Jan. 5, 1960 SHIZUO KIKUHARA 2,919,669

SPRAY-CONTROLLER FOR WATERCRAFT

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Fig. 1.

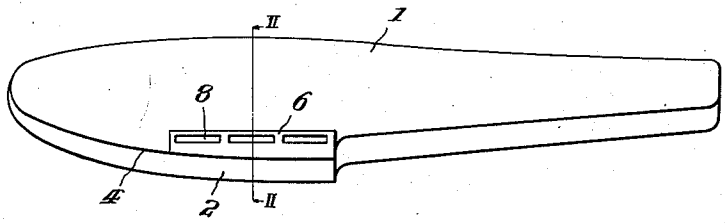


Fig. 2.

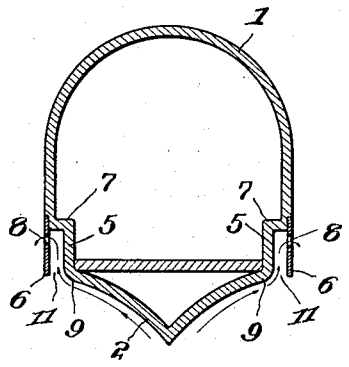


Fig. 3.

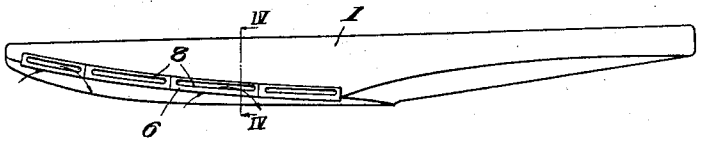
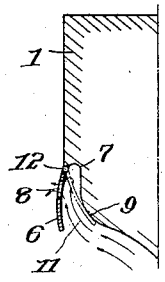


Fig. 4.



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Fig. 5.

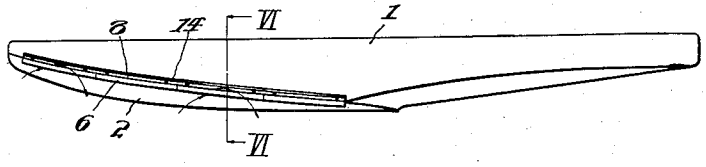


Fig. 6.

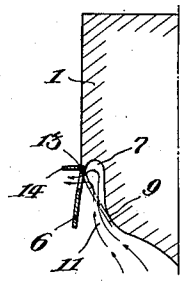


Fig. 8.

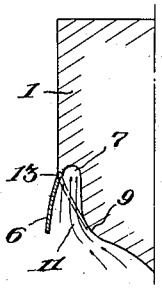


Fig. 7.

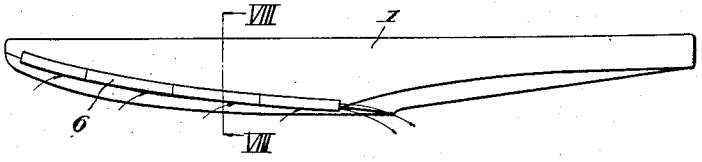
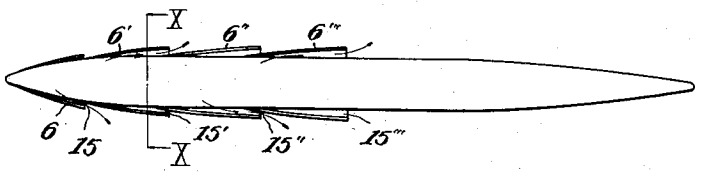


Fig. 9.



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Fig. 10.

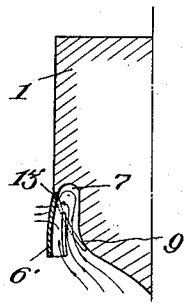


Fig. 12.

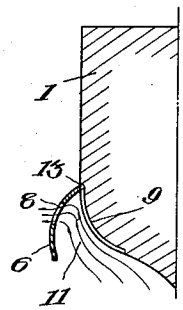


Fig. 11.

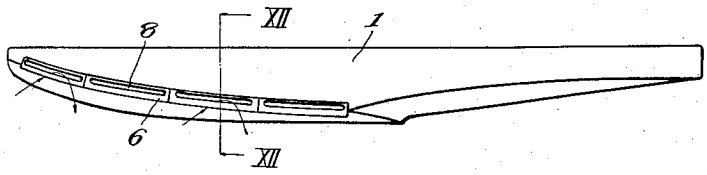
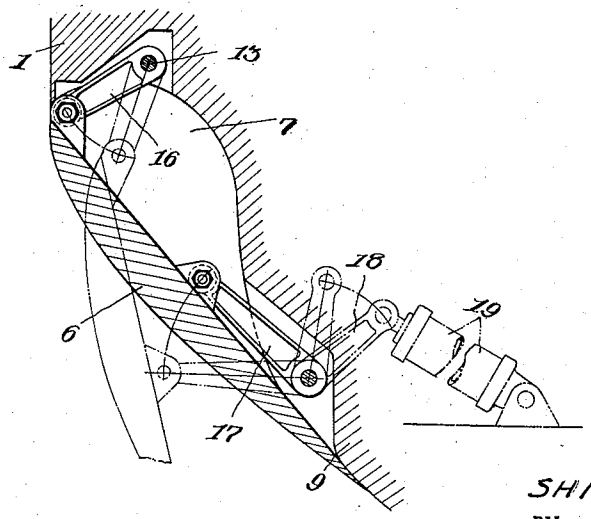


Fig. 13.



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SPRAY-CONTROLLER FOR WATERCRAFT

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Application July 19, 1957, Serial No. 672,913

5 Claims. (Cl. 114—66.5)

This invention relates to improvements in or relating to a dasher or a spray-controller of a glider on a flying-boat, motor-boat, hydroski, etc.

A boat with the device of this present invention has grooved space or water-ways opening downward along both sides of her body at certain height from a chine having smooth cross-sectional curve at its connection to the side wall of the groove. This groove has the outlets of water sprays at suitable parts such as the outer side wall of the groove or the rear end.

The object of the present invention is to prevent high splash of sprays especially of blister sprays coming out when the boat takes to the water. A boat having a conventional spray dam on the part of a chine can control velocity sprays coming out from the top of the boat and flying to each side of the boat, but this dam is ineffective in preventing the outbreaks of blister sprays having harmful effects on the boat, which come out from the point where the chine cut the water surface flying towards the back side of the boat.

The present invention is effective enough to prevent the outbreaks of blister sprays and makes the designing of boats especially of flying-boats much easier than ever since the designing of shapes and places of propellers, main blades, tail blades and etc. has been limited by the high splash of sprays inherent to flying boats without this new device. Owing to this device the load carrying capacity is increased, the height of the boat being shortened, and the arrangement of propellers, main and tail blades can be improved as desired. The combined effects of this invention on boat designing improve the overall capacity of the flying boats remarkably.

The nature of the invention will be better understood from the following description, taken in connection with the accompanying drawings in which a specific embodiment has been set for the purpose of illustration.

In the drawings:

Fig. 1 is a side elevation of a flying-boat with this device;

Fig. 2 is a vertical, cross section taken on the line II—II of Fig. 1;

Figs. 3 and 4 are respectively a side elevation and a cross section taken on the line IV—IV of Figure 3 embodying another form of this invention which has a number of flaps with slits on them forming side walls of the groove, said slits being made on the flaps to let sprays out from the groove;

Fig. 5 is a side elevation of another form of hull employed in accordance with this invention;

Fig. 6 is a fractional cross-sectional view taken on line VI—VI of Fig. 5 in the direction of the arrows;

Figs. 7 and 8 are a side elevation and a cross section taken on the line VIII—VIII of Figure 7 embodying still other forms of the invention where the flux of sprays stream is led inside the groove and is turned towards the rear end of the groove;

Figs. 9 and 10 show one form of the embodiment of this invention having the arrangement of flaps like gills

of fish so that sprays are led into the grooves and are exhausted to the rear direction;

Figs. 11 and 12 are a modification of the example shown in Figs. 1 and 2 showing a side elevation and a cross section taken on the line XII—XII of Figure 11, which has a dasher formed by flaps and a side of the body of a boat instead of concaved part of the body;

Fig. 13 shows a flap gear being moved by hydraulic pressure.

In the modification shown in Figs. 1 and 2, the forward half of hull **1** including the sides thereof are joined by chines **4** as in a conventional boat. In the rear half of bottom **2** of the hull, the upper parts of the bottom are joined to the sides of the hull by nearly perpendicular side walls **5** which are slightly indented from the sides of hull **1**, but being joined thereto by horizontal walls or shoulders **7**, each pair of walls **5** and **7** forming space **11** for a purpose hereinafter set forth. Flaps or cover-plates **6**, having slits **8** therein, are affixed to the hull adjacent the edges of the shoulders **7** and with spaces **11** form grooves or water-ways for the spray produced by the moving boat.

When a boat with this device glides on the water, not only velocity sprays but also blister sprays, coming out from the contact point between the chine and the water surface and flying towards the back on both sides of the plane, run on the surface of the bottom **2** and are led along the smooth curve **9** to the grooved space formed by a flap **6**. The kinetic energy and the momentum to the upper direction of blister sprays are lost by the crush to the bottom of the groove and the water sprays are exhausted through the slits **8**. The above described function of this device completely prevents the production of high sprays when the boat advances over the water.

In Figs. 3 and 4 flaps **6** of the groove having slits on them are hinged to the side of the boat instead of being fixed and are movable by link mechanism driven by oil pressure or electric power as shown in Fig. 13. During the flight the flaps **6** are moved around the hinge **13** and is pressed on the side of the boat through links **17**, **18** by oil-pressure cylinder **19**, as shown in Fig. 13. But these flaps are opened, as shown in the figure by chain lines, when the boat advances over the water and form grooves to lead spray into them and turn the flow to the horizontal direction by absorbing the energy of the spray as indicated by arrows in the said Figs. 3 and 4.

The above described devices obtain the same effect of controlling the height of the sprays produced as that of the modification illustrated in Figs. 1 and 2.

Figs. 5 and 6 illustrate a modification of the structure illustrated in Figs. 3 and 4, having a movable cover plate **14** for the slit **8** of the flap **6** to control the opening of the slit.

In the modification of Figs. 7 and 8 sprays, led by smooth curve **9** into grooved space **11** of a water-way formed by a number of flaps **6** and a shoulder **7** of the side of the boat, are turned in a rearward direction to be exhausted from an outlet at the rear end of a water-way after the energy of the sprays is partly absorbed. This grooved space may either be formed by flaps **6**, **6** hinged to the side of the body at **13** as shown in the figures or by fixed flaps which is a part of the body as shown in the example of Figs. 1 and 2.

Figs. 9 and 10 illustrate another modification of this device, which has, like gills of fish, a number of flaps **6**, **6′**, **6″**, **6‴** with no slit on them, and the sprays are led inside the flaps and are exhausted from outlets **15**, **15′**, **15″**, **15‴** at the end of each flap after a part of kinetic energy is lost there. In this case too, each flap may either be hinged to the body at the top **13** of the flap or be fixed to the body as shown in Fig. 10.

In the modification of Figs. 11 and 12, the body of the

boat has a continuous and smooth curve at a chine like an ordinary boat instead of being concaved as has been illustrated in the other modifications above set forth of this invention, and flaps having the same cross-sectional curve of the body are hinged at 13 to the body. Those flaps, hugging the side of the body during the flight, can be opened to form space 11 as shown in Fig. 12 and work as fenders by leading sprays inside the space and exhausting them through slits 8 after absorbing their kinetic energy.

It is to be understood that the same idea of forming the space for a water-way in this embodiment, instead of making a concaved part on the body, can be applied to the cases illustrated in Figs. 1–10 and that the invention is capable of various uses, and changes and adaptions may be made therein as will be apparent to a person skilled in the art.

What is claimed is:

1. In a flying boat and the like having a convex-curved chine on each side of the hull where contact is made with the water by said hull so adapted that the spray sheets produced, when said flying boat advances over the water, rise vertically while hugging the sides of said hull, the improvement which comprises providing said flying boat and the like with spray control means, said spray control means including a flap extending vertically downward at each side of said hull and forming with the adjacent side of said hull a long narrow groove, open at the bottom thereof, along the side of said hull immediately adjacent to each chine, said groove being adapted to catch the spray sheets that rise along said hull by the action of said chines, and means comprising a slit in the flap, for exhausting from the groove in a lateral direction the spray sheet caught therein.

2. In a flying boat and the like having a convex-curved chine on each side of the hull where contact is made with the water by said hull so adapted that the spray sheets produced, when said flying boat advances over the water, rise vertically while hugging the sides of said hull, the improvement which comprises providing said flying boat and the like with spray control means, said spray control means comprising an indented, stepped side wall on each side of said hull immediately adjacent to each chine, a flap extending vertically downward at each side of said hull and forming with the adjacent indented, stepped side wall of said hull a long narrow groove, open at the bottom thereof, along the side of said hull, said groove being adapted to catch the spray sheets that rise along said hull by the action of said chines, and means, comprising a slit in the flap for exhausting from the groove in a lateral direction the spray sheet caught therein.

3. In a flying boat and the like having a convex-curved chine on each side of the hull where contact is made with the water by said hull so adapted that the spray sheets produced, when said flying boat advances over the water, rise vertically while hugging the sides of said hull, the

improvement which comprises providing said flying boat and the like with spray control means, said spray control means including a flap extending vertically downward at each side of said hull and forming with the adjacent side of said hull a long narrow groove, open at the bottom thereof, along the side of said hull immediately adjacent to each chine, said groove being adapted to catch the spray sheets that rise along said hull by the action of said chines, and means, comprising a slit in the flap and an outlet at the rear end of said groove, for exhausting from the groove in a lateral direction the spray sheet caught therein.

4. In a flying boat and the like having a convex-curved chine on each side of the hull where contact is made with the water by said hull so adapted that the spray sheets produced, when said flying boat advances over the water, rise vertically while hugging the sides of said hull, the improvement which comprises providing said flying boat and the like with spray control means, said spray control means including a flap pivotally attached to said hull and extending vertically downward at each side thereof and forming with the adjacent side of said hull a long narrow groove, open at the bottom thereof, along the side of said hull immediately adjacent each chine, said groove being adapted to catch the spray sheets that rise along said hull by the action of said chines, and means, comprising a slit in the flap, for exhausting from the groove in a lateral direction the spray sheet caught therein.

5. In a flying boat and the like having a convex-curved chine on each side of the hull where contact is made with the water by said hull so adapted that the spray sheets produced, when said flying boat advances over the water, rise vertically while hugging the sides of said hull, the improvement which comprises providing said flying boat and the like with spray control means, said spray control means including a flap pivotally attached to said hull and extending vertically downward at each side thereof and forming with the adjacent side of said hull a long narrow groove, open at the bottom thereof, along the side of said hull immediately adjacent each chine, said groove being adapted to catch the spray sheets that rise along said hull by the action of said chines, means, comprising a slit in the flap, for exhausting from the groove in a lateral direction the spray sheet caught therein, and means for moving each of said flaps relative to said hull sides whereby when the flaps are drawn alongside the hull the grooves are substantially closed to present a smooth-flowing contour.

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