of the additional blade to the main rudder blade. Furthermore, a flow deflector with a round cross section is provided for which is fixed to the front edge of the main rudder blade and a series of flow intercepting fins which are fixed laterally in horizontal position to the control surfaces of the additional rudder blade.

The known rudders have no additional thrust bearings for the control pistons on the hull so that arising forces and bending moments are not sufficiently taken up.

Aim, solution, advantage

The aim of this invention is to improve the rudder with the sliding swivel piston articulation in such a manner that the arising forces and developing bending moments can be taken

up and guided into the hull as well. However, all the parts can further be connected with each other in such a way that movements with sufficient degrees of freedom are kept up and that the existing functionality is not limited herewith.

This aim is achieved with a rudder for seagoing vessels according to the type indicated in the introduction with the characteristics indicated in claim 1.

The rudder according to the invention with its sliding piston articulation offers the...

Claims

1. Rudder for seagoing vessels consisting of a main rudder (20) and a fin (10) forced guided by the main rudder (20), articulated thereon over a vertical piston (15), fin which is provided with a horizontal piston (11), whereby the vertical piston (15) and the horizontal piston (11) are connected with each other over a hinged bolt (14) to a sliding swivel piston articulation (100) and a bearing housing (16) of the vertical piston (15) is fixed on a hull,
characterized in
that, for receiving occuring forces and bending moments through the hull, the vertical piston (15) is supported on the hull by an additional thrust bearing (27) which is placed on the side of the hinged bolt (14) which is opposite the vertical piston (15) and which has a bearing bush (22) with a bush (21) into which an end of the vertical piston (15) projecting over the hinged bolt (14) is in gear and which has a supporting ring (24), on the side of the thrust bearing (27) turned away from the vertical piston (15), which forms a movement stopper for the vertical piston (15).

2. Rudder according to claim 1,
characterized in
that the bearing housing (16) of the vertical piston (15) is connected with a first horizontal cross bar (18) and over the thrust bearing (27) with a second horizontal cross bar (19) parallel to the first horizontal cross bar (18), whereby both horizontal cross bars (18, 19) are connected with a vertical cross bar (26) which is supported on the hull.

3. Rudder according to claim 1 or 2,
characterized in
that the bush (21) is made of bronze.