Aug. 30, 1966 F. L. KOENIG 3,269,347

KICK-UP RUDDER FOR SAILBOATS

Filed Feb. 9, 1965 2 Sheets-Sheet 1

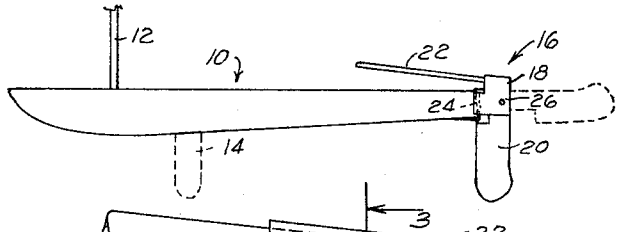


FIG. 1

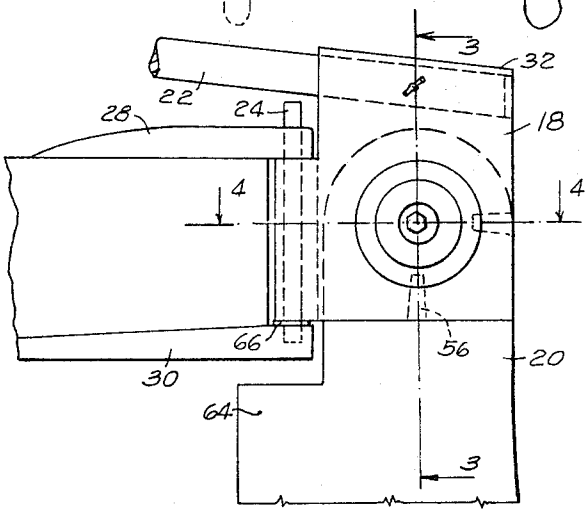


FIG. 2

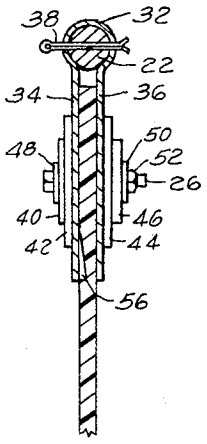


FIG. 3

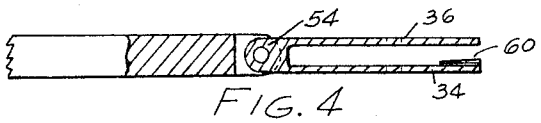


FIG. 4

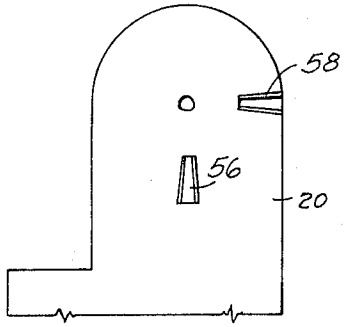


FIG. 5

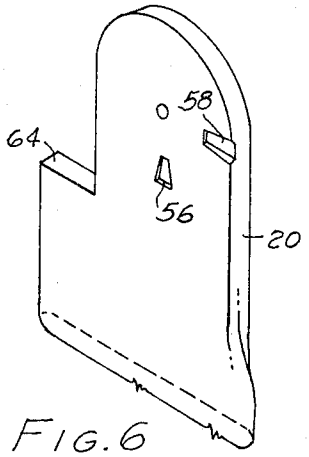


FIG. 6

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KICK-UP RUDDER FOR SAILBOATS

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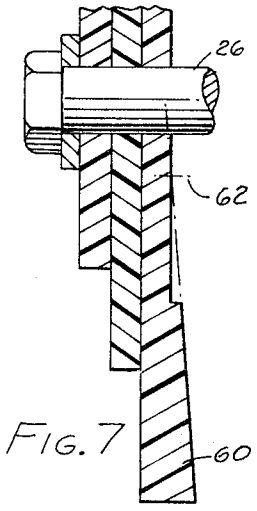


FIG. 7

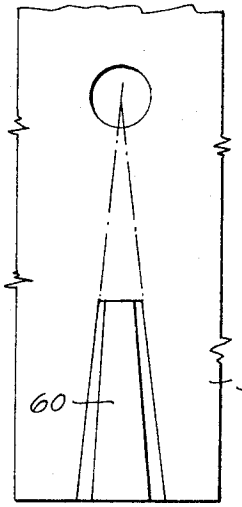


FIG. 8

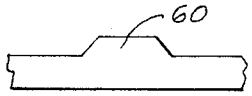


FIG. 9

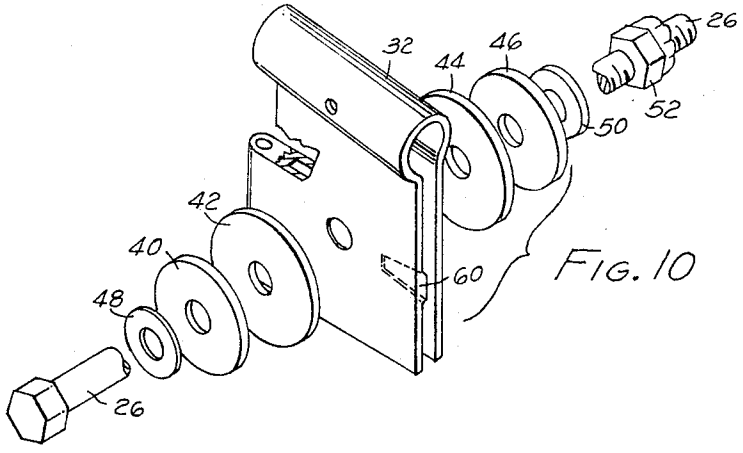


FIG. 10

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KICK-UP RUDDER FOR SAILBOATS

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6 Claims. (Cl. 114—162)

This invention pertains to sailboats, and in particular to improvements in the rudder construction of such boats which permits the rudder blade to be raised either manually, when beaching or in shallow water, or automatically when the rudder strikes a submerged obstruction or a shallow bottom. Means are provided to retain or detent the rudder blade either in its lowered (steering) position or in its raised position, subject to the application of a sufficient, but not damaging, force tending to swing the blade in the opposite direction.

It is a principal object of the invention to provide the foregoing functions by a construction that is eminently seaworthy and practical, and which can be applied to boats of any size to which it is applicable, for example from 8 or 10 foot lengths up to (say) 25 or 30 feet. A given size of installation may accommodate a certain part of the size range, the parts being altered in size, scale and in other ways, to be described, to accommodate other ranges of boat sizes.

A further object of the invention is to provide a construction of this kind in which the detent force tending to hold the rudder in its raised or its lowered condition can readily be adjusted by the user, in accordance with the characteristics of an individual boat or sailing conditions, so that the automatic kick-up action will occur only when there is real danger of damage to the rudder or the boat.

Still another object of the invention is to provide a design for such a kick-up rudder and its mounting that can readily be fabricated of suitable strong yet corrosion-proof materials, and with a minimum of machining or metal working operations. Essentially, the preferred construction includes the use of modern resin and glass fiber laminates, whose various shapes and formations are thus readily provided during the molding of the parts.

Yet another object of the invention is to provide a special form of tiller connection to the rudder assembly, so designed that when the tiller is in place (in a socket provided to receive it) it acts to captivate or retain against loss the main vertical pivot pin about which the steering motion of the rudder blade takes place. This feature obviates loss of the upwardly-loose pivot pin in case the boat is overturned or capsized, yet allows easy removal of the pin, and the rudder assembly or head, when this is desired.

Another object of the invention is to incorporate in the rudder head construction the function and parts normally accomplished by pintles and gudgeons.

The foregoing objects are attained by providing a rudder head in the form of a bracket comprising spaced vertical and parallel plates which pivotally receive between them the upper end of a rudder blade, and in which a pivot bolt also acts to clamp the rudder blade between said plates with a selectable frictional force. The operative (down-turned) rudder position, and a raised or upper position, are specifically defined by means of cooperating detent formations on an inner plate surface and an outer blade surface, such that after an initial retaining force is overcome, the rudder blade may easily be moved through the continuation of its pivotal arc to the opposite limiting position. The head or bracket is in turn pivoted for the usual limited horizontal motion about a pin secured as by gudgeons or the like that in effect form a part of the stern transom of the boat. The head also includes a socket to receive the usual tiller, and this socket

holds the tiller so positioned relative to the vertical or steering axis as to prevent accidental removal of the pivot pin defining that axis. Preferably, the rudder blade has a substantial extension in the "forward" direction beneath the boat's hull, passing forward beyond the pivot pin axis, to utilize hydrodynamic pressure on this forward portion as an aid in turning the tiller and rudder, and to reduce the magnitude of the reaction forces set up in the rudder mounting and the boat portions to which it is attached.

A preferred embodiment of the invention will be described in detail below, in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of a typical boat provided with the improved rudder construction.

FIG. 2 is a view looking in the same direction, but to a larger scale, and illustrating the detailed construction of the rudder mechanism.

FIG. 3 is a vertical sectional view, taken along 3—3 of FIG. 2.

FIG. 4 is a horizontal section taken along line 4—4 of FIG. 2, with the rudder blade removed for clarity.

FIG. 5 is a side elevation of the upper portion only of the rudder blade, looking in the same direction as in FIG. 2.

FIG. 6 is a fragmentary perspective view of the portion of the blade shown in FIG. 5.

FIG. 7 is an enlarged, fragmentary sectional view taken along line 4—4 of FIG. 3.

FIG. 8 is an enlarged face view of the corresponding face of the rudder blade clamping plate of FIG. 7.

FIG. 9 is an end view of FIG. 8.

FIG. 10 is a fragmentary perspective exploded view of the head bracket only of the invention.

The general environment of the invention is illustrated in FIG. 1, in which the sailboat **10**, with stern at the right, has the usual mast **12**, and ordinarily a retractable centerboard **14**. At the stern, a rudder assembly **16** includes the mounting head **18**, rudder blade **20**, and tiller **22**. The head as a whole is movable about a vertical axis at **24** for steering in the usual way, while the blade **20** is vertically rotatable in the head assembly about a bolt **26**, between the full-line position in which it would lie in the water, and a dash-line position out of, or substantially out of, the water.

FIG. 2 shows the rudder assembly in more detail, the same being mounted at the stern of the boat by a loose vertical-axis pivot pin **24** that passes, for example, through a hole in the gudgeon plate **28** of the transom, and is received in a socket in a rearward extension **30** of the keel plate. Limited horizontal (steering) motion is thus provided, by the use of the tiller **22**. Referring to FIG. 3, the latter is shown received in a socket **32** formed as a partial cylinder connecting the side plates **34** and **36** of the head bracket assembly **18**. A cotter pin or the like **38** passes through the walls of the socket **32** and the tiller to retain the latter removably in place. For operating convenience, the socket **32** and hence the tiller **22** are angled upwardly toward the bow of the boat, and the socket **32** is so disposed that the tiller passes always above the upper end of pivot pin **24**, so that the latter cannot be removed unless the tiller is first unseated. This obviates loss of the pivot pin, and the rudder, if the boat should capsize.

The side plates **34** and **36**, forming the rudder head, clamp between them the upper end of the rudder blade **20**, the bolt **26** and its nut **52** forming the horizontal pivot axis for vertical swing of the rudder, and serving also to apply clamping pressure to the plates through slightly flexible frictional washers **40**, **42**, **44** and **46** on opposite sides of the bracket or head, and outer rigid washers **48**, **50** of suitable metal such as brass or stainless steel. The nut **52** is preferably of the self-locking variety,

and the outer threads of the bolt may be deformed, after assembly, to prevent accidental loss of the nut, while permitting adjustment of the nut against the washers for flexural control.

The tiller socket **32** is preferably formed, as shown, as an integral continuation of the side plates, as is also the plate-connecting portion **54** through which passes the pivot pin **24** (FIG. 4). The entire bracket is preferably constructed by laying-up layers of glass fiber cloth, impregnated with a suitable thermosetting resin, about a suitable core plate corresponding generally to the shape of the rudder blade, and with suitable outer forming shells which are removed after the resin has been cured or hardened.

Detent formations are provided on one face (or both) of the rudder blade and the interior surface of one or both of the side plates **34** and **36**. The preferred shape of these detents is as indicated in FIGS. 2–6; for example, the rudder blade **20** is best shown in FIGS. 5 and 6 as provided with two shallow depressions **56** and **58** which commence at a distance from the pivot hole of bolt **26**, and extend radially outward therefrom, increasing both in cross-sectional width and in depth as they proceed outwardly from the hole. The side walls of these depressions are inclined to the plane of the face of the rudder blade, so that the cross-section, at each radial distance, approximates a segment of a truncated octagonal cone. These inclined radial walls provide a positive detenting action, in combination with a complementary projection **60** on the inner face of the plate **34**, as best shown in FIGS. 7 and 10. The depressions **56** and **58** are situated about 90 degrees away from one another, so as to hold the rudder blade selectively in the positions indicated in FIG. 1.

While the detent formations described and illustrated are especially preferred, for reasons detailed below, a similar action can be obtained with other shapes of the depressions and the projection; thus, truncated semi-conical or nearly semi-conical shapes may be employed, or even nearly hemispherical shapes, triangular sections, sections of other polygonal prisms, et cetera. The essential requirement is a positive detenting action without damage to the surfaces when the detent is purposefully or accidentally cammed in the releasing direction by a force sufficient to overcome the stiffness of the washers **40**, **42**, **46** and **48** and the tension in bolt **26**. The washers are preferably formed also of a glass fiber and resin laminate, for adequate strength, controlled flexibility and resistance to sea conditions.

The polygonal shapes having faces of 30° to 45° inclination provide inclined plane resistance that will allow movement without absolute locking, when proper pressure is applied, and compensate for wear better than some other sections such as half cylinder or triangular sections, because such wear will be on two opposed flat planes, and not on corners or radial surfaces.

The shape of projection **60** as illustrated has many advantages. When viewed in a vertical plane, all of the lines of the shoulders and base are radial about the kick-up pivot axis. In this way the entire areas of the inclined planes of the opposing surfaces move together and "pop" out of the restraining depression along its entire length simultaneously. If these lines were not radial, a scissors-like action would take place resulting in a gradual opening of the surfaces in a wedging motion that would defeat the "pop out" operation desired. Conversely, when viewed in a horizontal plane, the face of the inclined projection must not be radial about the axis and inside face of the head because the face of this member does not "hinge" at the bolt, but flexes in an arc about the center point about where indicated at **62** in FIG. 7. The proper theoretical contour of the projection in this plane would be an elliptical arc which would compensate for the flexing movement of the overlying washers **42**, **44** at the moment the projection **60** "pops" free of the depression in the blade head. Since this ellipse would be quite flat, a straight surface will be almost as effective, provided it is inclined at an angle that will intersect the inner face surface short of the axial line, as indicated at **62**.

The blade is formed with a portion **64** of the leading edge (FIG. 2) extending forward of the pivot pin **24**. This provides easier steering by making this forward portion act to help pull the after portion of the blade **20** in the desired direction. The main function of this is to decrease the torsional forces acting in the rudder head which would tend to open the jaws (spaced plates) of the head, thus undesirably decreasing the optimal pressure on the holding projection. This forward extension **64** will therefore allow lighter construction in the rudder head. The rudder blade itself is preferably formed of connected clam-shell halves of the glass fiber and resin laminate material.

The vertical and horizontal holes for rudder action and pickup operation can be molded in, preferably in solid (not hollow) portions of the blade provided for the purpose of giving better bearing surfaces at such locations. The holes may be formed by using Teflon plastic rod stock as "cores," properly positioned and removably secured in the mold. Since practically nothing will adhere to Teflon stock, these rods can be withdrawn from the form and the molded head without the necessity of a taper or "draw" section.

The pivot pin **24** of the rudder assembly is preferably a Delrin rod of appropriate diameter, and a Teflon washer **66** is placed between the lower gudgeon or keel extension and the lower bearing surface of the rudder head assembly at the pivot pin. These materials provide an inexpensive and relatively friction-free and noiseless rudder head.

While the invention has been disclosed herein in considerable detail, so that those skilled in the art can readily practice the same, various modifications can be made without departing from the spirit of the invention, and it is intended to include within the invention all such modifications and variations which fall within the scope of the appended claims.

I claim:

1. A kick-up rudder construction for sailboads, comprising a vertical-axis pivot pin secured to the stern of the sailboad, a rudder head bracket pivoted for horizontal swinging motion about the axis of said pivot pin said bracket comprising parallel spaced vertical plates, a rudder blade having its upper end received between said plates for vertical pivoting motion of said blade between a down-swung lowered position beneath the boat and an up-swung raised position at least substantially out of the water, a combined pivot axle and clamping bolt passing horizontally through said plates and said blade, frictional compression washers adjustably clamped against the outer faces of said plates by said bolt and a nut thereon, and cooperating localized detent formations on the inner face of one of said plates and the corresponding outer face of said blade to define rest positions of said blade in its respective lowered and raised positions.

2. A rudder construction in accordance with claim **1**, in which said rudder blade has a substantial forward extension below the level of said head bracket and below the waterline of the sailboat.

3. A rudder construction in accordance with claim **1**, in which said plates and said rudder blades are formed of laminated glass fiber and resin layers.

4. A rudder construction in accordance with claim **1**, in which said detent formations comprise complementary tapered radial formations disposed at a distance from the rotation axis defined by said bolt.

5. A kick-up rudder construction for sailboats, comprising a vertical-axis pivot pin secured to the stern of the sailboat, a rudder head bracket pivoted for horizontal swinging motion about the axis of said pivot pin, said bracket comprising parallel spaced vertical plates shaped

at their upper edges to define a tiller socket having an axis coplanar with the vertical plane of said pivot pin, a tiller in said socket extending forward over the upper end of said pivot pin to prevent loss of the latter in the event of capsizing; a rudder blade having its upper end received between said plates for vertical pivoting motion of said blade between a down-swung lowered position beneath the boat and an up-swung raised position at least substantially out of the water, a combined pivot axle and clamping bolt passing horizontally through said plates and said blade, frictional compression washers clamped against the outer faces of said plates by said bolt, and cooperating detent formations on the inner face of one of said plates and the corresponding outer face of said blade to define rest positions of said blade in its respective lowered and raised positions.

6. A kick-up rudder construction for sailboats, comprising a vertical-axis pivot pin secured to the stern of the sailboat, a rudder head bracket pivoted for horizontal swinging motion about the axis of said pivot pin, said bracket comprising parallel spaced vertical plates, a rudder blade having its upper end received between said plates for vertical pivoting motion of said blade between a down-swung lowered position beneath the boat and an up-swung raised position at least substantially out of the water, a combined pivot axle and clamping bolt passing horizontally through said plates and said blade, frictional compression washers clamped against the outer faces of said plates by said bolt, and cooperating complementary tapered radial detent formations of segmented octagon cross-section on the inner face of one of said plates and the corresponding outer face of said blade, at a distance from the rotation axis defined by said bolt, to define rest positions of said blade in its respective lowered and raised positions.

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