

Feb. 18, 1969

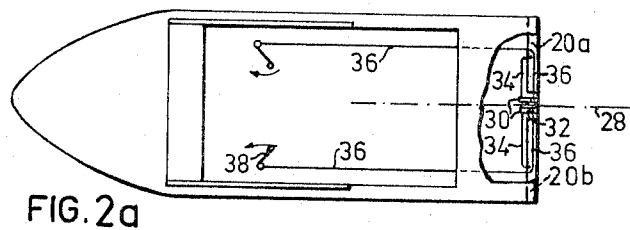
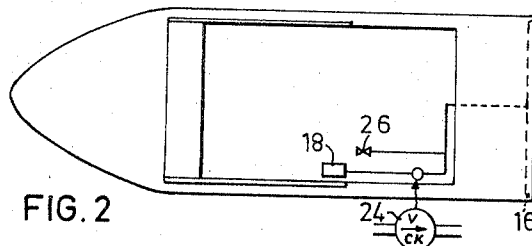
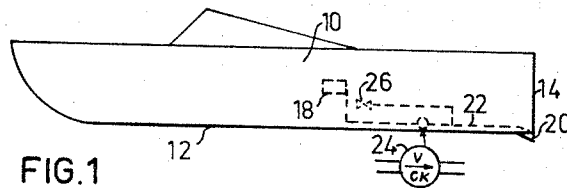
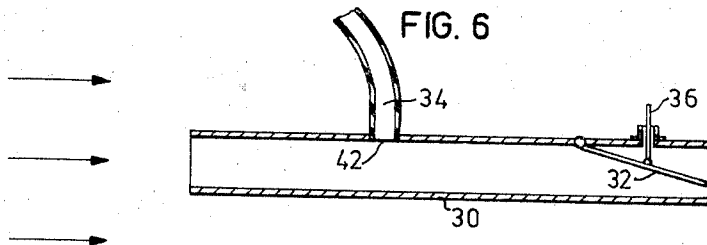
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3,428,012

TRIM ATTACHMENT FOR POWER BOATS

Filed Oct. 25, 1966

Sheet 1 of 3



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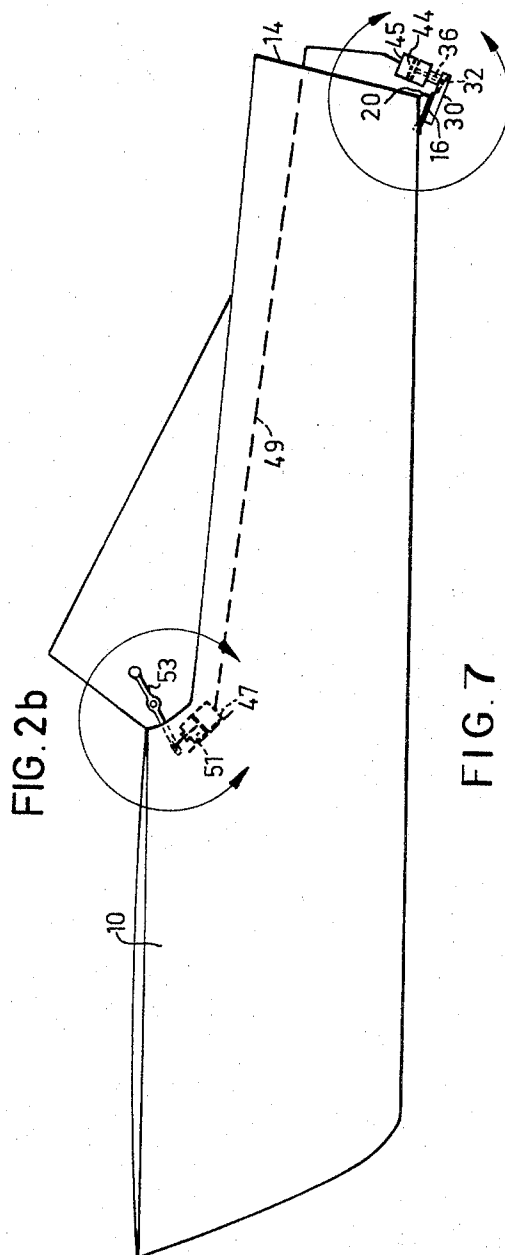
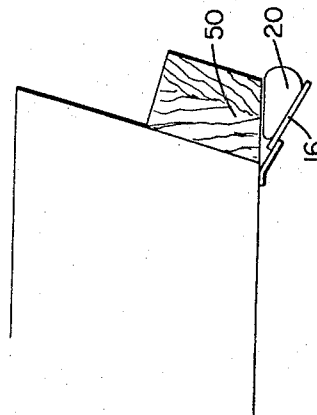


FIG. 7



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FIG. 3

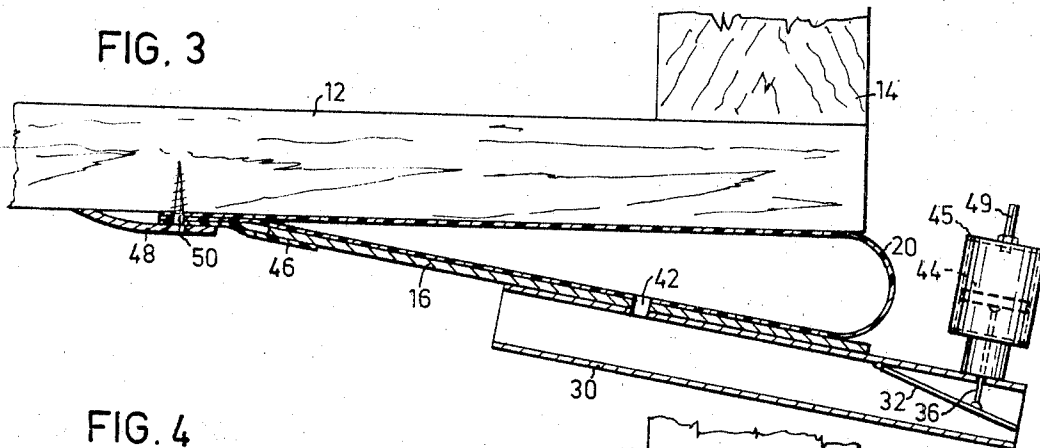


FIG. 4

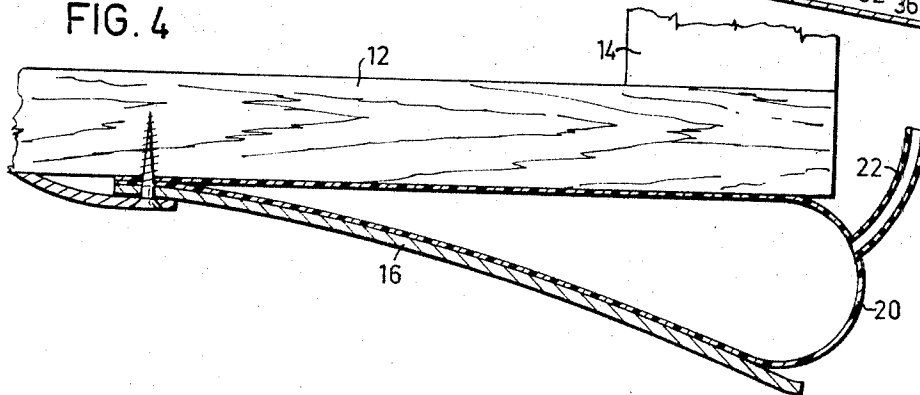
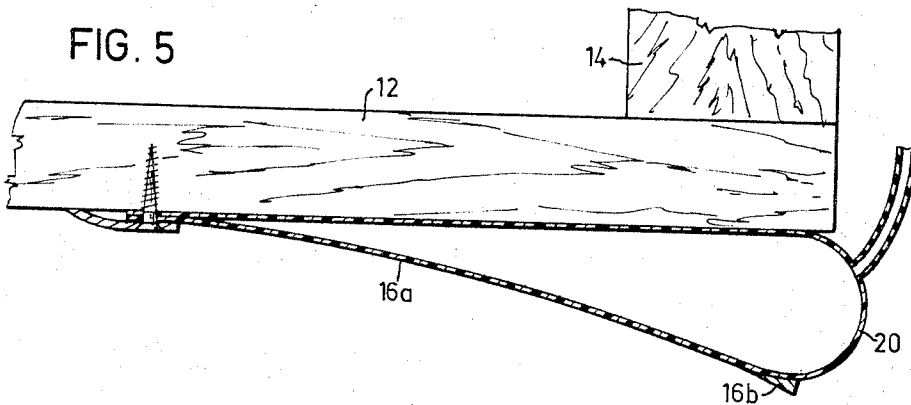


FIG. 5



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TRIM ATTACHMENT FOR POWER BOATS

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Int. Cl. B63b 1/22

14 Claims

ABSTRACT OF THE DISCLOSURE

A vehicle is provided with a trim attachment in the form of a tab or flap. In the case of a boat, it may be in one or more portions and extends across the bottom of the stern and has a dimension longitudinally of the boat that is between $\frac{1}{10}$ and $\frac{1}{200}$ of its dimension along the width of the boat. An inflatable and deflatable water bag between the tab and the boat swings the tab relative to the boat; and the liquid in the water bag is pressurized by supplying it from an open-ended tube that moves through the water to generate a velocity pressure head in the tube. An adjustable valve at the rear of this tube controls the velocity pressure in the tube; and the interiors of the water bag and the tube communicate with each other.

The present invention relates to power boats and trim attachments for such boats.

The main object of the invention is to provide a trim attachment for power boats having a hull with a bottom and stern, said attachment enabling longitudinal and lateral trimming of the boat under varying loading in order to obtain optimum attitude for movement of the boat through the water, greater speed with less fuel consumption than in similar boats heretofore known, improved visibility and permitting adjustment so that the compensation can be made for varying load conditions and for more comfortable riding in rough waters.

It is known to utilize movable surfaces or plates for trimming the position of the boat in its longitudinal direction, said surfaces or plates being connected to the bottom of the boat abaft the stern thereof. In certain cases the angular position of the trim plates may be changed during driving but in other cases adjustment has been possible only during standstill.

A suitable distribution of the power of pressure directly to the bottom of the boat may be obtained by setting the trim member to the desired angle by a bag containing gas or liquid and located between the trim member and the bottom of the boat. In this case the material of the trim member need only have a strength sufficient for the bending moment arising in the trim member in the longitudinal direction of the boat. In the lateral direction each section of the trim plate may be self-supporting which has the advantage that the trim plate may be divided into a plurality of parts located laterally of one another and being operated by one and the same bag. This is an essential feature in cases where the bottom of the boat is arcuate. Also weak trim plate material may be used so that the trim tab may automatically deflect so as to cause balance between water pressure and operating pressure as far as to the point at which the water separates from the trim member. An entirely flexible material, however, cannot be employed on account of the risk of flutter. In the case of an entirely flexible material, a somewhat stiffer separation edge for the water must be used in any case to prevent Coanda attachment of the water flow along the rear side of the bag.

The bag and the trim member are intended to be used as a means for longitudinal trimming mounted below the

bottom of boats immediately in front of the transom or under a prolongation member or bracket mounted on the transom of the boat.

Further objects, advantages and features of the invention will be apparent from the following description and claims wherein the construction, arrangement and cooperation of the several parts of the apparatus are set forth.

In the drawings:

FIG. 1 is an elevation of a boat equipped with a trim attachment according to the invention;

FIG. 2 is a plan view corresponding to FIG. 1;

FIG. 2a is a plan view of a boat equipped with a trim attachment according to a further embodiment of the invention;

FIG. 2b is an elevation of a boat provided with a trim attachment according to a still further embodiment;

FIGS. 3, 4 and 5 illustrate three embodiments of the invention in a longitudinal vertical section on an enlarged scale;

FIG. 6 is a longitudinal section on an enlarged scale of a pitot tube included in the embodiments illustrated in FIGS. 2a and 3; and

FIG. 7 illustrates a longitudinal vertical section of the rear portion of a boat provided with the trim attachment according to the invention.

Referring to FIGS. 1 and 2 the invention is adapted to be applied to a power boat having a hull 10 with an arcuate or plane bottom 12 and a stern plate or transom 14. Mounted below or on the bottom is a trim attachment comprising a substantially rectangular trim tab or strip 16 extending along substantially the entire breadth of the bottom of the boat and adapted to be set in various angular positions to the boat by operating means 18, 20. The tab or strip 16 has its fore end secured to the bottom of the boat whereas its rear end may be free, and it is essential that the dimension of the tab as counted in the longitudinal direction of the boat is small relative to the dimension in the transverse direction of the boat. This ratio may amount to $\frac{1}{10}$ - $\frac{1}{100}$. The trim qualities of such a trim member are quite satisfactory and the drag thereof in the water is small.

Various means may be used for setting the trim member to the required angle to the bottom of the boat, but the trim member may be amplified and a good strength of the entire attachment may be obtained if the operating means comprises a bag mounted between the trim member proper and the bottom of the boat or an elongation, such as a bracket secured to the rear of the stern. The bag may be inflated by air or other gas or expanded by liquid. Expansion of the bag causes setting of the tab 16 to an angle to the bottom of the boat and compression or contraction of the bag decreases said angle to a minimum at which the tab lies flush with the bottom.

The inflating means comprises a pump or adjustable volume formed by a flexible bag 18 and a conduit 22 between said pump and the bag 20, and further a non-return valve 24 in the pump or in said conduit, the non-return valve being adapted to prevent fluid introduced into the bag from returning if the pump is stopped. A release valve 26 is connected to the conduit 22 between the non-return valve 24 and the bag 20. Opening of the release valve 26 results in release of fluid from the conduit 22 and the bag 20, whereby the tab 16 is pressed upwards by the outer water pressure to its position flush with the bottom of the boat.

It is essential that the trim tab extends along the entire breadth of the boat to obtain the minimum drag for a certain lift effect. The bag should extend along the entire length of the trim tab to support it along its entire surface.

The embodiment of the trim attachment illustrated in FIGS. 1 and 2 is adapted for longitudinal trimming of the boat but if also lateral trimming is intended and for

other purposes the trim tab may be divided into a plurality of parts covering together substantially the entire breadth of the boat. Each trim tab may have its bag but a simpler construction may be obtained by a bag common to all trim tab parts. FIG. 2a illustrates an embodiment in which there are two trim tabs and bags 20a, 20b mounted symmetrically with respect to the center line 28 of the boat. The bags may be operated by a pump and valves like those illustrated in FIGS. 1 and 2, but FIG. 2a illustrates a modification in which the power for setting the trim tabs in position is obtained from the dynamic pressure of the water arising as the boat moves forwards in the water. This operating means comprises, for each trim attachment, a velocity head pressure generating tube 30 directed forwards with its open fore end and having near its rear open end a variable restriction 32. At the point located in front of said restriction 32 there are communications 34 between the interior of the tube 30 and the bags 20a and 20b. The restriction may be formed by a valve operated through link means comprising a Bowden wire 36 and a lever 38 for each trim attachment. The operation of the tube arrangement is illustrated in principle in FIG. 6.

As the boat moves forwards, water flows into the tube 30 and a pressure is built up in the tube as the flap valve 32 mounted at the rear end of the tube restricts the flow at this end. The communication 34 between the tube and the bag extends from a point 42 located in front of the restriction 32, whereby the pressure in the tube is transmitted to the bags 20a, 20b expanding the bags and setting the trim tabs at an angle to the bottom of the boat.

In the embodiment illustrated in FIG. 2b the tab 16 has attached to the bottom thereof a tube 30 operated by a restriction valve like the valve 32 in FIG. 6, said valve being operated by a piston 44 in a cylinder 45 carried by the tab 16. The top of the cylinder 45 is closed and the inner space thereof communicates with one end of an operating cylinder 47 through a conduit 49, the latter cylinder enclosing a piston 51 displaceable in the cylinder by a lever 53. Gas or liquid is enclosed in the cylinder spaces and the conduit 49 between the pistons 44, 51 so that a displacement of one piston is accompanied by a similar displacement of the other. Thus, the valve 32 may be easily set by the piston 51, the cylinder 47 and the lever 53 being mounted near the driver's seat in the boat.

In the embodiment illustrated in FIG. 3 the trim member comprises a stiff plate 16 having its fore end connected to the bottom of the boat by a flexible hinge member 46 secured to the boat by a protecting strip and screws 48, 50, respectively. The tab may be attached to the bottom wall of the bag by an adhesive or any other suitable means. As illustrated, a tube 30 may be attached to the bottom of the stiff tab 16, said tube 30 having a restriction valve 32. In this connection the communication between the bag and the tube 30 may be established by a single hole 42 bored through the walls of the bag and the pilot tube 30 as well as through the tab 16.

In the embodiment illustrated in FIG. 4 the trim tab is mounted as in FIG. 3 but is conceived as being of a flexible material. The bag 20 may be inflated and deflated through a conduit 22 corresponding to that illustrated in FIG. 1.

The trim tab may be integral with the lower wall of the bag, as shown at 16a in FIG. 5. In this case there must be a separation strip 16b for the water at the rear portion of the bag.

In the embodiments described hereinbefore the trim tab has been mounted below the aft portion of the bottom of the boat, but it is also possible to arrange the flap and the bag or bags below an extension or bracket 50 added to the stern of the boat as illustrated in FIG. 7.

The invention is not limited to the embodiments illustrated in the drawings, said embodiments being examples only. The operating means, such as Bowden cables and

piston arrangements, may each be combined with any of the embodiments and may be replaced by other suitable operating means.

What I claim is:

1. In a power boat comprising a hull with a stern and a bottom having a center line, trim members mounted at both sides of the center line, each trim member comprising a tab formed with a front edge and a rear edge and being secured to the bottom of the boat at its front edge, a bag mounted between said tab and said bottom, tubes mounted between the trim members at the bottom of the boat and extending longitudinally of the latter, each tube having open fore and aft ends and communicating with its own bag at a point between said ends, and an adjustable restriction mounted in each tube abaft the point of communication between the tube and the bag.

2. In a power boat comprising a hull with a stern and a bottom, a trim attachment mounted on the bottom at the stern, said attachment comprising a tab having a front edge and a rear edge and being secured to the bottom of the boat at its front edge, a bag mounted between the tab and the bottom of the boat, and means to expand the bag to set the tab at various angles to the bottom of the boat, the rear edge of the tab being lower than the front edge in such angular positions, said expanding means comprising a tube having open ends and extending in the longitudinal direction of the boat, a valve for controlling the flow through said tube, and means establishing communication between said tube and the inner of the bag at a point located in front of said valve.

3. A trim attachment as claimed in claim 2 and further characterized in that the tab is flexible and integral with a lower wall of the bag.

4. A trim attachment as claimed in claim 2, and means for controlling the position of said valve from inside the boat.

5. A trim attachment as claimed in claim 4, said control means comprising a hydraulic servo-control.

6. A trim attachment as claimed in claim 4, said control means comprising a lever and link means.

7. In a power boat comprising a hull with a stern and a bottom, a trim attachment mounted on the bottom at the stern, said attachment comprising a tab having a front edge and a rear edge and being secured to the bottom of the boat at its front edge, a bag mounted between the tab and the bottom of the boat, and means to expand the bag to set the tab at various angles to the bottom of the boat, the rear edge of the tab being lower than the front edge in such angular positions, said expanding means comprising means to supply water under pressure to the interior of the bag, said supply means comprising means communicating with the body of water on which the boat floats, said supply means supplying water to the interior of the bag from said body of water and discharging water from the interior of the bag to said body of water.

8. A trim attachment as claimed in claim 7, said supply means including at least one water pump.

9. A trim attachment as claimed in claim 7, said supply means comprising a pump responsive to movement of the boat through the water to establish a velocity pressure head of water within the pump.

10. A trim attachment as claimed in claim 9, and valve means for regulating the velocity pressure head in said pump.

11. In a power vehicle, a trim attachment comprising a tab swingably secured to the vehicle, a bag mounted between the tab and the vehicle, and means to expand the bag to set the tab at various angles to the vehicle in a flowing stream of fluid, the rear edge of the tab with respect to the direction of fluid flow being farther from the vehicle than the front edge in such angular positions, said expanding means comprising means for applying a velocity pressure head of the fluid adjacent the vehicle to the interior of the bag.

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12. A trim attachment as claimed in claim 11, and valve means for controlling the magnitude of said velocity pressure head.

13. A trim attachment as claimed in claim 12, and means within the vehicle for operating said valve means.

14. A trim attachment as claimed in claim 12, said applying means comprising a tube open at its forward end, the bag communicating with the interior of said tube in front of said valve.

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References Cited

UNITED STATES PATENTS

2,265,206	12/1941	Stampfl	-----	114—66.5
3,026,839	3/1962	Fridge	-----	114—66.5
3,313,262	4/1967	Yunku et al.	-----	114—66.5

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