United States Patent [19]

Duryea

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[45] **Aug. 13, 1974**

[54] **BOAT FLANKING RUDDER SYSTEM**

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[21] Appl. No.: **298,863**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 113,247, Feb. 8, 1971, Pat. No. 3,710,749.

[52] **U.S. Cl.** **114/163**

[51] **Int. Cl.** **B63h 25/06**

[58] **Field of Search** ..... 114/162, 163, 164, 66.5 P, 114/66.5 H

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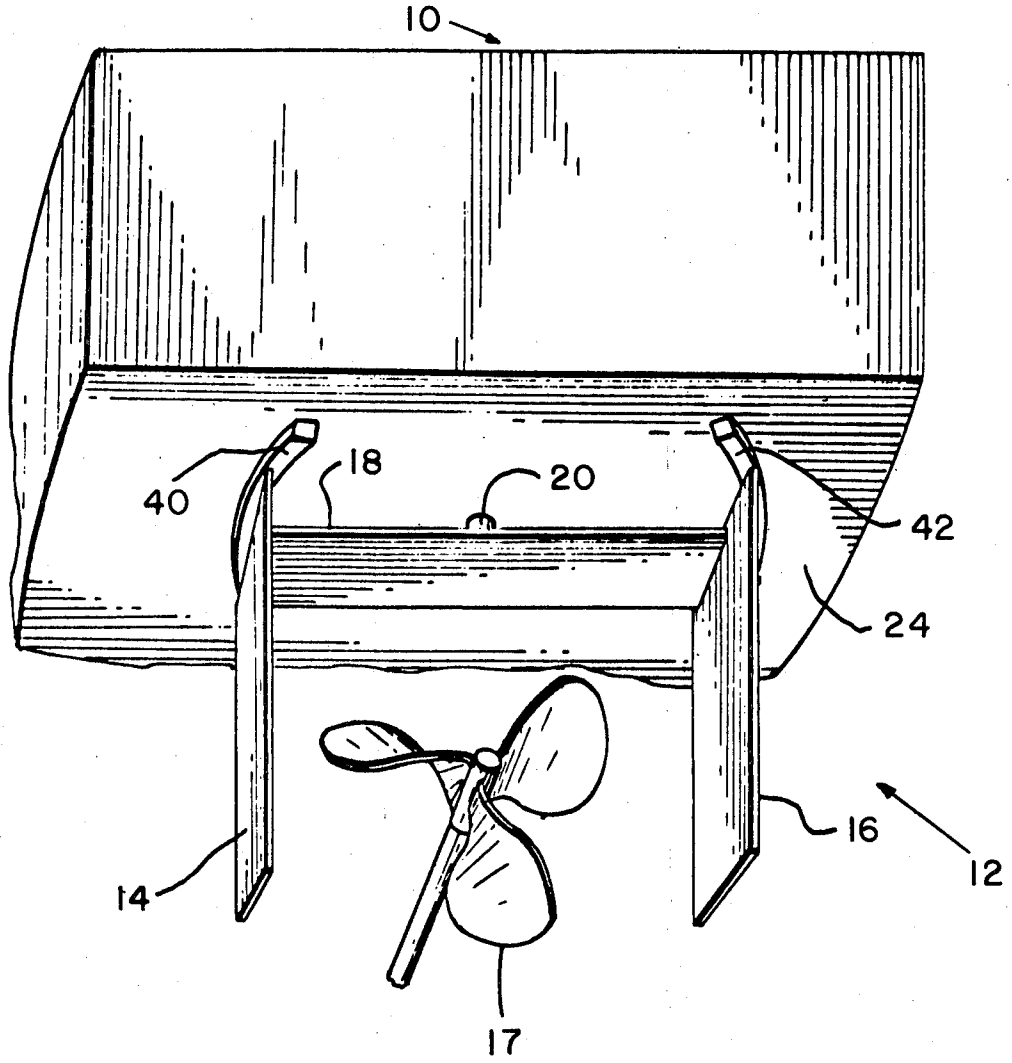
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Assistant Examiner—Stuart M. Goldstein
Attorney, Agent, or Firm—Cameron, Kerkam, Sutton, Stowell & Stowell

[57] **ABSTRACT**

A flanking rudder system for small, propeller driven boats including at least two transversely spaced rudder blades mounted in flanking positions on opposite sides of a boat propeller, with blade portions extending to pivot about the propeller, and single control means for varying the effective rudder angles and positions with respect to the longitudinal axis of the boat and the propeller. The rudders are connected by a transverse bridge member and the assembly may be detachable to provide simplicity of mounting and permit blade interchangeability. The improved rudder system may also include a hydro-foil or a planing bar.

8 Claims, 10 Drawing Figures



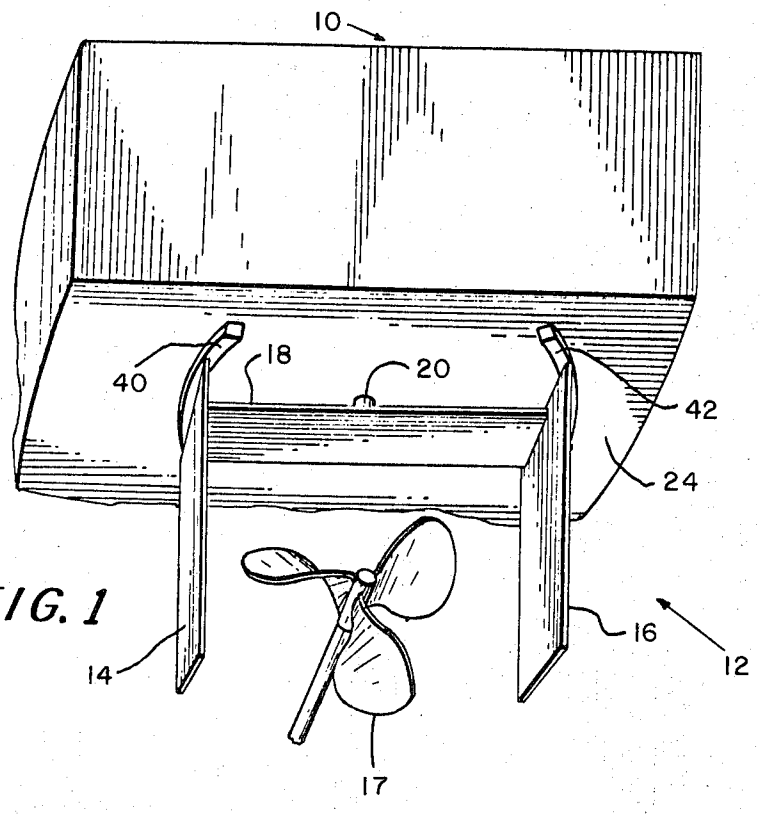


FIG. 1

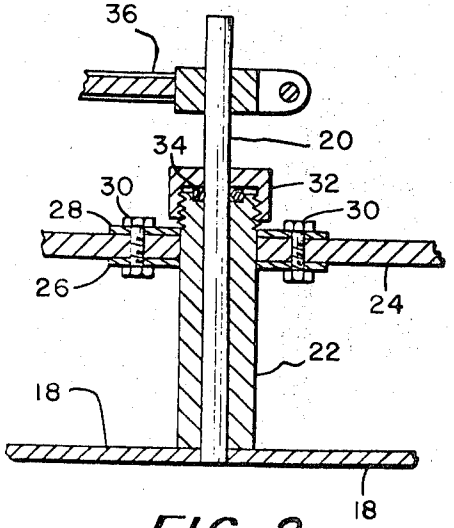


FIG. 2

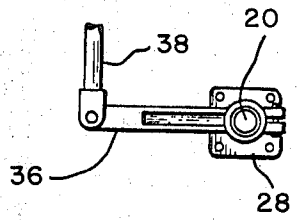


FIG. 3

FIG. 4

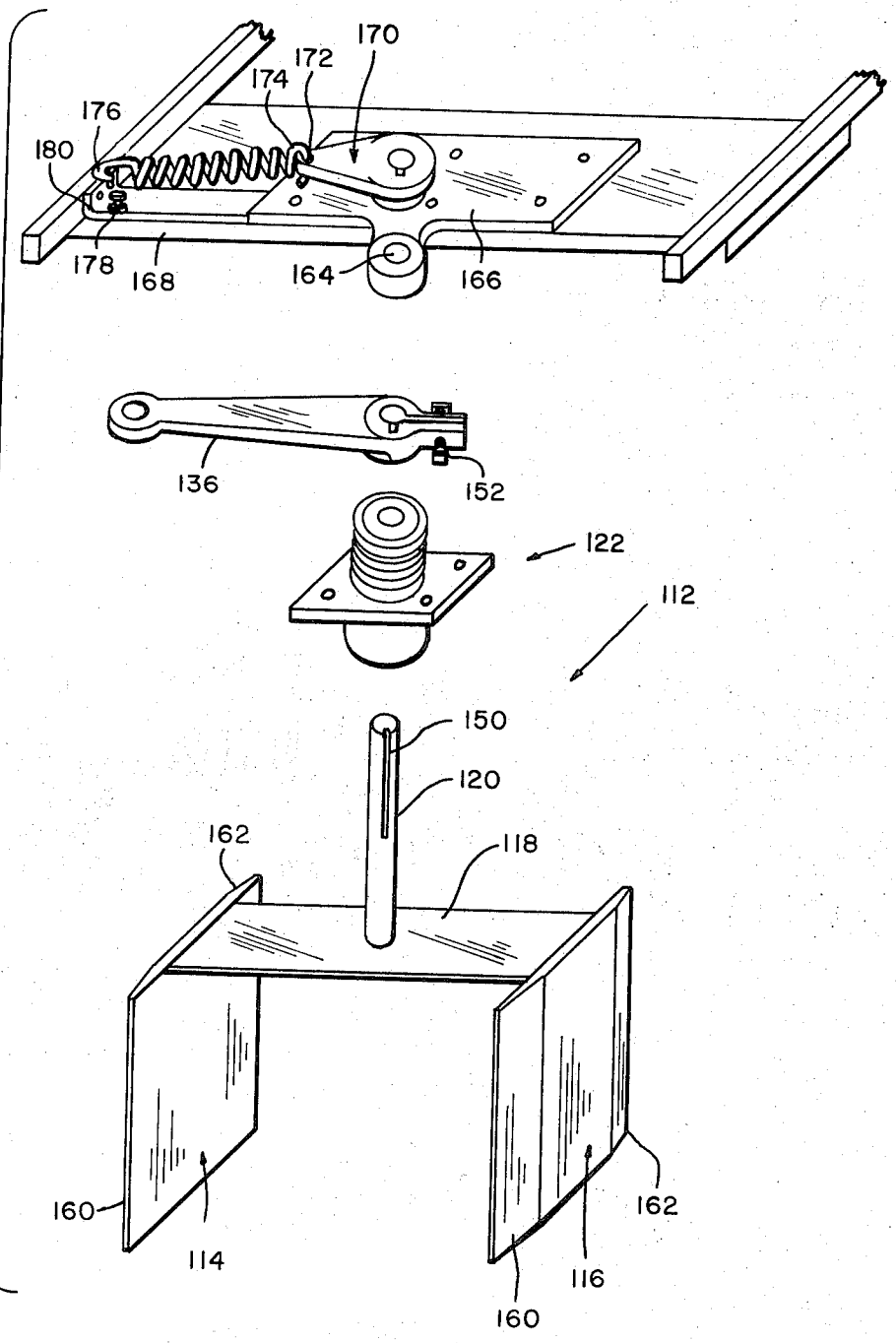

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FIG. 5

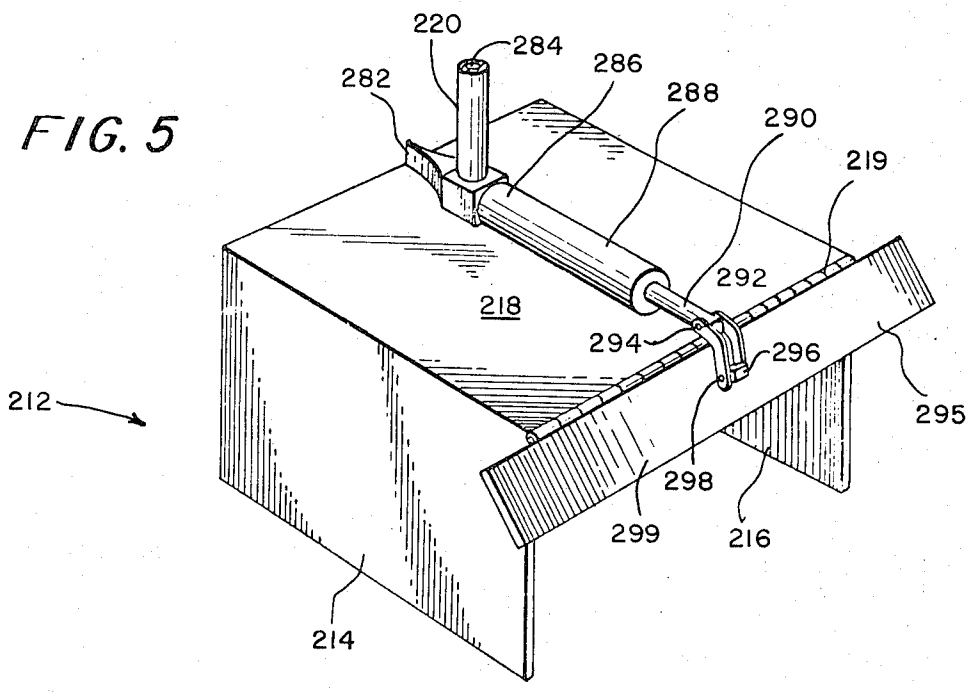
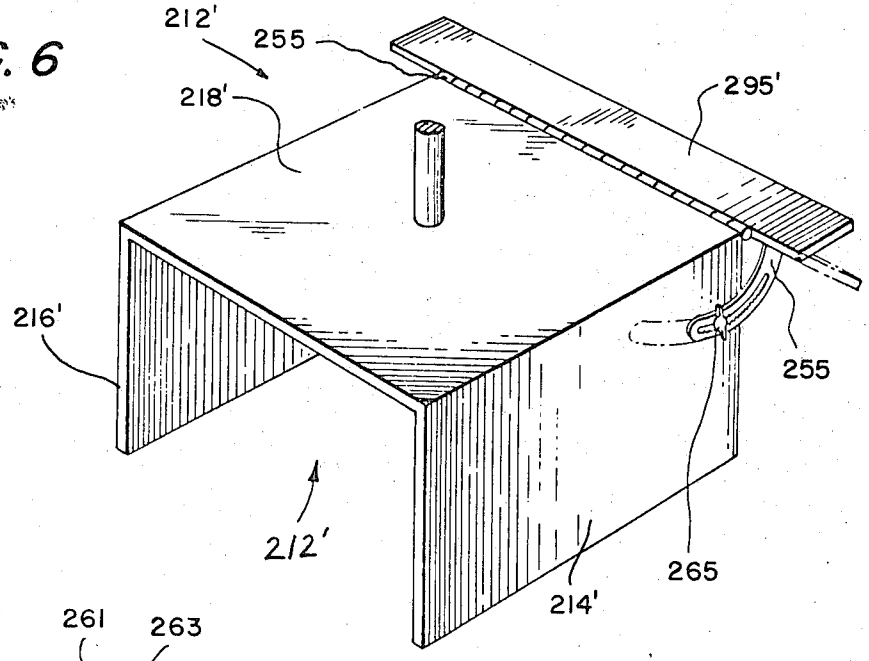


FIG. 6



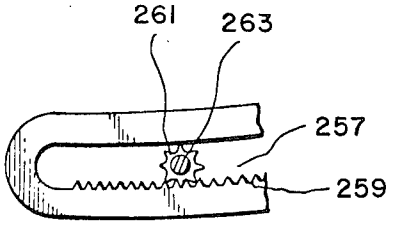


FIG. 7

FIG. 8

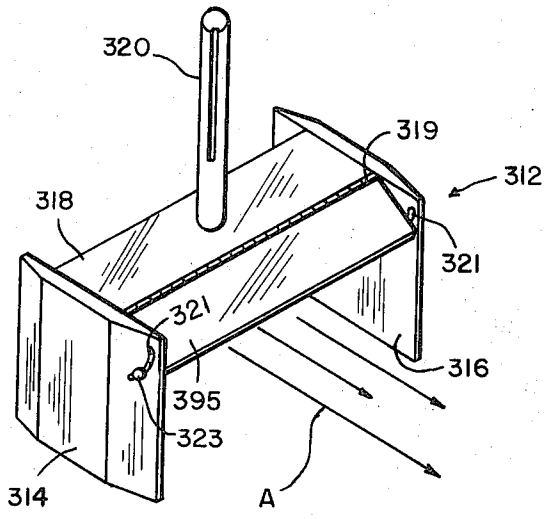
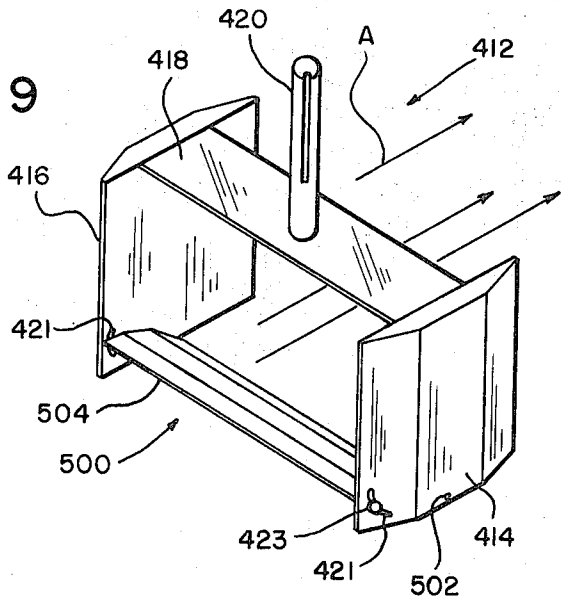

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FIG. 9


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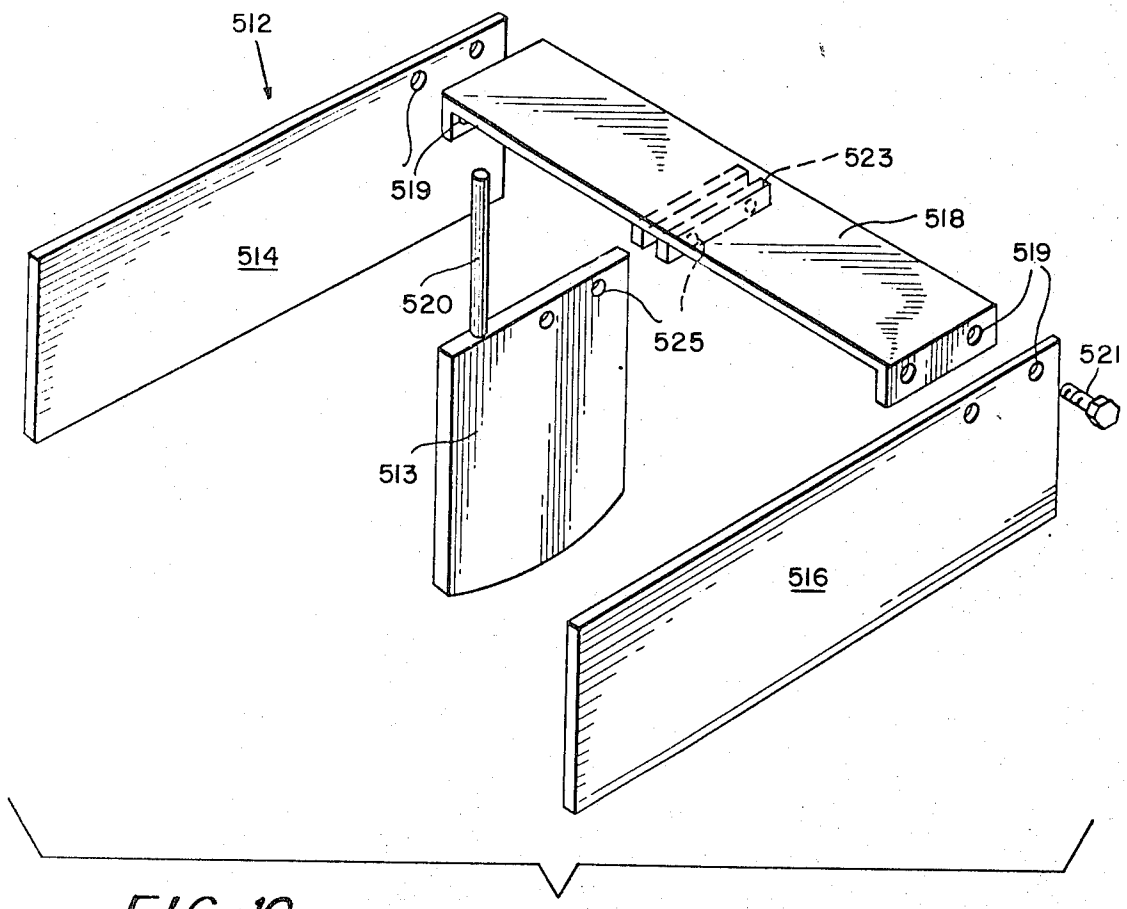

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FIG. 10

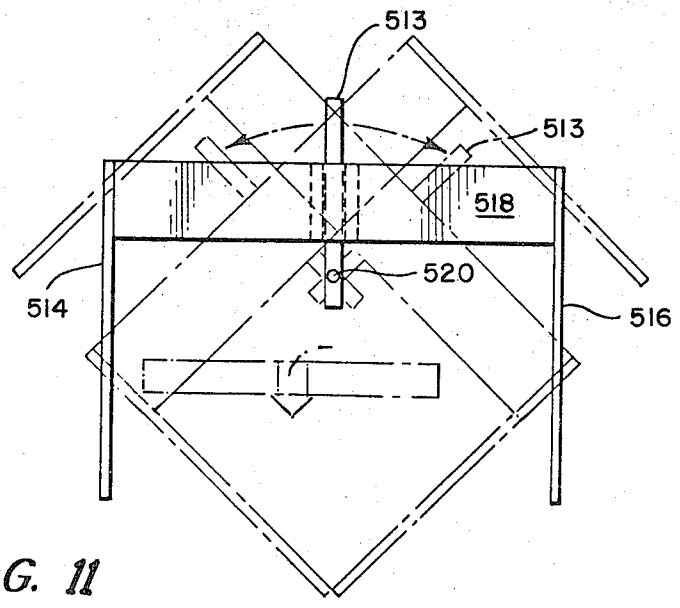

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FIG. 11

BOAT FLANKING RUDDER SYSTEM

This application is a continuation-in-part of my U.S. Pat. application Ser. No. 113,247 filed Feb. 8, 1971 and now U.S. Pat No. 3,710,749.

BACKGROUND OF THE INVENTION

Heretofore flanking rudder constructions and systems have been used, but in most instances complex mounting and control mechanisms were required, and efficiency of operation was less than optimum. The functions and use of flanking rudders are well known and it is the purpose of the present invention to provide improvements in structure, operation and mounting of such rudders.

SUMMARY OF THE INVENTION

It is accordingly a principal object of the present invention to provide a flanking rudder system for propeller driven, relatively small boats to improve operational characteristics, with simplified control mechanism and simplicity of mounting. In obtaining these improvements, the flanking rudder blades mounted on opposite sides of the propeller are so positioned as to most effectively coact with propeller flow and boat design for boat control. To this end portions of the flanking rudder blades extend operationally fore and aft of the propeller and pivot in respect thereto in their varied control angles. A single control is provided for directional control of the flanking blades of the invention. In one embodiment the blades are detachable from a common mounting and control mechanism, and blades of different shapes and sizes can be interchanged and the angular positionment varied for propeller torque compensation.

Additional objects and advantages of the invention will be more readily apparent from the following detailed discussion of the preferred embodiments thereof when taken together with the accompanying drawings in which:

FIG. **1** is a rear perspective view of a flanking rudder system according to the invention as mounted at the stern of a boat hull which is fragmentarily shown;

FIG. **2** is a fragmentary vertical sectional view of control and mounting mechanism for the form of the invention shown in FIG. **1**;

FIG. **3** is a fragmentary plan view of rudder control mechanism for the form of the invention shown in FIGS. **1** and **2**;

FIG. **4** is an exploded perspective view of a further modification having spring back rudder blades;

FIG. **5** is a perspective view of an improved flanking rudder and planing bar assembly.

FIG. **6** is a perspective view of a modified form of flanking rudder and planing bar assembly;

FIG. **7** is an enlarged fragmentary view of the adjusting means shown in FIG. **6**;

FIG. **8** is a perspective view of another form of the present invention;

FIG. **9** is a perspective view of another form of flanking rudder in combination with a hydro-foil;

FIG. **10** is an exploded perspective view of a further modification having detachable rudder blades; and

FIG. **11** is a fragmentary plan view pictorially presenting various control positions of the structure shown in FIG. **10**.

Referring now in detail to the drawings and in particular FIGS. **1, 2,** and **3** thereof, the stern of a boat hull **10** has operatively mounted thereon a rudder system **12** in accordance with the invention, including flanking rudder blades **14** and **16** respectively mounted on opposite sides of propeller **17**. The blades as shown are flat, although, as to be more fully described hereinafter, the shape can be varied.

In this form of the invention, the flanking rudder blades **14** and **16** are attached to a cross plate or member **18,** substantially as a one-piece construction or with detachable blades, as shown in FIG. **10.** The cross plate **18** is secured to shaft **20** extending through bearing housing **22.** The housing **22** is mounted to the bottom **24** of the boat via plates **26** and **28** and bolts **30** or the like. The upper end of the housing **22** receives a cap **32** below which is compressed packing material **34.** A control arm **36** is attached to the upper end of the shaft **20** and a tiller rod **38** is connected to the free end of arm **36.** In this embodiment, the flanking rudder blades **14** and **16** pivot as a single unit upon turning of shaft **20.** The dimensions and positionment of blades **14** and **16** are such that upon angular movement of the flanking rudders, one blade or portion thereof will extend toward a position behind the propeller **17** while the other will pass toward the front thereof. Greatly enhanced boat operation control results, and the construction is extremely simple and inexpensive to make, mount and control. In order to prevent rocking of cross member **18** and unwanted side thrusts on shaft **20,** the boat bottom **24** is provided with a pair of tracks **40** and **42** on which the upper top edges of the rudders slidably move. As shown in FIG. **1,** the tracks are in the form of arcuate bars secured on the underside of the bottom of the boat and over which the upper edges of the rudder plates slidably move. Such tracks are particularly useful on curved or V-bottom craft.

Referring now to FIG. **4** of the drawing, there is illustrated a modified form of the improved flanking rudder system of the invention. In FIG. **4, 112** generally designates the flanking rudder system which consists of a pair of rudder members **114** and **116** joined together at their upper ends by a cross piece or member **118,** to which the vertical rudder shaft **120** is secured.

It will be noted that the leading and trailing edges **160** and **162** of each of the rudder elements **114** and **116** are tapered to present a streamlined configuration to the flow of water thereby reducing vibrations and tuburlence during the passage of the boat through the water.

The rudder shaft **120** is attached to the hull or bottom, not shown, of the boat by the housing or mounting member **122.** A control arm for the flanking rudder system **136** is secured to the shaft **120** via key slot **150** in the shaft and locking means **152** forming a part of the control arm **136.** The control arm **136** is mounted on the shaft **120** such that a portion of the shaft projects upwardly and passes through an opening **164** in a plate **166** carried by a cross beam **168** positioned above the flanking rudders **114** and **116.** The portion of the control shaft **120** projecting through the opening **164** in plate member **166** has keyed thereto a short control arm generally designated **170.** The extended end **172** thereof is bored to receive one end of a helically wound spring member **174.** The opposite end **176** of the spring **174** is secured to a standard or pin **178** mounted on a bracket **180** which is also secured to the cross plank

168. The spring 174 is placed under increased tension when the control arm 136 is urged to urge the flanking rudders 114 and 116 from the straight run position whereby upon release of the control arm 136, the rudders 114 and 116 will return to a neutral position. The helically spring 174 also reduces the possibility of overcontrol of the flanking rudders as the force required to pivot the flanking rudders increases as the amount of movement of the rudders increase.

Referring to FIGS. 5, 6 and 7, there is shown a modified form of my improved flanking rudder having the additional provisions of a planing bar. In FIGS. 5 through 7, the flanking rudder assembly 212 is of the general type described in reference to FIGS. 1 through 3 and in the following detailed description, two hundred series reference characters corresponding to those employed in FIGS. 1 through 3 are employed where appropriate.

The flanking rudder system 212 includes flanking rudder blades 214 and 216, which are attached to a cross plate or member 218 substantially as a one-piece construction. The cross plate 218 has secured thereto a member 282 to which is secured the vertical control shaft 220, which shaft passes through a suitable bearing housing so that the rudders may be controlled from within the boat. Shaft 220 is bored as at 284, and the extended upper end receives a fitment having connection to a source of pressure fluid such as a pump or a hydraulic accumulator not shown in the drawings. The lower end of the bore 284 connects with end 286 of a single acting fluid pressure ram 288, which ram is spring returned to the planing bar neutral position parallel to the top surface of cross member 218. The pressure fluid ram 288 has a ram rod 290, the extended end of which is pivotally connected to a link 292 at pivot pin 294. The other end of the link 292 is pivotally connected to a boss 296 at pivot pin 298. The boss 296 is secured to the upper surface 299 of planing bar 295. The planing bar 295 is connected to the trailing edge of top plate 218 by hinge means 219 illustrated in the drawings as a conventional piano hinge, whereby when fluid pressure is directed to the pressure fluid ram 288, the force of the pressure acting against the piston and internal return spring and acting through the linkage 292 and 294 depresses the trailing edge of the planing bar 295, as illustrated, for example, in FIG. 5, thereby accomplishing the known planing bar functions.

A modified form of flanking rudder planing bar assembly is illustrated in FIGS. 6 and 7 wherein the unitary generally U-shaped flanking rudder generally designated 212′ is provided with a planing bar 295′ connected to the trailing edge of the top plate 218′ by an extended hinge 219′. The angle of the planing bar 295′ relative to the plane of plate 218′ is manually adjustable via an arcuate bracket 255 having one end secured to the lower surface of the planing bar 295′ while the free end is provided with an arcuate track 257. One surface, such as surface 259, of the track 257 may be toothed to provide a rack engageable by pinion 261 rotatable via shaft 263 and actuator 265, as more clearly illustrated in FIG. 7.

While the planing bar construction has been described in reference to FIGS. 5 through 7, and in association with a flanking rudder of the type illustrated in FIGS. 1 through 3, it will be appreciated that such construction could also be employed in conjunction with the flanking rudder illustrated in FIGS. 10 and 11, to be described hereinafter.

Referring to FIG. 8 of the drawing, a modified form of flanking rudder system is illustrated including a planing bar generally of the type shown in FIGS. 5 and 6 of the drawing. In FIG. 8, the flanking rudder system 312 includes flanking rudder elements 314 and 316. The rudder elements 314 and 316 are connected adjacent their upper ends by cross plate 318 to which the vertical control shaft 320 is secured. The most rearward portion of the top plate 318 generally designated 395 is pivotally attached to the cross member 318 by, for example, piano hinge 319. The angle of adjustment of the planing bar portion 395 of the flanking rudder system is controlled by an arcuate slot 321 in the upper rearward portion of each of the flanking rudders 314 and 316. A threaded stud carrying a locking nut or the like 323 projects through each of the arcuate slots 321 whereby the angular position of the planing bar portion 395 of the flanking rudder system 312 may be controlled. It will be recognized that a hydraulic control system for the planing bar 395 of the assembly 312, such as illustrated in FIG. 5, may be employed without departing from the scope of the present invention.

Referring to FIG. 9 of the drawing, a modified form of the flanking rudder system generally designated 412 is illustrated. In FIG. 9, the flanking rudder assembly 412 includes a pair of flanking rudders 414 and 416 rigidly connected at their upper ends by a cross beam 418. The cross beam 418 rigidly supports the control shaft for the rudder assembly designated 420 as previously described with reference, for example, to the form of construction shown in FIGS. 1, 2 and 3. Adjacent the forward lower ends of the flanking rudders 414 and 416 is mounted a hydro-foil generally designated 500. The hydro-foil is hinged to the flanking rudders 414 and 416 by a pivot pin 502 which passes through suitable bores and bearings in the rudders and is anchored internally within the member 500. The most forward end 504 of the hydro-foil is adjustably mounted to the pair of flanking rudders 414 and 416 via arcuate slots 421 provided in each rudder, which slots receive threaded studs and adjustable anchoring means generally designated 423, which correspond to the anchoring and adjusting studs 323 illustrated and described in reference to FIG. 8 of the drawing. In both FIGS. 8 and 9, the relative movement of the boat carrying the flanking rudder assemblies and the water when the boat is in motion in the forward direction is represented by arrows A. The hydro-foil 500 mounted between the pair of flanking rudders 414 and 416 acts in a manner similar to conventional hydro-foils on motor driven water-going craft.

The form of the flanking rudder system 512 shown in FIGS. 10 and 11 incorporates a detachable construction for the flanking rudders and includes the usual standard rudder 513 which is attached to shaft 520 mounted in a usual controllable manner. Flanking rudder blades 514 and 516 are detachably connectible to a common cross bar or plate 518 through coacting holes as at 519 in the respective members by bolts or the like 521. The blades 514 and 516 again flank the propeller. The cross plate 518 is attachable to rudder 513 by a pair of brackets 523 or the like, and coacting holes 525 and bolts, not shown.

The connecting cross plate 518 can be flat, V-shaped or curved semicircularly around the propeller. If de-

sired, the starboard blade can be preset to offset propeller torque.

In this embodiment the blades, in operation, also extend forward and behind the propeller. A single tiller bar serves for control of the flanking rudder and the construction is such that no additional holes need be drilled in the hull for installation. The rudder blade, post and coacting mounting structure can be suitably reinforced as required to compensate for additional strain resulting from the blanking rudder construction.

FIG. **11** shows varied angular positions of the flanking rudder system and components of FIG. **10** and it will be noted that the rudder system is offset with respect to the propeller shaft **527** to permit removal of the shaft without removing the rudder assembly.

In the form of the invention shown in FIGS. **10** and **11** it will be recognized that the center rudder **513** could be elemented and the rudder control rod **520** connected to the cross plate **518** by making the cross plate wider or wider merely at the zone of connection so that no new or additional opening need be made in the bottom of the boat.

From the foregoing description of the various forms of the present invention, it will be appreciated by those skilled in the art that the aims and objects hereinbefore set forth and others are fully accomplished by the present invention.

I claim:

1. A flanking rudder system for propeller driven boats comprising:

a. transversely spaced flanking rudder blades mounted in flanking positions on opposite sides of the propeller;

b. said blades being cojointly angularly movable with respect to the boat and propeller;

c. said blades being so dimensioned and positioned as to have portions thereof extending fore and aft of the propeller at all angular positions thereof and upon selected angular adjustments of the blades with respect to the longitudinal center line of the boat, one said blade will at least in part be positioned behind the propeller;

d. a cross plate interconnecting said spaced flanking rudder blades, a rudder post pivotally mounting said cross plate and blades attached thereto below said boat, angular rotation of said rudder post pivoting said cross plate and angularly swinging said blades to positions at least partially ahead and behind said propeller; and

e. blade stabilizing means cooperating with said blades and the bottom of the boat, said stabilizing means including a pair of spaced tracks secured to the boat bottom in curved paths and engageable by the spaced flanking rudder blades at all angular positions thereof.

2. A system as claimed in claim **1** including a water tight elongated bearing assembly mounting said rudder post through the bottom of said boat, a lever arm connected to the free end of said rudder post and means selectively operable for selective angular rotation of said rudder post through movement of said lever arm.

3. The flanking rudder system defined in claim **1** including an adjustable planing bar extending between the pair of rudders and means for adjusting the angle of said planing bar.

4. The invention defined in claim **3** wherein the adjusting means includes a pressure fluid ram.

5. The flanking rudder system defined in claim **1** including an adjustable hydro-foil extending between the pair of rudders and means for adjusting the angle of said hydro-foil.

6. A system as claimed in claim **1** including a central rudder blade positioned intermediate said flanking blades and cojointly angularly adjustable therewith.

7. A system as defined in claim **1** including means urging said flanking rudder blades to a centered position, said means comprising spring means having one end connected to rudder actuating means and the other end secured to the boat.

8. The invention defined in claim **7** wherein said spring means includes a lever arm connected to the rudder post and a helical spring connected at one end to one end of said lever arm and connected at the other end to means carried by the boat whereby when said lever arm is moved to pivot said flanking rudder blades from a centered position the helical spring is placed under tension.

* * * * *