Aug. 22, 1933. E. WESNIGK 1,923,958

HYDROPLANE

Filed Feb. 11, 1931

Fig. 1

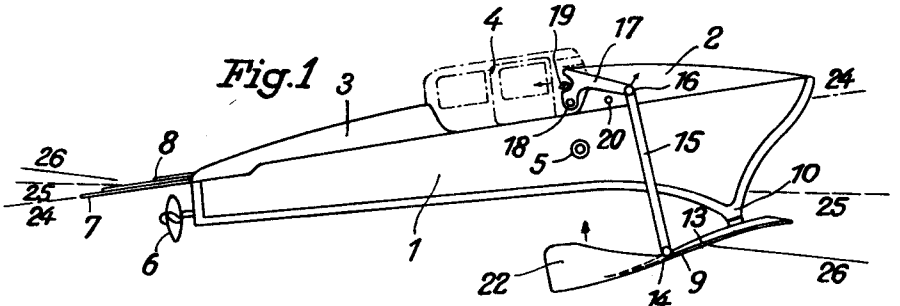


Fig. 2

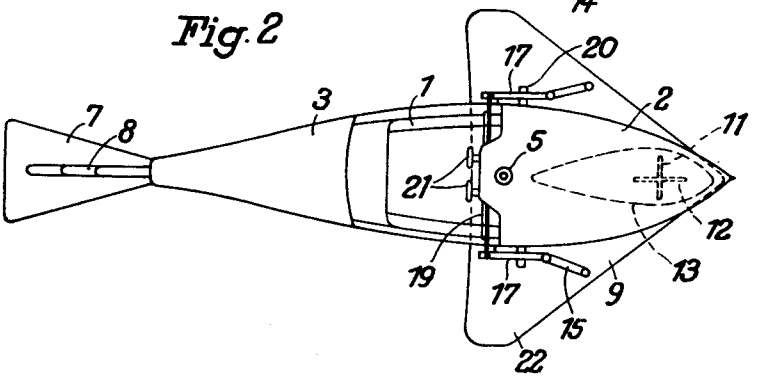


Fig. 3

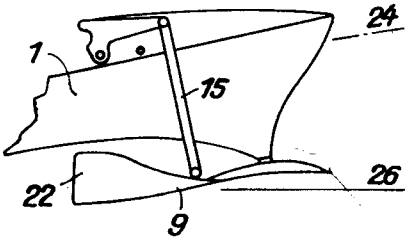


Fig. 4

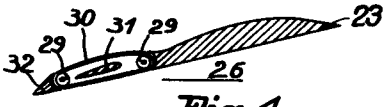
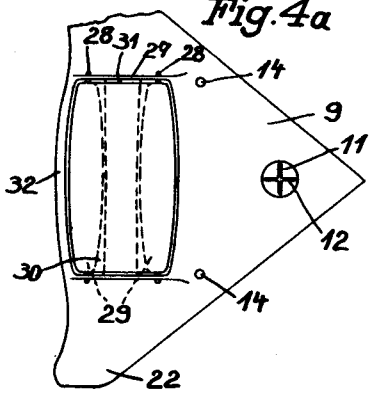


Fig. 4a



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HYDROPLANE

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11 Claims. (Cl. 114—66.5)

The invention relates to a hydroplane (or aeroplane floating body), the body of which in running is lifted on its fore part above the water by a main gliding face, whereas the after portion rests on the water by a tail wing.

The essential features of the invention consist in arranging special supporting means containing springs for holding the main face so as to have always favorable angles of incidence in the several skimming positions of the boat, and in specially shaping the main face itself with respect to its contour, longitudinal section and cross curvature. Moreover, a rolling belt or the like is inserted in the essential supporting portion of said face so as to be able to revolve in contact with the water and reduce the friction.

These new constructions and arrangements allow of producing extraordinary economical and fast boats which at once are able to sustain very rough waves, as the body is tall, and the gliding face is sharp, and even if made very large it is not liable to be damaged due to its correct yielding under supernormal forces.

The invention is illustrated by way of example in the drawing, in which

Fig. 1 is a lateral view of a relatively small boat,

Fig. 2 is a top view of the same,

Fig. 3 is a partial lateral view of the boat being in an other buoyancy position than in Fig. 1,

Fig. 4 is an enlarged longitudinal section of a main gliding surface, and

Fig. 4*a* is partial top view of the same.

A boat body 1 is shaped as shown to a complete stream-line shape having a sharp stem, keel and stern. A fore deck 2 and after deck 3 are provided for covering the largest portion of the boat, and the middle portion, serving as a passenger compartment, is shown by dash and dotted lines as enclosed by a cabin 4 having glass windows. The centre of gravity of this boat including the machine and all accessories is shown at 5. A driving propeller 6 is arranged on the stem as usual, and thereabove a tail fin 7 is held elastically by a laminated spring 8 for damping the shocks arising from waves and from occasional jumping of the boat out of the water.

The main weight of the boat is supported by a main gliding face 9 fastened to a stem fin 10 by a cardan joint, the cross pivot 11 of which is held on the fin 10, and the longitudinal pivot of which is fastened to the gliding face 9. The said cardan joint is enclosed in a fish like hood 13 which in the shown example of the gliding face 9 made of sheet metal is fastened on top of said face.

On its after portion, the gliding face 9 is provided with universal joints 14 for attaching struts 15 which by upper universal joints 16 are linked to spring levers 17. Said spring levers 17 are held on the boat body in bearings 18 and are loaded by both ends of a laminated spring 19, so as to tend to adjust the gliding surface 9 to a large angle of incidence. Abutments 20 serve for confining this action. The spring 19 is made regulable with respect to its tension by pressure spindles 21 arranged on both sides of the ships middle plane, so as to be able to exert more or less heavy pressures on each of the members 17 and 15 and adjust not only the gliding face 9 to a favorable angle of incidence of say 3° to 8° against the horizontal, but also bring the body into a crosswise inclined position against said face for shifting the centre of gravity sideward and causing the boat to run a curve to said side. This entire supporting system has all members which need to be protected inside the boat and easily accessible, and any perforations of the boat body below the water line are avoided.

On its after portion, the sliding face 9 is provided with lateral points 22 so as to have a shape similar to the V-shape known in aeroplane wings, in which the middle portion of the trailing edge is essentially horizontal and straight or only moderately vaulted downward, whereas the lateral points 22 are remarkably curved upward. The said lateral points 22 are moreover with advantage arranged with smaller angles of incidence than the main portion of the face 9. This extends in its rear portion essentially back of the struts 15 and the stiffening hood 13, for ensuring a great leverage on the spring 19 and allow the latter to be adjusted on a wide range. Further the free trailing edge may be made elastic for absorbing the shocks arising from minor waves and other irregularities immediately on the shock origin.

According to Figs. 4 and 4*a* the main gliding face is shown for matter of clearness as a solid body of a longitudinal section corresponding essentially to the hood 13, but it may also be made hollow of sheet metal. The entering edge 23 is confined by upper and lower surfaces including an angle which corresponds to a favorable angle of incidence of say 5°, so that the beginning of the upper face is always nearly horizontal and does not throw the water upward into the air as foam, and even at varying angles of attack never remarkable cavitation arises.

In its rear portion, this face has two longitudinal upward directed flanges 27 between which the face is cut out, and axles 28 supporting barrel shaped rollers 29 are held in said flanges. A belt 30 of rubber or other caterpillar construction is extended over said rollers 29 so as to be able to easily revolve with them under the influence of water friction in the ahead movement of the boat. An inner stiffening member 31 stiffens the flanges 27 against each other, and a rear or trailing member 32 serves the same purpose and moreover causes the water streaming along the lower side of the face 9 and belt 30 to follow its nearly straight course instead of sticking to the belt and rear roller.

The new vessel works as follows. In resting position it swims on the dash and dotted water line 24. In beginning its course it assumes firstly a critical position in being lifted to the dotted water line 25, and finally it comes to the fully shown full speed water line 26, in which state only the rear portions of the main face 9 and of the tail fin 7 touch the water. In the first and last of the said positions the boat has a lateral stability of the metacentric type, in the first case arising from the static displacement of the body 1, and in the last case from the dynamic or stream lifts acting on the gliding face 9. In the intermediate position, in which the body is fully out of the water but the gliding face is fully immersed, said gliding face by aid of its upturned points 22 furnishes a lateral stability in the same way as in aeroplanes, undersea boats or other vehicles running completely enclosed in a continuous medium, whereas no metacentric stability exists in this state.

The variations of the attacking angle of the whole boat between the rest water line 24 and the full speed water line 26 are taken up by the gliding face 9 as follows. At rest the spring levers 17 are applied to the abutments 20, if necessary with remarkable pressure, and hold the face 9 at a favorable attacking angle of say 10° against the water line 24. When the boat starts the levers 17 become free from the abutments 20 as soon as the body emerges and begins to be supported by the gliding face 9. The spring device 17, 19 is so measured that in this case the attacking angle of the face 9 with relation to the boat body is diminished to such a degree, that the ascension angle of the boat is made up and the attacking angle with respect to the now existing water line 26 is the same as before or rather essentially smaller, for instance 3° to 4°, according to the most favorable conditions for high speed running.

In running the boat at increasing speeds, progressively smaller portions of the gliding face 9 become able to support the boat on the water. This is made useful for attaining remarkable longitudinal shifting of the lift centre between the different positions by using a comparatively long gliding face, which advantageously has a length of half up to the full size measured over the points 22. Thereby not only in running the boat at highest velocities the struts 15 are the heavier loaded and the attacking angles correspondingly diminished to the most favorable minimum value, but also in merging into a steep wave at full speed the inverse takes place, which means that the angle of incidence is increased and the lift is augmented and its centre shifted forward so that the boat is effectively prevented from capsizing even in such cases. Thereby the new boat has a quite extraordinary seaworthiness, and it is undoubtedly adapted for ocean traffic under all weather conditions, as model tests have proven complete longitudinal and lateral stability even in crosswise incoming broken waves submerging the whole model, and the elastic gliding faces have proven to insure smooth running under the severest conditions.

The invention is not restricted to boats, but also large ships can be built in the new construction, as also larger ships can accommodate the necessary engines, owing to the good economy of this type and owing to the fact that gliding faces of unwont large span can be used, so that also moderate speeds at moderate engine powers can be realized.

The triangular shape of the gliding face is not only specially adapted for being fastened to the body on three points as described, but its oblique edges cause foreign swimming bodies to slide off, and they insure good starting qualities, as the scarcely avoidable whirling of the streaming water on the still somewhat immerged entering edge arises successively on different points of the entering edges after each other, as said points emerge, and thereby undue high power consumption in starting is avoided. Moreover, the said triangle like shape has a broad trailing edge and thereby a good proportion of span to wetted length and consequently a good economy.

The rolling belt 30, which has often been proposed in connection with boat bottoms or walls without success, becomes successful in combination with the new gliding face 9 or also with the tail fin 7, as by the elastic construction of same the belt is protected from being overloaded and damaged. Due to the clean water flow along the lower sides of said gliding faces including the lower run of said belt, this belt is well adapted to revolve in following said water flow and materially reduce the water friction, this the more as its upper run at normal speeds of the boat works completely unobstructed in the free air.

I claim:

1. A hydroplane, comprising in combination a sharply keeled body, a tail fin on said body, a main gliding face pivotally fastened to the fore keel part of said body and on a lower level than said tail fin by a joint arranged before the lift centre of said face so as to allow the waves to overflow said face when gliding, and a spring inserted between said body and face so as to tend to adjust the latter to a large angle of attack, said gliding face having an essentially triangular shape with one corner on the fore end and with a longitudinal dimension equal to a value betwen the half and the full span dimension.

2. A hydroplane, comprising in combination a body, a tail fin on said body, a main gliding face of essentially triangular shape, a horizontal cross pivot arranged near the front corner of said face and connecting the latter to the fore part of said body and below its bottom, and a spring inserted between said body and gliding face so as to tend to adjust the latter to a large angle of attack.

3. A hydroplane, comprising in combination a body a tail fin on said body, a main gliding face, a cardan joint connecting said face to the fore part of said body, said cardan joint comprising a longitudinal axis and a horizontal cross axis and being arranged before the lift centre of said face, two spring parts positioned inside the boat body, and struts connecting said spring parts to points

of said gliding face, situated behind said cardan joint.

4. A hydroplane, as claimed in claim 3, wherein levers are pivoted to the body and inserted between the spring parts and struts.

5. A hydroplane as claimed in claim 3, wherein the two spring parts acting on the struts are provided with separate means for altering their tension.

6. A hydroplane, comprising in combination a body, a tail fin on said body, and a main gliding face fastened to said body at a distance below the fore part of the latter, said gliding face being provided on a part of its lower surface with means revoluble in the longitudinal direction.

7. A hydroplane as claimed in claim 6, wherein the revoluble means consist of a tension member extended over rollers.

8. A hydroplane as claimed in claim 6, wherein the revoluble means consist of a tension member extended over rollers, and a ledge is provided on the gliding face so as to form a trailing edge in the rear of said tension member.

9. A hydroplane, comprising in combination a sharply keeled body, a tail fin on said body, a main gliding face pivotally fastened to the fore keel part of said body and on a lower level than said tail fin by a joint arranged before the lift centre of said face, a spring inserted between said body and face so as to tend to adjust the latter to a large angle of attack, and an abutment on said body for confining a maximum angle of attack of said face, said spring being pretensioned so as to apply the abutting member of said face to said abutment under no lift condition of said face.

10. A hydroplane, comprising in combination a sharply keeled body, a tail fin on said body, a main gliding face pivotally fastened to the fore keel part of said body and on a lower level than said tail fin by a joint arranged before the lift centre of said face, a spring inserted between said body and face so as to tend to adjust the latter to a large angle of attack, and an abutment on said body for confining a maximum angle of attack of said face.

11. A hydroplane, comprising in combination a sharply keeled body, a tail fin on said body, a main gliding face pivotally fastened to the fore keel part of said body and in a lower level than said tail fin by a joint arranged before the lift centre of said face, a spring inserted between said body and face so as to tend to adjust the latter to a large angle of attack, said spring being so dimensioned that from zero to full lift acting on said face it causes said face to swing for an angle essentially corresponding to the angle by which the body fore part ascends in starting, and tension adjusting means for said spring.

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