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2,344,433

SYSTEM OF CONTROL FOR BOATS

Filed Oct. 14, 1943

2 Sheets-Sheet 1

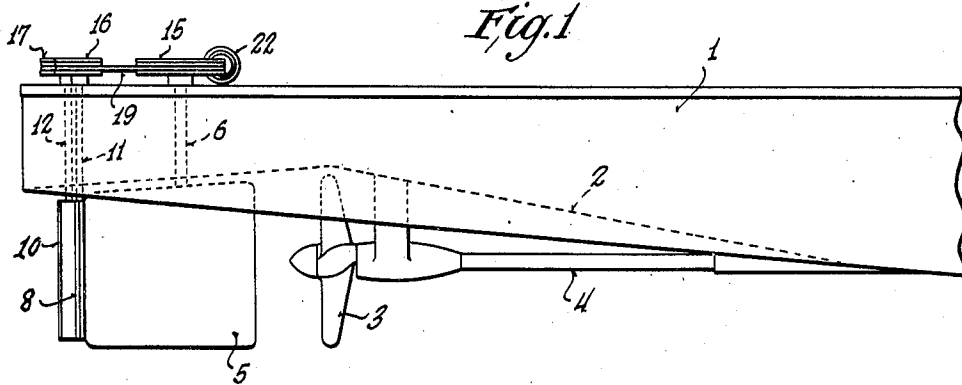
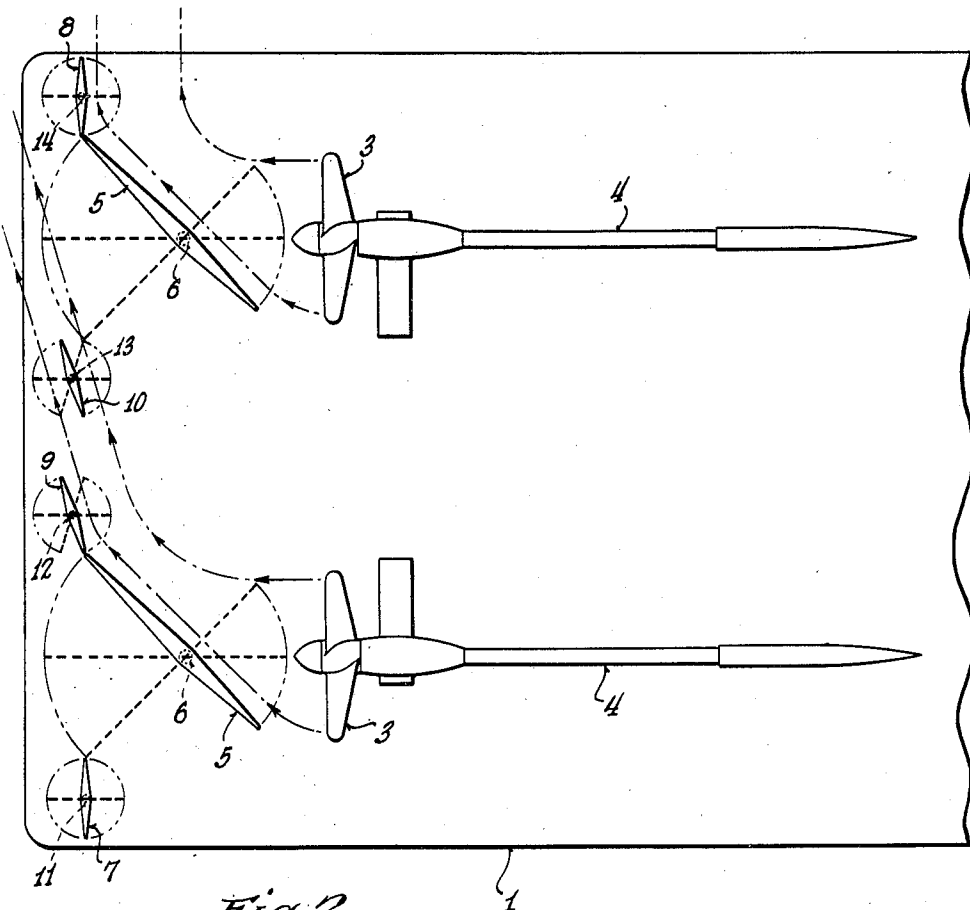


Fig. 2

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2 Sheets-Sheet 2

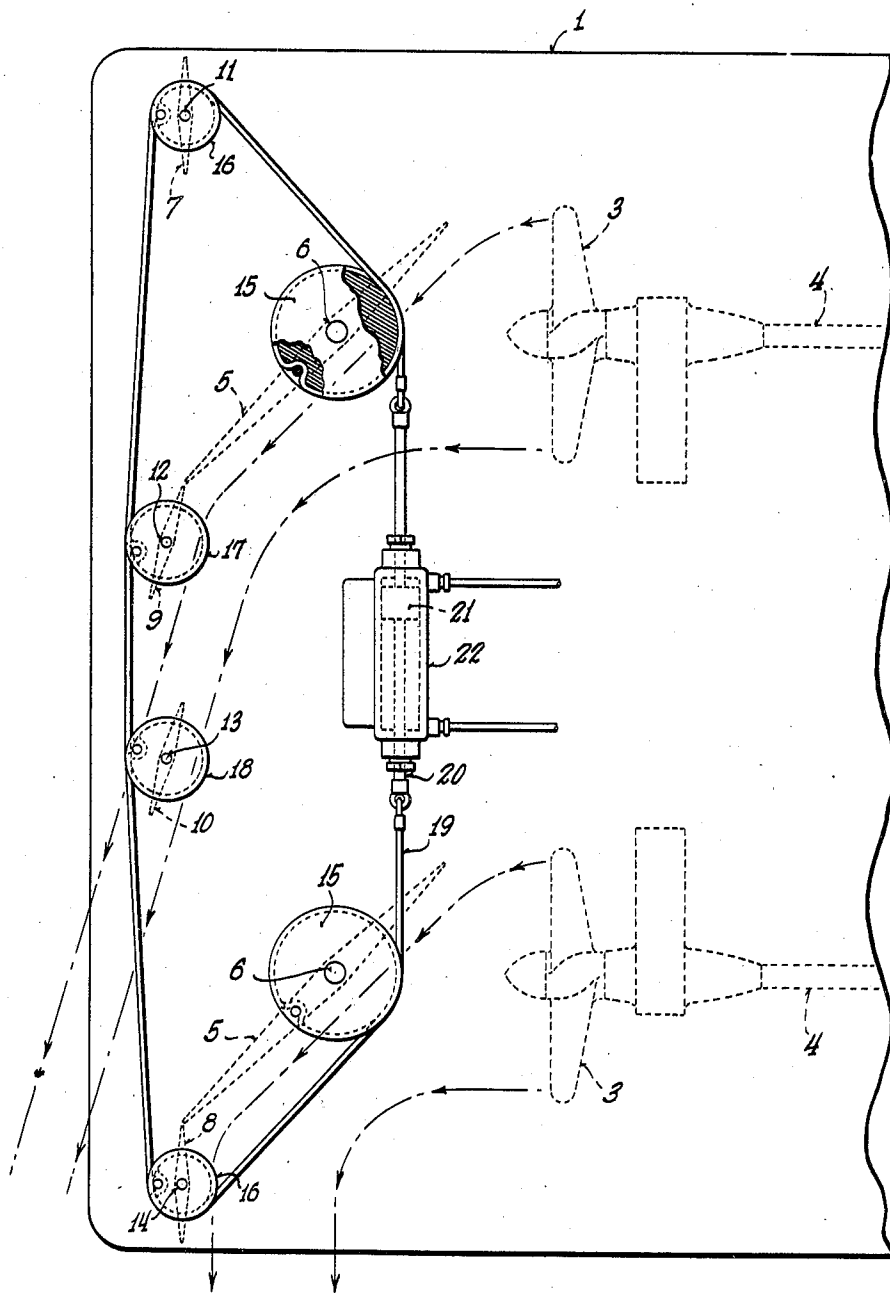


Fig. 3

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SYSTEM OF CONTROL FOR BOATS

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This invention relates to a system of control for boats and is particularly directed to boats such as towboats engaged in river navigation.

A towboat either pulls or pushes a string of barges. Most usually it is used to push a string of barges ahead of it and these towboats are often required to navigate winding rivers that have sharp sudden turns.

Objects of this invention are to provide a novel system of control for a boat which is very easy to operate, which provides an effective control of the slip stream with a minimum of shock and eddies produced in such slip stream, and which is so arranged that the entire slip stream can be deflected at full velocity through any angle desired up to and including substantially a right angle to the axis of the boat.

In greater detail, objects of this invention are to provide a system of control for a boat in which if a single propeller is used, a main rudder is located rearwardly of the propeller and a pair of auxiliary rudders is located rearwardly of the main rudder, and to provide means for simultaneously turning the main rudder and at least the auxiliary rudder on the side towards which said main rudder is turned, preferably turning both of the auxiliary rudders in the same direction as the main rudder, the means being so related to the main and auxiliary rudders that the auxiliary rudders are turned through a greater angle than the main rudder in all settings of the main rudder and preferably are turned through an angle approximately twice that of the angle through which the main rudder is turned.

Further objects are to provide a system of control for a boat which is so arranged that it is adapted for either a single propeller boat, as hereinabove set forth, or for a boat provided with a plurality of propellers, the invention contemplating the positioning of a main rudder rearwardly of each propeller and associating auxiliary rudders located rearwardly of the main rudder with the main rudder in such a manner that auxiliary rudders are located on each side of each main rudder, and to provide means for simultaneously turning the auxiliary rudders through an angle greater than that through which the main rudders are turned with the intermediate auxiliary rudders turned through a slightly lesser angle than the outermost auxiliary rudders.

Further objects are to provide a system of control for boats in which at least one propeller and one main rudder is provided with the main rudder located rearwardly of the propeller and with a pair of auxiliary rudders located on opposite

sides of the main rudder, and to provide means for turning the auxiliary rudders through approximately twice the angle of the main rudder, the location and position of the main and auxiliary rudders being such that the leading edge of the auxiliary rudder towards which the main rudder is turned is in close proximity to the trailing edge of the main rudder so that the slip stream is deflected in a gradual manner laterally of the rear portion of the boat without substantial shock or eddies.

Further objects are to provide a simple form of control which may be readily applied to towboats or other boats and which is so arranged that it does not require reversal of the engine or engines in executing the sharpest turns needed in river navigation.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a side elevation of the rear portion of a towboat.

Figure 2 is a bottom view of the structure shown in Figure 1 showing the rudders arranged to produce a left-hand thrust at the rear portion of the towboat.

Figure 3 is a plan view of the structure shown in Figure 1, with parts broken away, showing the position of the parts when the rudders are set to produce a left-hand thrust on the rear end of the boat.

Referring to the drawings, it will be seen that a towboat indicated at 1 has been diagrammatically illustrated. The engine, steering wheel and other associated mechanisms have been omitted. It is to be noted that the bottom of the towboat is inclined upwardly at its rear and is provided with tunnels as indicated at 2 in which the propellers 3 operate. These propellers are driven from engines, not shown, through the medium of the propeller shafts 4.

Main rudders indicated generally by the reference character 5 are located rearwardly of the propellers. These main rudders 5 are preferably provided with a relatively shorter forward portion and a relatively longer rear portion so as to have the center of the thrust on the main rudders approximately coincide with the axis of the rudder shafts 6.

The towboat is provided with a series of auxiliary rudders located rearwardly of the main rudders. There are, in the example chosen for illustration, a pair of outer auxiliary rudders 7 and 8 and a pair of intermediate auxiliary rudders 9 and 10 carried by the rudder shafts 11, 12, 13 and 14. In the example chosen for illus-

tration, a twin screw boat has been shown provided with two main rudders and four auxiliary rudders. It will be apparent as the description proceeds that if desired two outer auxiliary rudders and a single intermediate auxiliary rudder could be employed for a twin screw boat. It is apparent, however, that in the event a single screw boat were used, one main rudder and two auxiliary rudders would be employed. In the event a greater number of propellers were employed, the number of auxiliary rudders would be suitably increased.

Mechanism is provided for simultaneously operating the main and the auxiliary rudders and this mechanism is so arranged that the main rudders are arranged to turn a maximum of approximately 45° on each side of center and the outer auxiliary rudders 7 and 8 are arranged to turn a maximum of 90° on each side of center. It is preferable to have the intermediate auxiliary rudders 9 and 10 turn through an angle slightly less than 90° on each side of center as indicated in Figures 2 and 3, for instance.

This simultaneous operation of the rudders as described above may be accomplished in any suitable manner. A very simple means is illustrated in the drawings in which the main rudder shafts 6 are provided with relatively large drums 15 and the rudder shafts 11 and 14 for the outer auxiliary rudders are provided with drums 16 of half the diameter of that of the drums 15. The drums 17 and 18 for the shafts 12 and 13 of the intermediate auxiliary rudders are slightly larger than the drum 16. All of the drums are connected for simultaneous motion by means of a cable 19 which is wrapped around and secured to each drum to prevent slipping. The cable is attached to a suitable motor as shown or it may be operated directly from the steering wheel. In the form shown it is attached at opposite ends of the piston rod 20 operated by means of the piston 21 located within the cylinder 22. The operation of the piston 21 is controlled from the steering wheel or in any suitable manner in accordance with the usual practice.

The operation of the apparatus will be readily understood from Figures 2 and 3, it being remembered that Figure 2 is a bottom view and Figure 3 is a plan view.

In steering the towboat, no matter how sharp a turn is desired, the direction of rotation of the propellers is not reversed. Instead the propellers continuously run in the same direction. Consider for example Figure 3. This figure shows the position of the main and auxiliary rudders when the maximum thrust to the left at the rear end of the boat is obtained. It is to be noted that the main rudders 5 are turned 45° and that the tip of the right-hand main rudder 5 is closely adjacent the tip of the auxiliary rudder 8. The auxiliary rudder 8, it will be noted, is turned 90°. It is also to be noted that the tip of the left-hand main rudder 5 is in close proximity to the tip of the auxiliary intermediate rudder 9 and that this intermediate auxiliary rudder 9 is turned slightly less than 90°. The intermediate rudder 10 parallels the intermediate rudder 9. The left-hand auxiliary rudder 7 is turned 90°, but as it is out of the slip stream, it does not in any way hinder the flanking motion of the boat.

The slip stream is indicated by the arrows and it will be seen that the main rudders first direct the slip stream to the right at approximately 45° and that the auxiliary rudder 8 deflects the slip

stream to the right at approximately 90° and that the auxiliary rudders 9 and 10 deflect the slip stream to the right an amount slightly less than 90°. It is to be noted that the main and auxiliary rudders provide a means for gradually deflecting the slip stream so that there is a minimum of shock produced in the slip stream and so that there is a minimum of whirls or eddies. The slip stream is first deflected a certain amount by the main rudders and is thereafter deflected a greater amount by the auxiliary rudders.

The main rudders serve to deflect the slip stream a given amount and thereafter the auxiliary rudders serve to deflect the slip stream a greater amount thereby securing a gradual deflection of the slip stream. This construction allows the slip stream to be deflected without shock to practically a full 90° degrees from the axis of the boat, or to any lesser amount. It is to be noted in this connection, that if the main rudders are turned to a lesser angle than that shown, the auxiliary rudders are proportionally turned but to a greater extent than the main rudders.

For straight ahead travel all of the rudders parallel the axis of the boat.

Where the expression "towboat" is used, it is intended that this expression shall refer to a boat which either pushes a string of barges or which pulls a string of barges.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A system of control for a boat comprising a propeller, a main rudder located rearwardly of said propeller, a pair of auxiliary rudders located rearwardly of said main rudder with the auxiliary rudders positioned on opposite sides of said main rudder, and means for simultaneously turning said main rudder and said auxiliary rudders in the same direction with the auxiliary rudders turned through a greater angle than said main rudder, whereby the slip stream will be deflected by said main rudder and the deflected slip stream will again be deflected by the auxiliary rudder on that side towards which said main rudder is turned.

2. A system of control for a boat comprising a propeller, a main rudder located rearwardly of said propeller, a pair of auxiliary rudders located rearwardly of said main rudder with the auxiliary rudders positioned on opposite sides of said main rudder, and means for simultaneously turning said main rudder and said auxiliary rudders in the same direction with the auxiliary rudders turned approximately twice the angle through which said main rudders are turned, whereby the slip stream will be deflected by said main rudder and the deflected slip stream will again be deflected by the auxiliary rudder on that side towards which said main rudder is turned.

3. A system of control for a boat comprising a propeller, a main rudder located rearwardly of said propeller and in alignment with said propeller, a pair of auxiliary rudders located rearwardly of said main rudder with the auxiliary rudders positioned on opposite sides of said main rudder, and means for simultaneously turning said main rudder and said auxiliary rudders in the same direction with the auxiliary rudders turned through a greater angle than said main rudder,

said auxiliary rudders being so related to said main rudder that the leading tip of the auxiliary rudder towards which the main rudder is turned is in close juxtaposition to the trailing tip of the main rudder when said main rudder is turned to its maximum extent, whereby the slip stream may be turned sharply laterally without substantial shock or eddies.

4. A system of control for a boat comprising a propeller, a main rudder located rearwardly of said propeller, a pair of auxiliary rudders located rearwardly of said main rudder and with the auxiliary rudders positioned on opposite sides of said main rudder, means for turning said main rudder and for simultaneously turning to a greater extent at least the auxiliary rudder on the side towards which said main rudder is turned, whereby a gradual lateral deflection of the slip stream is obtained.

5. A system of control for a boat comprising a pair of propellers, a main rudder associated with each propeller and located in line with and rearwardly of the corresponding propeller, a pair of outer auxiliary rudders located rearwardly of said main rudders and on opposite sides of said main rudders, at least one intermediate auxiliary rudder located between said outer auxiliary rudders and rearwardly of said main rudders, and means for simultaneously turning all of said rudders in the same direction with the auxiliary rudders turning through a greater angle than said main rudders.

6. A system of control for a boat comprising a pair of propellers, a main rudder associated with each propeller and located in line with and rear-

wardly of the corresponding propeller, a pair of outer auxiliary rudders located rearwardly of said main rudders and on opposite sides of said main rudders, at least one intermediate auxiliary rudder located between said outer auxiliary rudders and rearwardly of said main rudders, and means for simultaneously turning all of said rudders in the same direction with the auxiliary rudders turning through a greater angle than said main rudders, the said intermediate auxiliary rudder turning through a lesser angle than said outer auxiliary rudders.

7. A system of control for a boat comprising a plurality of propellers, a main rudder for each propeller located rearwardly of the corresponding propeller, a plurality of auxiliary rudders located rearwardly of said main rudders with an auxiliary rudder located on each side of a main rudder, and means for simultaneously turning said main rudders and turning said auxiliary rudders through a greater angle than said main rudders.

8. A system of control for a boat comprising a plurality of propellers, a main rudder for each propeller located rearwardly of the corresponding propeller, a plurality of auxiliary rudders located rearwardly of said main rudders with an auxiliary rudder located on each side of a main rudder, and means for simultaneously turning said main rudders and turning said auxiliary rudders through a greater angle than said main rudders, the outermost of the auxiliary rudders turning through a greater angle than the remaining auxiliary rudders.

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