Oct. 8, 1968 W. P. JENSEN ET AL 3,404,651

BOAT-TRIMMING VANE MECHANISM

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Fig. 1.

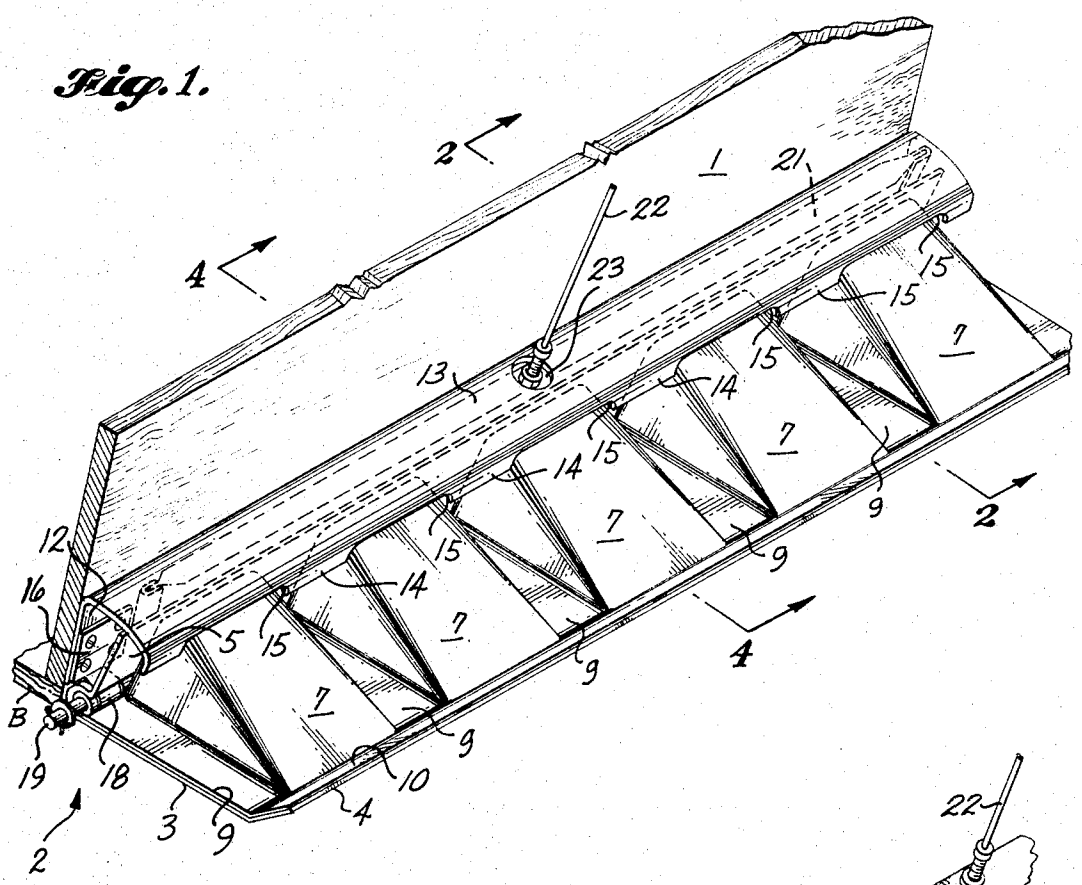
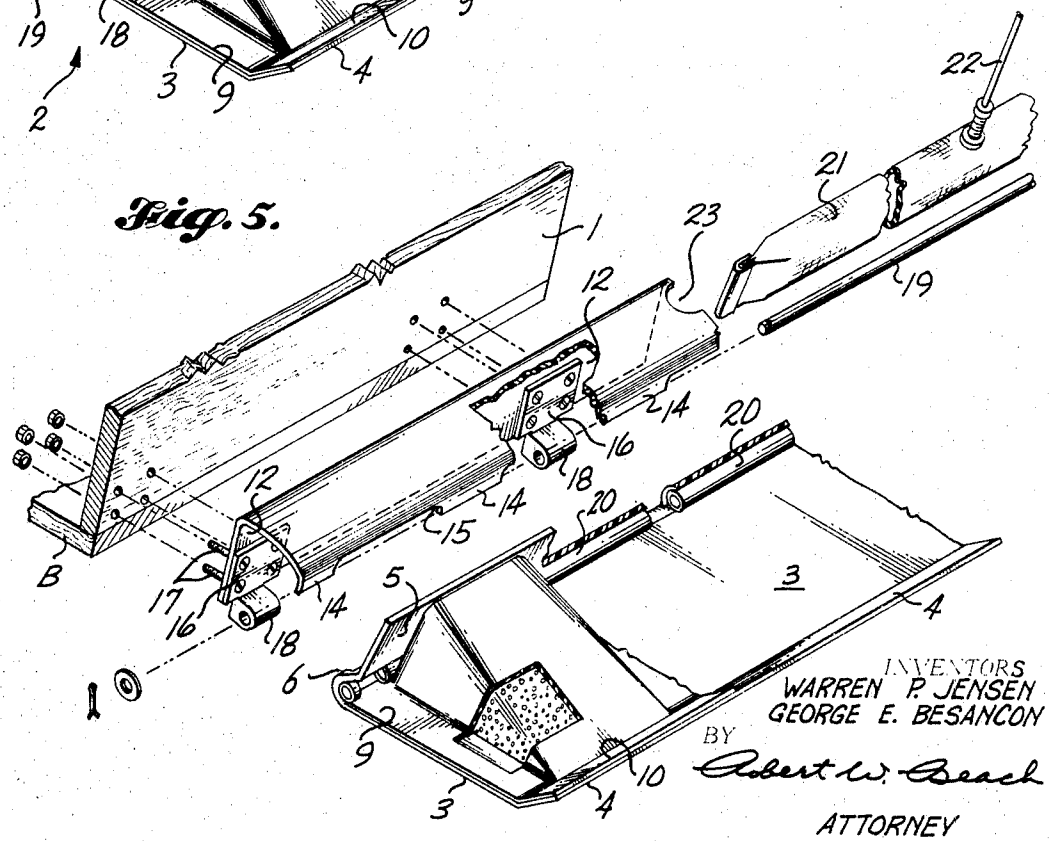


Fig. 5.



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Fig. 2.

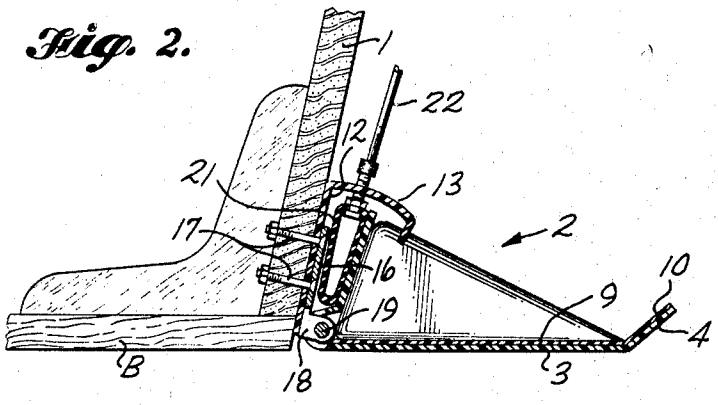


Fig. 3.

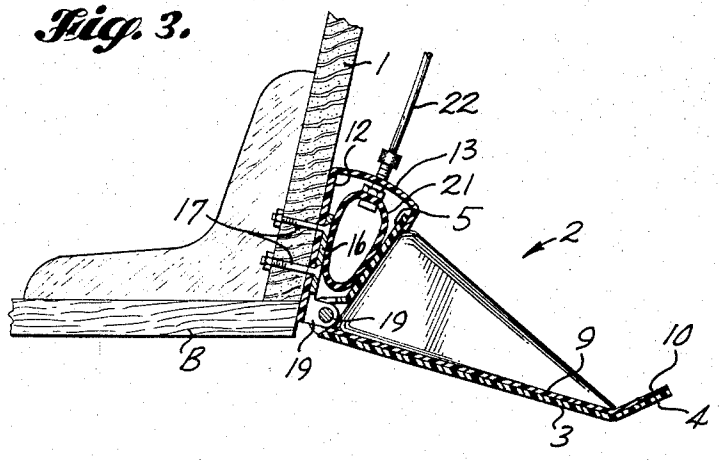
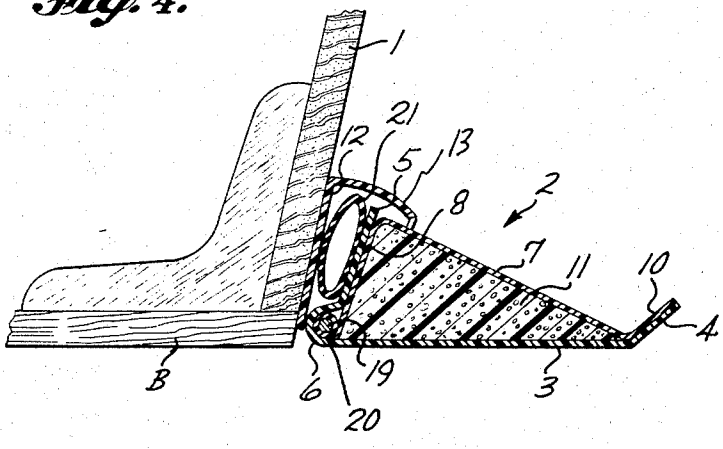


Fig. 4.



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Fig. 6.

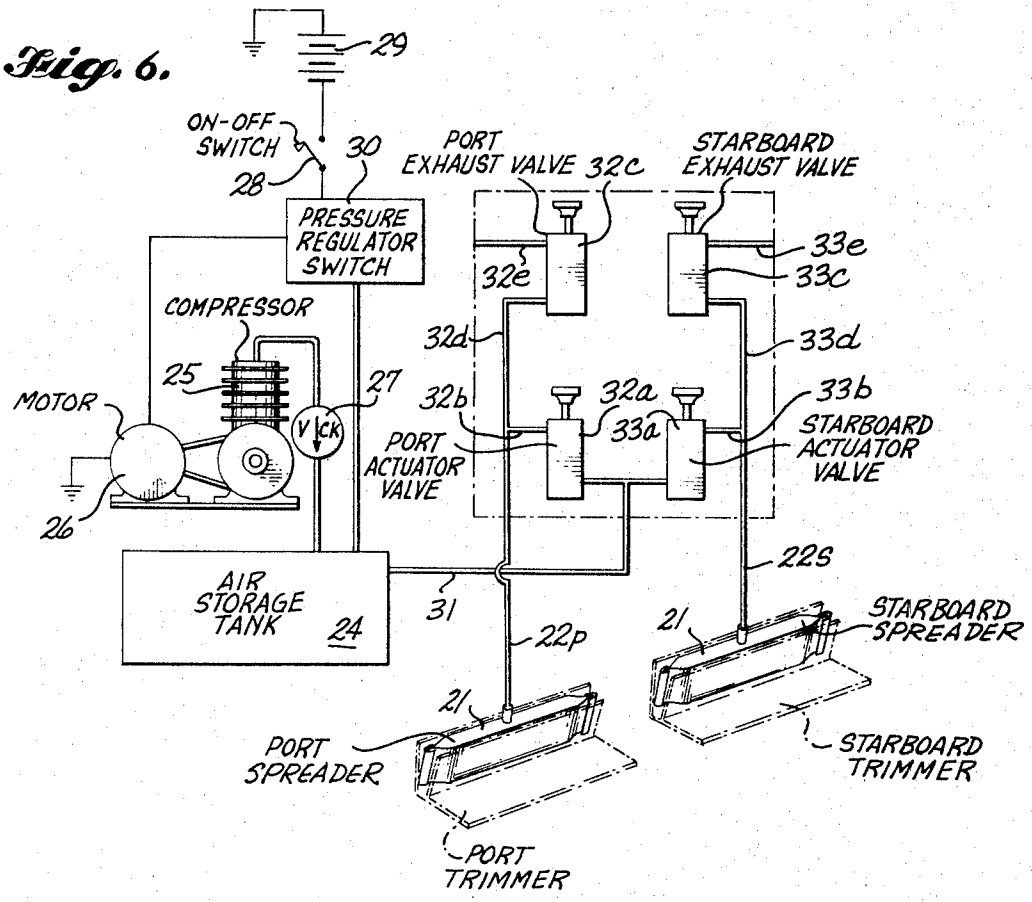
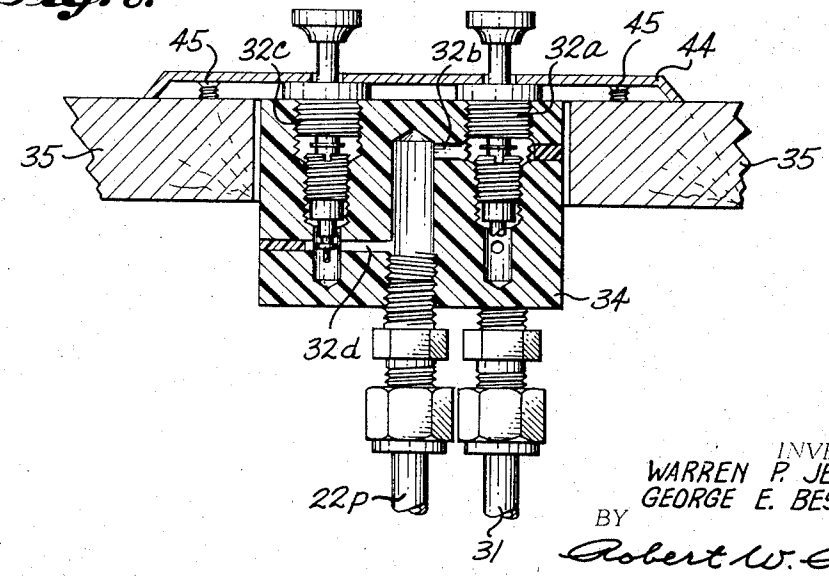


Fig. 8.



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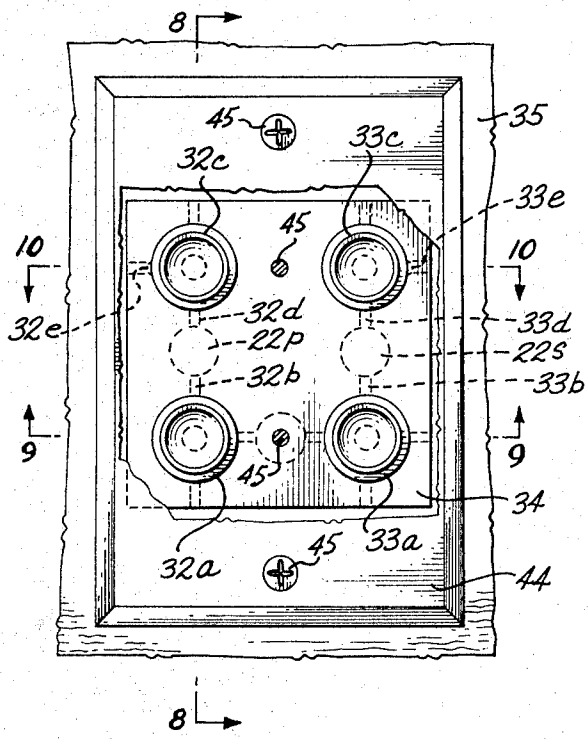


Fig. 7.

Fig. 9.

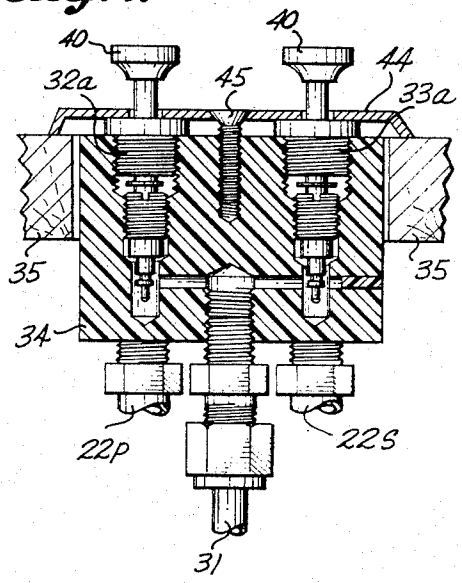


Fig. 10.

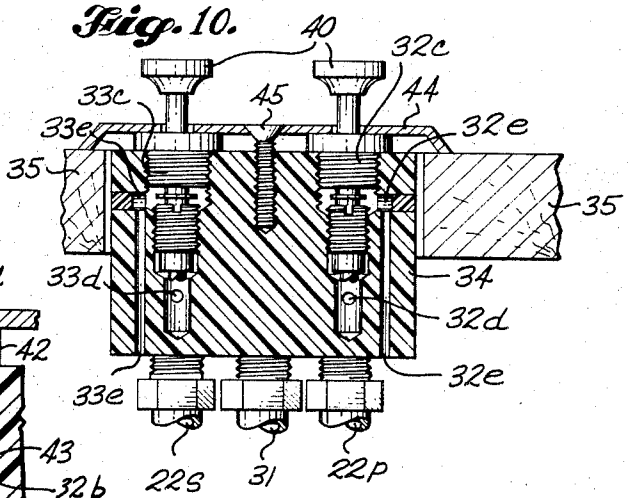
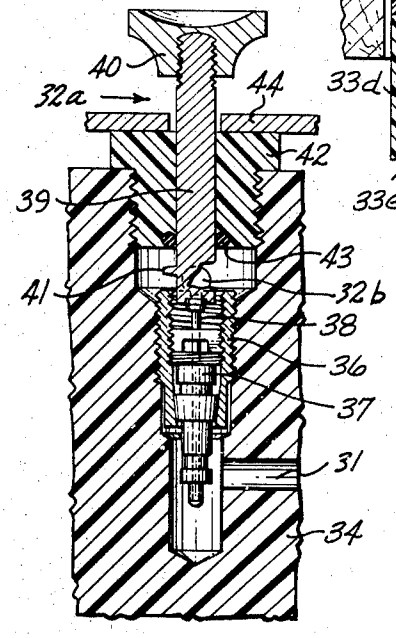


Fig. 11.



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BOAT-TRIMMING VANE MECHANISM

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19 Claims. (Cl. 114—66.5)

ABSTRACT OF THE DISCLOSURE

A vane structure, formed of an upright front wall and a lower wall braced by foam plastic-filled gussets integral with and extending between such walls, is attached by a hinge at the junction of the front wall and bottom wall to the lower portion of a mounting plate attachable to a boat transom. A flange projecting rearwardly from the upper portion of the mounting plate is engageable with the upper portion of the vane's front wall to limit downward swinging of the vane about the hinge. A hose section engaged between the mounting plate and the vane's front wall can be expanded by fluid under pressure to press against the vane's front wall for swinging the vane about its hinge. Flow of fluid to the hose section is controlled by manual push-button valves grouped in a valve block.

A principal object of the invention is to provide a trimming vane for boats which is of very rugged construction, which can withstand substantial loads without appreciable warping or twisting, and which can exert a substantial force on the water through which the boat moves, yet will be light and buoyant.

It is a further object to provide such a trimming vane which is strong and tough so that it is unlikely to be damaged, even though it may strike an object forcefully or be struck forcefully by an object.

It is also an object to construct such a trimming vane of material which, although tough and hard, will tend to minimize damage to an article which it may strike.

A further object is to provide a trimming vane made of durable plastic material which will not deteriorate appreciably as a result of long exposure to salt water and which is not readily subject to failure as a result of fatigue.

An additional object is to provide mechanism for swinging and for controlling the swinging of a trimming vane effectively, yet which will be of simple and inexpensive construction, will have a minimum of moving parts, and will be reliable in operation.

FIGURE 1 is a top perspective of a boat-trimming vane installation according to the present invention. FIGURES 2 and 3 are longitudinal sections through a trimming vane installation taken on line 2—2 of FIGURE 1, showing parts in different adjusted positions. FIGURE 4 is a longitudinal section through the trimming vane installation on line 4—4 of FIGURE 1.

FIGURE 5 is a top perspective of the trimming vane installation of FIGURE 1 with components shown in exploded relationship and having parts broken away.

FIGURE 6 is a diagram of pressure fluid supply mechanism for actuating the trimming vane.

FIGURE 7 is a plan of a multiple-valve block mounting a cluster of valves. FIGURES 8, 9 and 10 are different vertical sections through the multiple-valve block of FIGURE 7 taken along lines 8—8, 9—9 and 10—10, respectively.

FIGURE 11 is an enlarged vertical section through the left valve unit of FIGURE 9 taken on line 9—9 of FIGURE 7.

The general idea of installing deflectable vanes on the stern of a boat to be used for trimming the boat longitudinally is not new, but particular installations have had defects or deficiencies which have given more or less trouble. Some installations have been unsightly and difficult to make. Materials used have deteriorated or corroded. The structures have been heavy, or parts have failed as a result of stresses to which they were subjected or fatigue. Some installations have been difficult to adjust or not capable of being adjusted from the pilot's station. The present structure and installation overcomes such disadvantages.

The trimming vane structure is adapted to be mounted on the transom 1 of a boat. The vane structure indicated generally at 2 includes an angle component of molded plastic material including a generally horizontal bottom panel 3 with a trailing edge portion 4 turned upward at an obtuse angle to it, and an upright front panel 5 integral with the forward portion of the bottom panel 3. Preferably the connecting portion 6 between the bottom panel and the front panel forms a curved forward projection, as shown in FIGURE 4.

The bottom panel 3 and the front panel 5 are stiffened and the entire trimming vane is rigidified by providing hollow gusset channels 7 of considerable width, as shown in FIGURE 1, which extend between the bottom panel and the front panel. These gussets are formed as part of a shell including front gusset walls 8, the forward faces of which fit contiguously against the rear face of the front panel 5. Between the hollow gussets are webs 9 which overlie and contact the bottom panel 3 in face-to-face relationship. The rear portion of the shell is bent upward to form a flange 10 engageable in contiguous relationship to the upturned trailing edge portion 4 of the bottom panel.

Each of the channel pockets formed by a gusset 7 is filled with foamed plastic material, forming a cellular buoyant or flotation structure of light weight. The entire trimming vane structure can be integrated into a rigid unit by bonding the front walls 8 of the gussets 7 to the front panel 5, the web portions 9 of the shell to the bottom panel 3, and the trailing flange 10 of the shell to the trailing portion 4 of the bottom panel. By such bonding, the hollow gussets will be sealed in watertight relationship to the angle panel structure so that the combinaion angle and gusset shell structure is floatable.

The trimming vane structure defined can be mounted on the transom 1 of a boat by a mounting plate 12. From the upper portion of this mounting plate, a flange 13 projects rearwardly so as to overlie the upper portion of the trimming vane structure. Lips 14 project downward from the trailing edge of this flange for engagement between the gussets 7 of the trimming vane structure, leaving wide notches 15 between such lips for receiving the upper portions of gussets 7. Such mounting plate can be secured to the transom 1 by applying reinforcing plates 16 to the back of the mounting plate and extending bolts 17 through such reinforcing plates and the transom.

The reinforcing plates 16 also carry ears 18 projecting downwardly and rearwardly from them, which ears are apertured to receive a hinge rod 19 that extends through the tube sections 20 bonded within the forwardly-projecting curved portion 6 of the angle member of the trimming vane at the junction of the front panel 5 and the bottom panel 3. Such curved junction of the angle member is cut away at spaced locations to receive the ears 18, as shown best in FIGURE 5. The hinge rod 19 extends continuously throughout the length of the trimming vane structure and is secured in place by a cotter key and washer at each end, as shown in FIGURE 1.

It will be seen from FIGURES 1, 2, 3 and 4 that the apex of the trimming vane structure at its lower forward

corner can be attached by the hinge rod **18** to the mounting plate **12** securely for free swinging of the trimming vane structure relative to such mounting plate. Downward swing of such trimming vane structure is limited by engagement of the upper edge portion of the front panel **5** with the depending lips **14** on the rearwardly-projecting flange **13** of the mounting plate **12**, as shown in FIGURE 3. In most installations, however, the buoyancy of the trimming vane structure will be sufficiently great so that such structure will float upward from the position of FIGURE 3 toward the position of FIGURES 2 and 4 if no force is applied to such structure tending to swing it downward.

During forward movement of the boat through the water, such water will exert on the trimming vane structure a force tending to swing it upwardly in addition to the force produced by the buoyancy of such structure. At higher speeds, however, the bow of a motorboat tends to be elevated and its stern to settle. Consequently, in order to trim such a boat to run level, it is necessary to apply a vane-depressing force of a value greater than the elevating force of buoyancy and the dynamic force of the water over which the boat runs in order to maintain the vane in a downwardly-swung attitude to provide the desired lifting force on the boat's stern for trimming purposes. Such a force can be applied rearwardly to the front wall **5** of the trimming vane structure.

Compact mechanism for applying a vane-depressing force conveniently to the front panel **5** of the vane structure is illustrated in FIGURES 2, 3, 4 and 6 in the form of a hose section **21** having its opposite ends sealed, as indicated in FIGURE 6. Inflation of such hose section will exert a spreading force between the mounting plate **12** and the front wall **5** of the trimming vane structure.

The tube **21** used as spreading means is compact in the flattened condition shown in FIGURES 2 and 4 when the vane is in its raised position. Fluid under pressure, preferably air, is supplied to the hose section through a tube **22** secured to the side wall of the hose section, as shown in FIGURES 2 and 3. Through this tube, fluid under pressure can be supplied to and discharged from the hose section. When fluid under pressure, such as air, is forced into the hose section, it will be expanded toward a circular cross-sectional shape, as illustrated in FIGURE 3, to exert a spreading force between the mounting plate **12** and the front panel **5** of the trimming vane structure. Because the tube **22** passes through a hole **23** in the top flange **13** of the mounting plate, the hose section cannot shift lengthwise appreciably relative to the trimming vane. Also, the flange **13** will prevent the hose section from floating upward and from being wedged upward out of the channel between the mounting plate and vane front plate **5**.

In order to be able to control heeling of a boat, as well as its longitudinal trim, it is desirable to provide a trimming vane installation at each side of the boat stern, and in FIGURE 6, a port trimmer and a starboard trimmer are illustrated. The pressure fluid line **22***p* is connected to the port spreader hose section **21** and the line **22***s* is connected to the starboard spreader hose section **21**. The mechanism for controlling supply of fluid under pressure to these lines, or discharge of fluid from them, should be operable independently. Air under pressure can be supplied selectively to these lines from an air storage tank **24** into which a compressor **25** driven by a motor **26** injects air past a check valve **27**. The operation of such motor is controlled by a switch **28** connected to a power supply **29**. The motor can be energized intermittently by a pressure regulator switch **30** sensitive to the pressure of the air in the storage tank so as to maintain the air in the storage tank at a predetermined value. A vacuum-type compressor may be used instead.

Air under pressure is supplied from the storage tank **24** to the port spreader and to the starboard spreader through a supply line **31**, actuator valves **32***a* and **33***a*, respectively, and lines **32***b* and **33***b*, which connect to lines **22***p* and **22***s*, respectively. Discharge of fluid from the spread is controlled by valves **32***c* and **33***c*, respectively. Valve **32***c* is connected between a line **32***d*, connected to line **22***p*, and a line **32***e* which communicates with the atmosphere. Similarly, valve **33***c* is connected between a line **33***d*, which is connected to line **22***s*, and a line **33***e* in communication with the atmosphere.

All of the valves **32***a*, **33***a*, **32***c* and **33***c* are manually operable selectively and independently to control the positions of the port trimmer and the starboard trimmer. It is desirable for the pilot of the boat to be able to operate these control valves at any time, and, consequently, they should be mounted in a cluster within each reach of the pilot. Preferably such valves are grouped in a suitably ported valve block, such as shown in FIGURES 7 to 10. Each of such valves is simply a push-button valve of the one-way type. The valve block **34** can be of square cross section, as indicated by FIGURES 7, 8, 9 and 10, and the valves **32***a*, **33***a*, **32***c* and **33***c* can be mounted in a square cluster, one valve being located in each corner of the block, as shown in FIGURE 7.

Mounting of the several valves in a single block facilitates installation of the valves on an instrument panel **35**, for example, as shown in FIGURES 7 to 10. A preferred installation of each valve in the valve block **34** is shown on an enlarged scale in FIGURE 11. The valve block can be made of plastic material, such as acrylic resin, in which valve cavities and connecting ports are drilled. A metal liner **36** is screwed into each valve cavity, and such liner is threaded internally to receive a check valve **37**, such as of the automobile tire valve core type. The stem **38** of such valve core projects upward to be engaged by a valve rod **39** onto the upper end of which a button **40** is screwed.

An annular flange **41** on the lower portion of the valve rod **39** prevents such valve rod from being withdrawn upwardly through the bore in the valve rod mounting collar in which it slides. Such collar is screwed into the upper end of the valve cavity in the valve block **34**. Such flange also limits the downward movement of the valve rod by seating on the upper end of the metal liner **36**. When the valve rod **39** is inserted through the bore of collar **42**, passage of air through such bore is prevented by the sealing ring **43**. When the collar **42** of each valve has been screwed into the valve block **34** such collars can be held in place in the valve block by a cover plate **44** extending over the block and held in position by securing screws **45**. The buttons **40** can then be screwed onto the upper ends of the valve stems.

Since each push-button valve **32***a*, **33***a*, **32***c* and **33***c* is independent of the other valves, the pilot can operate selectively any valve or any combination of valves simultaneously. It would, of course, be of no benefit to operate valves **32***a* and **32***c* simultaneously because such manipulation would simply discharge air from the storage tank **24** through lines **31**, **32***b*, **32***d* and **32***e* to atmosphere. Similarly, it would be of no benefit to operate valves **33***a* and **33***c* simultaneously because this would simply result in air flowing from the storage tank **24** through lines **31**, **33***b*, **33***d* and **33***e* to atmosphere. It may, however, be desirable for the pilot to operate valves **32***a* and **33***a* simultaneously, for swinging downward both the port trimmer and the starboard trimmer at the same time so as to trim the boat properly for an increased speed. Correspondingly, it may be desirable to operate valves **32***c* and **33***c* simultaneously to enable both trimming vanes to be moved upward simultaneously by reducing the pressure in both the port spreader and the starboard spreader at the same time. Also, in some instances, it may be desirable to operate valves **32***a* and **33***c* simultaneously, or valves **33***a* and **32***c* simultaneously, for the purpose of reducing the heel of the boat without altering its longitudinal trim.

It will be understood that only one line **22***p* and one

line 22*s* need be connected to the port spreader hose section and the starboard spreader hose section, respectively, because manipulation of valve 32*a* or valve 33*a* will connect the air supply line to duct 32*b* or 33*b*, respectively, for flow of air into a spreader hose section. Alternatively, if valve 32*c* or valve 33*c* is operated, line 22*p* or line 22*s* will be connected to atmosphere for discharge of fluid from the respective hose sections 21, resulting from the squeezing pressure of the trimming vane front wall 5 on the hose section.

We claim:

1. Boat-trimming vane mechanism comprising a vane including a bottom and a front wall rigidly connected for conjoint movement, hinge means connected to said vane for mounting said vane swingably on the stern of a boat, and spreader means engaged with said vane front wall at a location spaced upwardly from said hinge means and reacting from the boat's stern to press against said vane front wall for swinging said vane relative to the boat's stern.

2. The boat-trimming vane mechanism defined in claim 1, in which the vane includes a front wall panel, a bottom panel and means bridging between substantially the upper edge of said front wall panel and the trailing edge portion of said bottom panel for maintaining said panels in fixed relationship with respect to each other.

3. The boat-trimming vane mechanism defined in claim 2, and foam plastic material in the space between the front wall panel, the bottom panel and the bridging means.

4. The boat-trimming vane mechanism defined in claim 2, in which the bridging means includes a bridging wall in sealed relationship to the front wall panel and the bottom panel.

5. The boat-trimming vane mechanism defined in claim 1, and bridging means extending between the vane front wall and the vane bottom and forming therewith a rigid sealed compartment.

6. The boat-trimming vane mechanism defined in claim 5, in which the sealed compartment contains foamed plastic material.

7. The boat-trimming vane mechanism defined in claim 5, in which the vane front wall is a panel, the bottom is a panel, and a plurality of hollow gussets bridging between said vane front wall panel and said bottom panel spaced lengthwise of the hinge means and forming, respectively, hollow compartments.

8. The boat-trimming vane mechanism defined in claim 7, in which the vane front wall panel and the vane bottom panel are continuous, and a shell having spaced downwardly-opening pockets bonded to the bottom panel to close such pockets for forming the hollow gussets, respectively.

9. The boat-trimming vane mechanism defined in claim 1, and mounting means forward of the vane front wall securable to a boat stern and including an upper flange extending rearwardly over the upper edge of the vane front wall for covering the space between the vane front wall and said mounting means, the spreader means being located between said mounting means and the vane front wall and beneath said upper flange.

10. The boat-trimming vane mechanism defined in claim 9, in which the rear portion of the mounting means flange has a depending lip engageable with the vane front wall for limiting the degree of swinging of the vane wall away from the mounting means.

11. The boat-trimming vane mechanism defined in claim 1, in which the hinge means includes a hinge rod extending substantially the full length of the vane front wall.

12. The boat-trimming vane mechanism defined in claim 1, in which the vane is of rigid plastic material.

13. The boat-trimming vane mechanism defined in claim 1, in which the spreader means includes a chamber expandable by supply of fluid under pressure to it.

14. The boat-trimming vane mechanism defined in claim 13, a source of fluid under pressure, and connecting means connecting said source of fluid under pressure and the spreader means expandable chamber and including push-button valve control means.

15. The boat-trimming vane mechanism defined in claim 14, in which the connecting means includes a sole line connected to the expandable-chamber means and the valve control means has two one-way valves, one of such valves controlling flow of fluid under pressure to the expandable-chamber means and the other of said valves controlling discharge of fluid from the expandable-chamber means.

16. The boat-trimming vane mechanism defined in claim 14, in which two vanes are mountable on a boat's stern, one on the port side and the other on the starboard side, each of such vanes includes expandable-chamber spreader means, and the connecting means includes a tube connected to each of the vanes and the valve control means has control valves for controlling flow of fluid to the expandable-chamber spreader means of the two vanes mounted in a cluster.

17. The boat-trimming vane mechanism defined in claim 16, in which the control means includes four control valves arranged in a square cluster.

18. The boat-trimming vane mechanism defined in claim 16, in which the control valves are all mounted in a single valve block.

19. The boot-trimming vane mechanism defined in claim 18, in which the valve block is of plastic material and the connecting means includes ports in such valve block.

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