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E. L. ECKFIELD

3,435,795

TRIM AND PLANING CONTROL MEANS FOR WATERCRAFT

Filed Sept. 8, 1966

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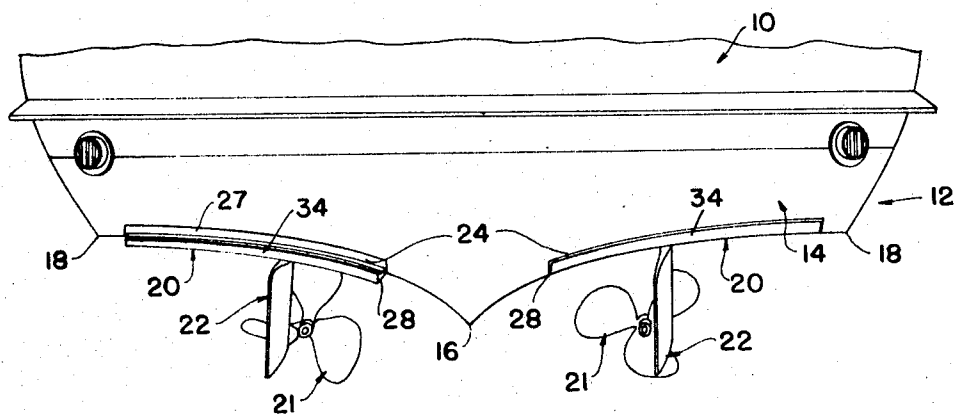


FIG. 1

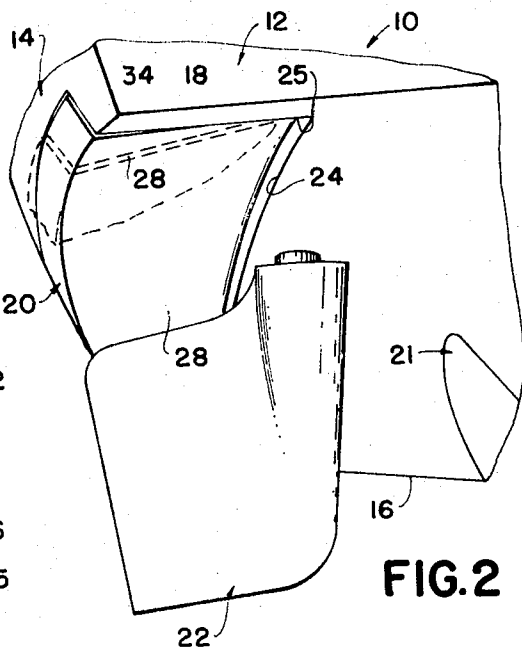


FIG. 2

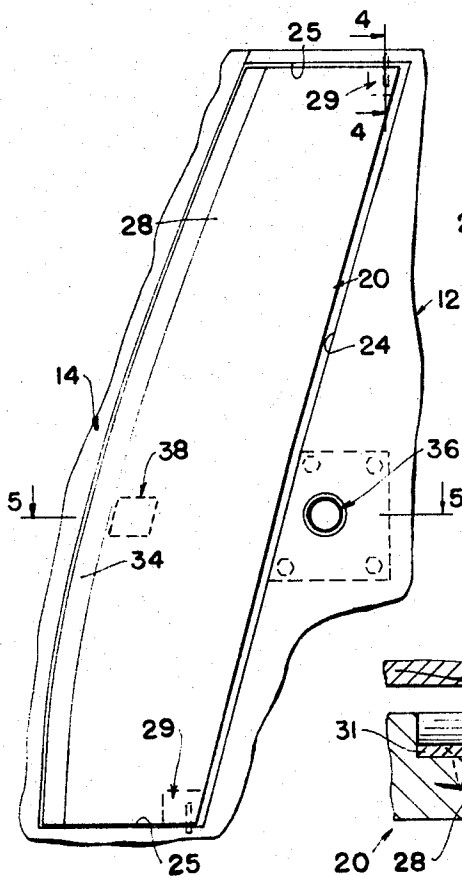


FIG. 3

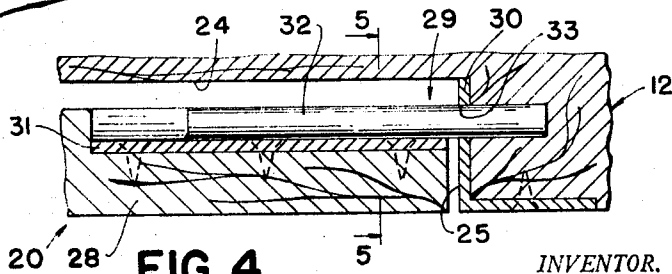


FIG. 4

INVENTOR.
EUGENE L. ECKFIELD
BY *Whittemore, Hallock & Bell*
ATTORNEYS

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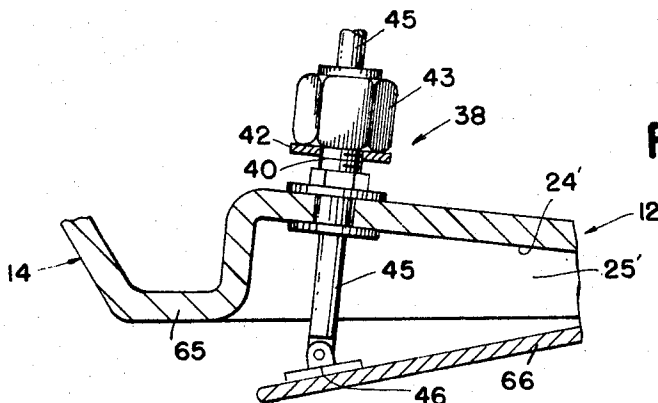
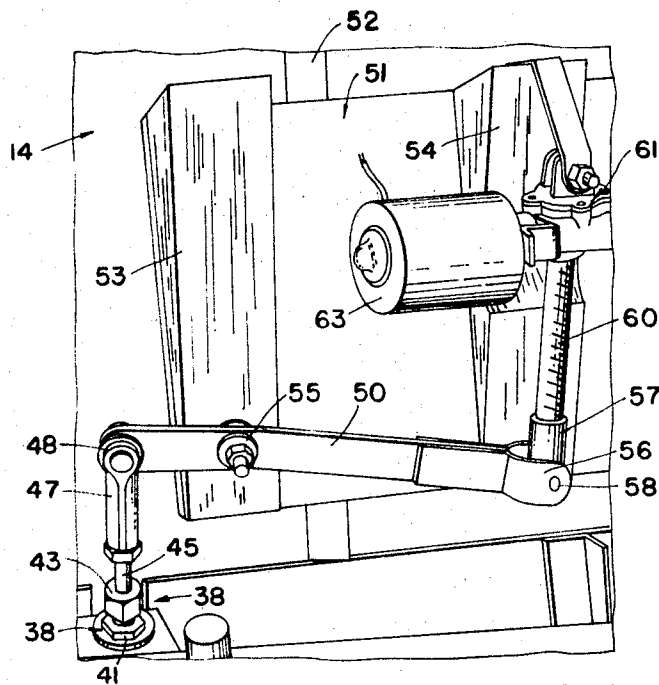
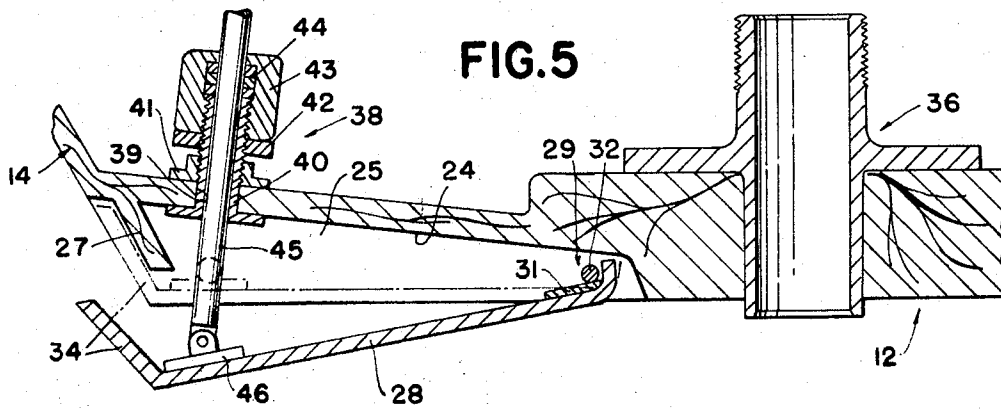
E. L. ECKFIELD

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INVENTOR.

EUGENE L. ECKFIELD

BY *Whittemore, Halbert & Belknap*
ATTORNEYS

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E. L. ECKFIELD

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FIG. 9

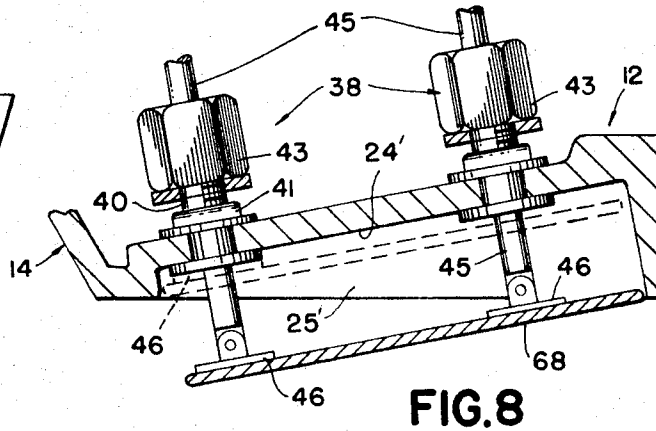
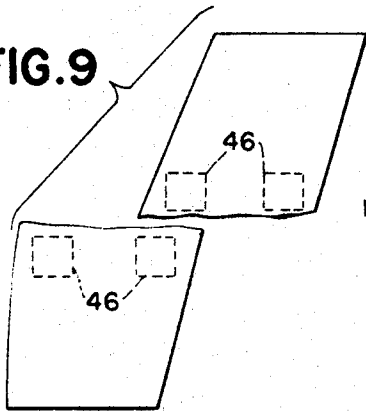


FIG. 8

FIG. 10

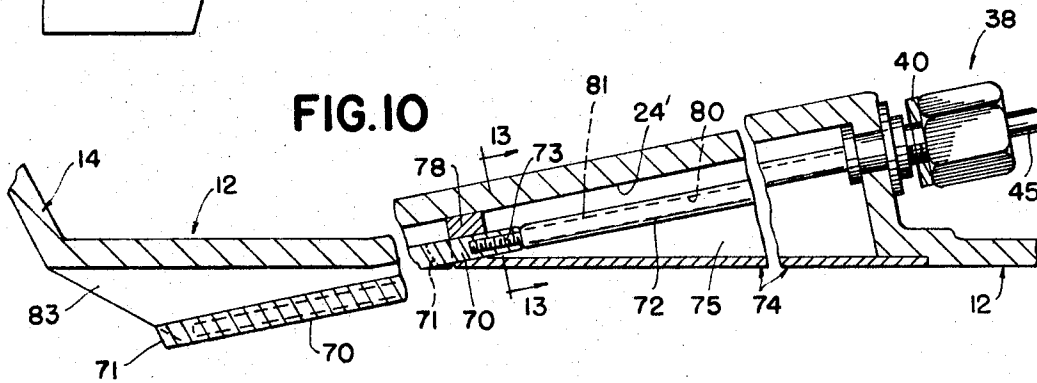


FIG. 11

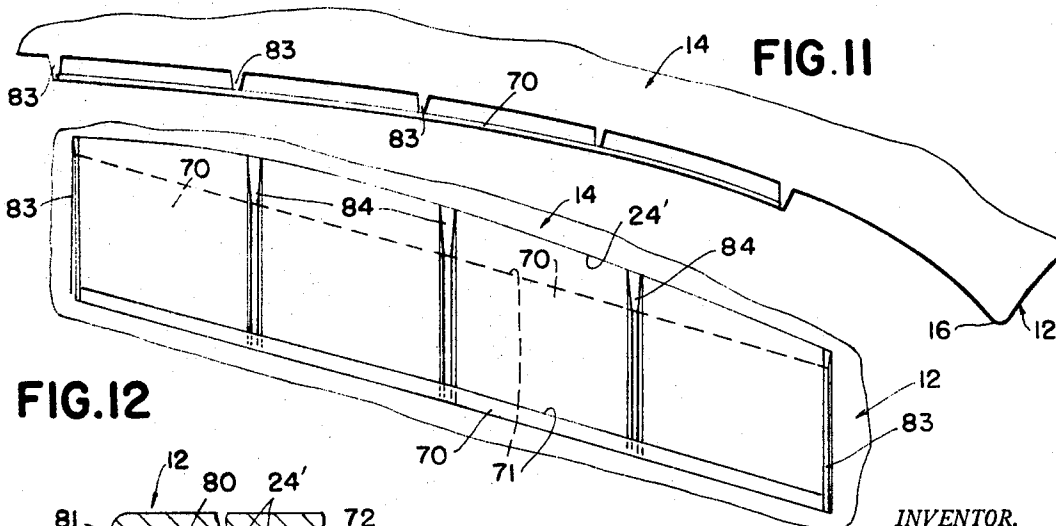


FIG. 12

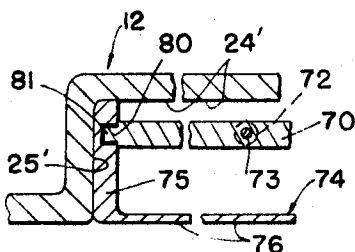


FIG. 13

INVENTOR.
EUGENE L. ECKFIELD
BY *Whittemore, Hulbert & Baskin*
ATTORNEYS

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3,435,795

TRIM AND PLANING CONTROL MEANS FOR WATERCRAFT

Eugene L. Eckfield, Pompano Beach, Fla., assignor to
Chris-Craft Industries, Inc., Pompano Beach, Fla., a
corporation of Delaware

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U.S. Cl. 114—66.5

16 Claims

ABSTRACT OF THE DISCLOSURE

Trim and planing control means for watercraft of different hull designs are disclosed in various embodiments. These uniformly feature an arrangement in which the hull is recessed, on opposite sides of its keel center line and directly forwardly of the lower end of the stern transom of the craft, the recesses being defined by parallel upright side walls joined across the top thereof by a forward and downwardly inclined wall. The recesses are preferably covered to a considerable extent at the rear thereof by a part of the transom.

Each recess has a planing member housed and movably mounted therein, the member being operated by means within the craft to depress it out of a normal coplanar, substantially flush relation to adjacent surfaces of the hull to a position in which a substantial part of the length of the plane member is disposed in planing position below its recess and the hull. In a preferred embodiment, the planing member is provided at its rear with an upwardly offset portion, which portion coacts with the transom in closing the rear of the recess when the planing member is retracted into that recess.

The present invention relates to improvements in trim and planing control means for watercraft, in particular power propelled boats of one description or another; and in accordance with the invention such means, in the various embodiments described herein, takes the form of an adjustable trim control plane or planes mounted at the aft end of a boat and in the main forward of the transom of the latter. A vertical adjustment of such plane means enables the craft to be easily and properly trimmed to compensate for unsymmetric loading, or to enable the craft to best plane for an efficient movement through the water.

It is an object of the invention to provide a boat having adjustable trim control means of the sort described, usually incorporating a control plane at each side of the keel line, in which the two planes are individually rigid and of a nature such that they may conform with an aft curved hull outline, although the planes may, as in the past, also be of rectilinear rear outline for association with a boat having a flat-edged transom. Previous trim and planing control tab arrangements of which I am aware have been unsuited to being built into a hull whose bottom transom outline curves outwardly, forwardly and upwardly from the aft keel zone toward the chine lines of the vessel.

Thus, in accordance with the invention the control plane member of itself has a curvilinear outline to correspond with that of the transom bottom when the plane is in a relatively inoperative, retracted position, and it is, moreover, mounted for vertical adjusting movement away from and back to that position in such manner that its aft edge at all times maintains parallelism with the curved aft outline of the watercraft.

In a preferred embodiment, in which the plane has a pivotally adjustable mount to the hull, this is accomplished by offsetting two side hinge pivots of the plane

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relative to one another, fore and aft-wise. In other embodiments the plane has a bodily adjusting movement relative to the hull, and its mount for this movement is also such that substantial rear parallelism with the transom bottom is preserved at all times.

Another object of the invention is to provide improved trim and/or planing control structure which is, in the retracted position thereof received wholly within a bottom recess at the aft of the hull. The craft is thereby enabled to travel through the water with less friction than when the trim or planing control structure is more exposed; and this is also true in connection with the illustrated embodiments regardless of whether the control plane is entirely retracted within the hull recess, or whether it extended from the latter in greater or lesser degree.

Yet another object is to provide a boat equipped with a recessed and rigid trim control plane unit as described, in which the aft hull recess accommodating the plane is disposed forward of the transom, preferably being at least in part closed at its rear by a bottom portion of the transom. This minimizes the area of exposure of the recess to a following sea, hence minimizes the tendency of the craft to broach in this condition of operation. Not only is there a minimized tendency to broach in a following sea, but also when proceeding astern stress on the planes and their operating mechanism is minimized, along with a detrimental effect on steering and tendency to depress the stern. There is less resistance to rearward travel. These are important advantages of the present improvements. Again, this is true whether the control plane is in an extended position or is wholly retracted within the bottom hull contour.

In further accordance with the invention, in at least one embodiment thereof, the control plane is provided at its aft end with an up-turned, flange-like part, which part not only reinforces and stiffens the plane, but also supplements the effect of the transom, as referred to above, in minimizing exposure of the hull recess and plane to a following sea and when proceeding astern. The flange outwardly and upwardly overlaps the bottom edge of the transom, mating about the latter in curved conformity therewith and shielding the hull recess when the boat is afloat or ashore.

According to all of the optional adaptations of the invention, the rigid control plane means of the latter have operating connections extending through a sealed hull packing and are preferably controlled by individual motorized adjusting drives at a conveniently accessible position within the watercraft.

The foregoing, as well as other objects, will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawings illustrating the invention, wherein:

FIG. 1 is a fragmentary view in rear elevation of a power marine craft typically equipped with dual trim and/or plane control means of a pivoted type, in accordance with one embodiment of the invention, one control plane member being shown in an elevated or retracted position, in which it comes flush with the aft hull and transom contour of the boat, and the other plane member being shown in a lowered or extended position;

FIG. 2 is a fragmentary view in upward perspective showing a bit more clearly the nature of the improvement in regard to the control plane and an aft hull recess in which it is disposed, as shown in solid line, in its retracted position, an extended position of the plane member being indicated in dotted line;

FIG. 3 is a fragmentary bottom plan view showing the plane and recess arrangement (propeller and rudder provisions of the boat being omitted, although the figure shows a rudder stuffing box to indicate the positional

relationship to the latter of the control plane), this view indicating the aft-to-forward offsetting of the plane pivots;

FIG. 4 is an enlarged scale fragmentary view in transverse vertical section on line 4—4 of FIG. 3, showing a detail of the control plane pivoting arrangement;

FIG. 5 is a fragmentary view in enlarged scale and vertical longitudinal section along a line corresponding to line 5—5 of FIGS. 3 and 4, with the trim and/or planing control member being shown in solid and dot-dash line, respectively, in its extended and retracted positions;

FIG. 6 is a fragmentary perspective view of the stern interior of the boat, illustrating individual, motor-operated means for effecting the adjustment of the control plane, such means being typical of an operator which may govern any of the optional embodiments of the invention;

FIG. 7 is a side elevational view illustrating a part of one of those optional modifications, in which the control plane is received in its entirety in a hull recess whose aft wall terminates substantially forward of the transom of the craft, the plane also lacking the upturned rear flange of the embodiment of FIGS. 1—5;

FIG. 8 similarly illustrates another alternative, in which a single plane is operated for a movement bodily, rather than pivotally, and in an up-and-down way;

FIG. 9 is a fragmentary bottom plan view showing the location of appropriate operating means for the control plane structure of FIG. 8;

FIG. 10 is a fragmentary sectional illustration of a still further alternative embodiment in which the plane adjusts bodily in a fore and aft direction;

FIG. 11 is a fragmentary rear elevational view of a control plane installation in accordance with FIG. 10;

FIG. 12 is a bottom plan view showing the plane and recess arrangement of FIGS. 10 and 11, the plane being indicated in solid and dotted line, respectively, in its retracted and extended positions; and

FIG. 13 is an enlarged, fragmentary view, partially broken away, in transverse vertical section on line 13—13 of FIG. 10.

Referring to FIGS. 1, 2, 3, 4 and 5 as illustrating a preferred embodiment of the invention insofar as the plane arrangement, per se, is concerned, the marine power craft 10 illustrated therein is of a type having a hull 12 shaped at its stern transom 14 in a rearwardly convex outline, the bottom edges of the transom 14 on either side of the keel line 16 curving upwardly and outwardly to chine lines 18. The transom also inclines substantially uniformly upwardly and to the rear across its beam dimension. It is in a hull design of this type that the improved trim and/or planing control structures, of which there are two generally designated 20, are particularly well adapted for installation. However, they are also obviously well suited for use on a craft having a flat or transversely rectilinear bottom transom outline. The positional relationship of the control plane units or structures 20 to the respective twin screws 21 and 22 are clearly shown in FIGS. 1 and 2, i.e., directly above and approximately centered on the latter and above and well aft of the former. However, these relationships are not essential to the invention, nor is it necessary that there be dual plane units 20, nor that the invention be embodied in a twin screw craft.

Now referring in particular to FIGS. 2, 3 and 5 of the drawings, the boat hull 12 is shown as being provided equidistantly on either side of its center keel line with a bottom recess 24 of a substantial forward-to-aft length and substantial vertical dimension, the top wall of recess 24 inclining upwardly and aft-ward. As appears in FIGS. 1 and 3, each recess 24 also has considerable width in the beam-wise direction, in fact amounting to a major part of the width of the stern hull half in which it is located. Recess 24 is laterally defined by upright side walls 25. Adjacent the rear of each recess, the transom 14 is formed to provide a downwardly and forwardly inclined extension 27, representing a slight forward recess-

ing or offsetting of the transom proper in the zone of recess 24. This extension to a great extent closes and conceals the aft end of recess, as best appears in FIG. 5.

Each of the control plane units 20 comprises a rigid plate- or panel-like plane 28 of a forward-aft length and a transverse width approximating but a trifle less than corresponding dimensions of the recess 24, in which the plane is wholly received in its retracted position, indicated in solid line in FIG. 2 and in dot-dash line in FIG. 5. At its forward end, the plane 28 (reference being had to FIGS. 4 and 5 in conjunction with FIG. 3), has pivot or hinge means 29 at its opposite sides by which the plane is journaled on side walls 25 of recess 24.

Thus, each wall 25 has a metal angle 30 fixedly applied there to serve as a wear resistant journal, and the plane 28 is recessed at its forward side corners to fixedly receive a flat metal mounting base 31; and a transverse pivot rod 32 is welded to this base. Rod 32 projects outwardly of one side of the member into a journal opening 33 of angle 30, thus providing for a limited vertical swing of plane 28 into and out of the recess 24 under the control of a motorized operating unit, to be described. It is to be understood that various alternatives of the hinge structure of FIG. 4 are contemplated. For example, a bearing unit of nylon or other suitable plastic might be substituted for the metal journal provisions of that figure.

The trim plane 28 is formed at its rear to provide an upwardly inclined, integral flange extension 34 which substantially reinforces and stiffens the plane member, although this is not the primary function of flange 34. As illustrated in dot-dash line in FIG. 2, the latter rearwardly overlaps the transom extension 27 in the retracted condition of the plane. The side-to-side width of plane 28 being but slightly less than that of recess 24, it is seen that in the retracted or elevated position of the plane its flange 34 and that of the transom at 27 substantially wholly seal off the aft end of recess 24. Likewise, in the lower or extended position of plane 28, shown in solid line in FIG. 5, the extensions 27 and 34 still to a considerable extent close off the rear of recess 24. Accordingly, an undesirable effect of a following sea to cause broaching of the craft is minimized to the point of being eliminated, various advantages when steering stern-wise are obtained, and the recess 24 is shielded and protected when the boat is ashore, as mentioned above.

Now referring to FIGS. 3, 5 and 6 of the drawings, in which are shown motorized operating means such as is associated with each plane unit 20, the hull 10 is provided rearwardly and in forward-to-aft alignment with its rudder and rudder shaft sealing structure 36 (which constitutes no part of the invention) with a tubular stuffing box-type sealing unit 38, which is applied to an opening 39 in the hull bottom just forward of transom 14. This sealing unit may typically comprise a bottom-flanged and externally threaded, elongated sleeve 40 received from below in the opening 39 and clamped to the hull by a flanged nut 41. Another nut member 42 threaded onto sleeve 40 serves as a base against which an inverted cup shaped gland 43 threaded downwardly on sleeve 40 may abut, thus permitting a variable compression of several packing rings 44 within the gland. An upright operating rod 45 for the control plane structure 20 extends upwardly, from a horizontally pivoted connection to a small bracket plate 46 fixed on the top trim plane 28, through sleeve 40 and gland 43, being liquid-tight sealed by the packings 44.

As illustrated in FIG. 6, the plane operating rod 45 is fixedly connected to the base of a clevis-like adapter stem 47, and this clevis member is pivotally connected at 48 with one end of a medially pivoted lever arm 50.

The reference numeral 51 in FIG. 6 designates a suitable supporting bracket which is fixedly mounted within the boat hull 10, as to a stanchion 52 on the inner side of transom 14. Upright spacer and aligning blocks 53,

54 are fixedly carried by bracket 51; and the plane operating lever arm 50 is medially pivoted at 55 to the block 53. Of course, any other appropriate and desired arrangement for mounting the operating means for the plane unit 20 is contemplated.

The end of arm 50 opposite from its end pivot 48 is provided with a clevis or fork formation 56, within which an internally threaded sleeve or nut 57, preferably a ball type, is pivotally mounted at 58. Nut 57 internally receives an upright screw shaft 60; and this screw is rotatably driven through a speed reduction unit 61 fixedly clamped to the bracket spacer and aligning block 54. An electric motor 63 drives shaft 60 through reduction unit 61 under the control of suitable operating switch means (not shown) wired to the motor. Individual motorized means as shown in FIG. 6 are provided for the individual and selective operation of the two plane units 20. To the extent that the stuffing box and operating components appear in other figures of the drawings, they are designated by corresponding reference numerals. It is contemplated that the lever arm operating provisions shown in FIG. 6 may be replaced by more direct operating connections between motor 63 and shaft 45.

The embodiment of the control unit which is shown in FIG. 7 is one in which the plane-receiving hull recess, here specially designated 24' and bounded by side walls 25' is formed in the hull 12 well forwardly of the stern transom 14, being spaced from the latter by an intervening hull portion 65. Thus recess 24' is fully closed at its rear by the last named portion, which, as in the first embodiment, is in effect an extension portion of transom 14.

The stuffing box provisions at 38 are identical with those previously described. However, the adaptation of FIG. 7 is shown as employing a forwardly pivoted control plane 66 which lacks a rear and upward extension, corresponding to the extension 34 of the plane member 28 of the earlier form; and the recess 24' will be fully closed by transom extension 65 and plane 66 when the latter is in a retracted position flush with the bottom of hull 12.

FIGS. 8 and 9 depict another optional embodiment of the principle of the invention, in which the control plane member 68 is operated for adjustment bodily in an upward and downward way. To this end and to insure a properly controlled action in adjustment, the plane 68 is actuated through two pairs (FIG. 9) of parallel operating rods 45, each pivotally articulated to a plate 46 on the plane being each sealed by a stuffing box unit 38. The several operating rods 45 may be drivingly coordinated in any suitable fashion, as by a motor operated coupling for each pair or by a single coupling for the four operators which will insure a simultaneous adjusting movement. This maintains the control plane parallel to the angle of recess 24' in moving from its retracted position, shown in a dotted line in FIG. 8, to its extended position appearing in solid line.

Yet another alternative embodiment is illustrated in FIGS. 10-13, inclusive, in which the control plane is also bodily adjustable, as distinguished from the pivotal adjustment of the embodiment first described. In this case, the motion of the control plane, specially designated 70, is in a forward to aft direction, or vice versa, to and from a retracted position in which its tail end 71 (FIG. 10) is withdrawn into the outline of hull 12 and its recess 24'.

The plane 70 is plate-like and flat, being disposed for sliding movement in a downwardly and rearwardly inclined paralleling the top of hull recess 24'. It is operated for this motion by one or more actuating rods 72 which have threaded end connection at 73 into the forward edge of plane 70, as appears in FIG. 10.

In its adjusting motion between the solid line extended position of FIG. 10 and the dotted line retracted position, the control plane 70 has the assistance of a special adapter housing, generally designated 74, which is of triangular cross section as viewed in FIG. 10, being bounded at its

opposite sides by upright walls 75. A bottom plate 76 extends integrally between walls 75; and the housing is suitably secured rigidly from beneath across the forward portion of the hull recess 24', flush with the hull surface.

Adapter housing 74 is formed at its rear to provide an integral, transversely elongated guide formation 78 beneath which the control plane 70 slides and is sustained from above for stability in its adjusting motion. As illustrated in FIG. 12, plane 70 is of full transverse width, hence needs this sustaining action from above at zones across its width. FIG. 12 shows the plane 70 in solid line in its retracted position, and in dotted line as extended to the rear.

Further to the end of stably guiding control plane 70, the side walls of adapter housing 74 are provided with elongated fore-to-aft grooves 80 in which are received reduced thickness ribs 81 extending along the sides of plane 70. Thus, canting of the plane in adjustment is positively prevented. See FIG. 13.

In order to complete the guidance and support from above of control plane 70, in its extended position (solid line in FIGS. 10 and 11 and dotted line in FIG. 12), the hull 12 is provided, directly to the rear of recess 25' and forwardly of transom 14, with a pair of depending ribs 83 in fore-to-aft alignment with respective side walls of recess 24', being in effect continuations of those walls beneath the normal bottom of hull 12, as appears in FIG. 10. Between the ribs 83, the hull is also formed to provide a plurality of laterally spaced guide ribs 84 of lesser height than the ribs 83, as illustrated in FIG. 11; and in its slidable adjustment the plane 70 is laterally guided between the hull ribs 83, while being sustained from above by the intermediate ribs 84.

It is believed that the mode of operation of the improved trim and planing control means, in any of the embodiments thereof, will be obvious to those skilled in the art from the above description. It will be recognized that the invention affords an extremely simple and rugged arrangement of a vertically adjustable control plane member which may be contoured in conformity with a curved transom outline to mate flush with the latter in a retracted position, as well as with the bottom contour of the hull, plus means to adjust the plane member while maintaining substantial parallelism of the aft transom and plane edges. The offset hinge means of the preferred pivoted plane version of the invention make this possible, and in the versions in which the plane has bodily adjusting movement the maintenance of parallelism is inherent.

Another important advantage of the invention resides in the fact that the trim planes are wholly received within the respective hull recesses, and protectedly forward of the transom, thereby setting up little or no frictional resistance to travel, while enabling the craft to be quickly and easily trimmed and/or altered as to attitude as loading and speed or other conditions may require.

What is claimed is:

1. In a boat having a transom adjoining a rear hull portion, the improvement comprising a rigid and adjustable trim plane member installed on said hull portion with at least a major part of said member forward of said transom, said hull portion having a recess immediately forward of said transom in which said member is disposed, a lower surface of the member being substantially flush with said hull portion in a retracted position of the plane member in said recess, and means to movably adjust said member between said retracted position and an extended position in which a substantial part of its length is disposed below said recess and hull portion, said transom including a part aft of said recess which downwardly covers at least a portion of the rear of said recess when said plane member is in said extended position.

2. The improvement of claim 1, in which said plane member has a surface adjacent the rear thereof which extends upwardly in the direction toward the hull recess

and said covering part of said transom when the plane member is in said extended position.

3. The improvement of claim 2, in which said upwardly extending surface of said plane member rearwardly overlaps said covering part of the transom when the member is in said retracted position.

4. The improvement of claim 1, in which pivot means comprises a pivot unit at each side of the plane member hinging the latter to said hull portion, said pivot units being offset from one another in the fore and aft direction.

5. The improvement of claim 4, in which said transom has a bottom edge in the fore-to-aft zone of the plane member which curves upwardly and outwardly to a chine line of the boat, said plane member having a rear surface substantially matching the curvature of said transom edge when the member is in retracted position.

6. The improvement of claim 1, in which said plane member is mounted for adjusting movement by means occasioning an upyard or downward bodily movement of the member in the adjustment.

7. The improvement of claim 1, in which said transom curves outwardly and upwardly at its bottom toward a chine line of the boat, said plane member being correspondingly curved at its aft portion to come flush with the transom curve in the retracted position of the member.

8. The improvement of claim 2, in which said transom curves outwardly at its bottom toward a chine line of the boat, said plane member being correspondingly curved at its aft portion to come flush with the transom curve in the retracted position of the member.

9. A marine craft having a transom adjoining a stern hull portion, said transom having a bottom edge curving upwardly and outwardly toward a chine line of the craft and said hull portion having an aft-to-forward extending bottom recess therein, and a trim and/or planing control unit operatively assembled to the craft, comprising a rigid plane member disposed substantially in its entirety within said recess when said member is in inoperative, retracted position, said craft having means operatively connected to said plane member to operate the same between said retracted position and an operative, extended position in which a substantial portion of the member is disposed beneath the recess, said member having an aft curvature in general conformity with that of said transom edge, the lower surface of the plane member being substantially flush with that of said hull portion when the member is in retracted position, and the curvatures of the transom and plane member being substantially flush with one another in that position.

10. The craft of claim 9 in which said recess is located in its entirety forward of said transom, being substantially covered at its rear by a portion of the transom.

11. The craft of claim 9, in which said plane member is pivotally mounted in the recess by pivot units at the sides of the member which are offset relative to one in the forward-aft direction.

12. The craft of claim 9, in which said recess is substantially located in its entirety forward of said transom, being substantially covered at its rear by a portion of the transom, said plane member being pivotally mounted in the recess by pivot units at the sides of the member which are offset relative to one another in the forward-aft direction.

13. In a boat having a transom adjoining a rear hull portion, the improvement comprising a rigid and adjustable trim plane member installed on said hull portion with at least a major part of said member forward of said transom, a lower surface of the member being substantially flush with said hull portion in a retracted position of the plane member, and means to movably adjust said member between said retracted position and an extended position in which a substantial part of its length is disposed below said hull portion, said plane member having a surface adjacent the rear thereof which extends upwardly in the direction toward said transom when the plane member is in said extended position.

14. The improvement of claim 13, in which said hull portion has a recess in which said plane member is received in said retracted position of the latter.

15. A marine craft having a transom adjoining a stern hull portion, a rigid and adjustable trim plane member installed on said hull portion forward of said transom, said hull portion having a recess in which said trim plane member is disposed, and trim member having a lower surface substantially flush with said hull portion when in retracted position in said recess, means to movably adjust said plane trim member from said retracted position to an extended position in which a substantial part of said lower surface is below said recess and said hull portion, and a transversely extending member at the rear of said trim plane member which extends upwardly toward said transom thereby covering a portion of the rear of said recess when said trim plane member is in said extended position.

16. The craft according to claim 15 in which said transom includes a part aft of said recess which downwardly covers at least a portion of the rear of said recess and cooperates with said upwardly extending part of said trim plane member to shield and protect said recess.

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ANDREW H. FARRELL, *Primary Examiner*.