



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
06.06.2001 Bulletin 2001/23

(51) Int Cl.7: **B63B 1/22**

(21) Application number: **99935201.6**

(86) International application number:
PCT/RU99/00223

(22) Date of filing: **09.07.1999**

(87) International publication number:
WO 00/03914 (27.01.2000 Gazette 2000/04)

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

(30) Priority: **15.07.1998 RU 98113193**
15.07.1998 RU 98114297

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(54) **HYDROPLANE**

(57) The present invention pertains to the ship-building industry and more precisely to the construction of hydroplanes that include propulsion spoilers. This hydroplane comprises a hull with a keeled bottom as well as stem propulsion spoilers, and also includes water-jet propulsion devices mounted in the stem part of the ship. The water-intake openings of the propulsion devices are arranged at the bottom of the hull in front of the spoilers. When the ship moves with the propulsion spoilers in an expanded position, an area of increased pressure is

formed immediately in front of said spoilers. This area propagates into the water-intake openings and the water intake from the area with an increased pressure increases the operation efficiency of the water-jet propulsion devices. This hydroplane can further be fitted with aft spoilers while the bottom comprises aft and stern transverse steps behind which the spoilers are arranged. In this case, the deadrise angle of the bottom ranges from 6 to 12° at the aft step and from 0 to 6° at the stern step.

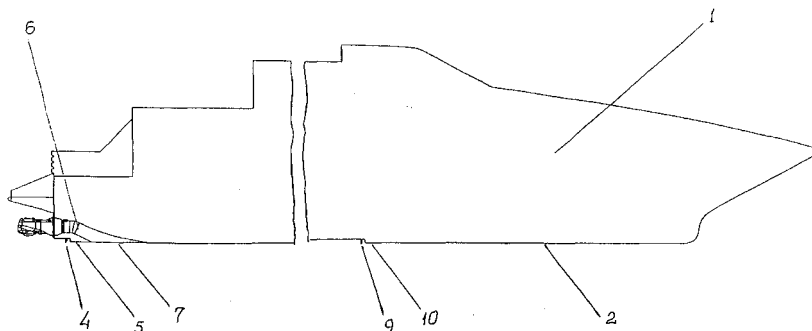


Fig.1

Description

Field of Invention

[0001] This invention relates to the shipbuilding field and, in particular to the construction of hydroplane or planing craft provided with extendable interceptors.

Prior Art

[0002] There are hydroplanes or planing crafts that are known to have a hull with a deadrise bottom and controllable aft and forward interceptors (spoilers) mounted in recesses arranged in the bottom.

[0003] The high speed craft described in patent RU 2096240 of 1997, has a hull with a deadrise bottom provided with a forward and aft transverse planing steps and extendable interceptors that are mounted behind these steps and divided symmetrically into portside and starboard-side sections. An automatic interceptor control system permits the interceptors to be used as pitch and roll control elements.

[0004] However, the optimization of speed and sea-keeping performance of the known craft, improvement of its operational efficiency and enhancement of comfort level for passengers and crew can only be achieved due to the operation of the control system.

[0005] Generally, these hydroplanes use a propeller as a propulsive device, which is connected to the main engine located in the central or aft section of the hull by means of shaftlines supported by shaft brackets (Inventor's Certificate SU 1025574).

[0006] The disadvantages of the known hydroplane are an increased drag due to projecting parts of the shaftline and rudders as well as considerable space inside the hydroplane taken up by the main engines, shaftlines and auxiliary equipment.

[0007] There is a planing craft that is known to have a water-jet propulsive device that provides better efficiency at higher speeds compared to the craft fitted with propellers (SU 200452). However, this craft does not use interceptors that would considerably improve its speed and seakeeping performance.

Summary of Invention

[0008] The present invention permits to combine the advantages of interceptors with those of waterjets on hydroplane, the resultant effect of using each of these components being supplemented by an additional effect obtainable at a certain arrangement of interceptors relative to the water-jet intake openings in the hydroplane's bottom.

[0009] According to the invention, a hydroplane has a hull with a deadrise bottom and aft extendable interceptors and is provided with one or more water-jets at the aft part of the hydroplane, the water intake openings of water-jets being arranged in the hull's bottom forward

of the interceptors.

[0010] A hydroplane may also be provided with bow (forward) interceptors. The bottom may have an aft and a forward transverse planing steps with interceptors, in this particular case, mounted behind the steps.

[0011] The deadrise angle of the bottom may vary along the hydroplane's length, the optimum angle range being 6° to 12° at the forward step and 0° to 6° at the aft step.

Brief Description of the Drawings

[0012] The invention will now be described in more detail with reference to an exemplifying embodiment thereof and also with reference to the accompanying drawing in which

Figure 1 is a schematic side view of an inventive hydroplane

Figure 2 is a schematic bottom view of an inventive hydroplane

Figure 3 is a schematic stem view of an inventive hydroplane

[0013] Proportions between individual components and structural elements shown in the drawings are modified for better representation.

The detailed description of the invention

[0014] The hydroplane illustrated in Figure 1 has a hull 1 with a deadrise bottom 2 and aft interceptors 3 and 4 (for portside and starboard-side respectively) that are capable of moving out of a slot in the bottom (not shown) or from behind the aft transverse planing step 5. The hydroplane is provided with one (or more) water-jet 6 mounted at the aft end of the hydroplane, the intake opening 7 of the water-jet 6 being arranged in the bottom 2 of the hull 1 forward of the interceptors 3 and 4 as shown in Figure 2.

[0015] The hydroplane may also be fitted with forward interceptors 8 and 9 that are located behind the forward transverse step 10, port and starboard. The forward, or bow step 10 is arranged on the hull's bottom forward of its center of gravity 11. If necessary, the interceptors 8 and 9 can be divided into sections (not shown in the drawings) that are then controlled individually to compensate for pitch and roll motions in a seaway.

[0016] The aft interceptors 3 and 4 and the forward interceptors 8 and 9 if fitted (see Figures 2 and 3) are constructed with a sharp outer edge, which secures a continuous flow separation at the edge.

[0017] The deadrise angle of the bottom varies along the hydroplane's length from 6° to 12° at the forward step 8 to 0° to 6° at the aft step 4. Optimum deadrise angles for each planing step of a specific hydroplane are determined from model tank tests. The increase of deadrise angles over the above-stated maximum values

will result in a lower drag-lift ratio for the hydroplane while their decrease beyond the above-stated ranges will somewhat improve it but will also cause problems for stable planing and increase vertical accelerations experienced during the ride in a seaway.

[0018] The bottom surface of the hydroplane forward of each planing step has symmetrical flat areas that coincide with the areas of the bottom surface wetted during the planing mode of operation, as determined from the model tests. The flat areas 12 forward of the forward planing step are of triangular or trapezoidal shape. The flat areas 13 forward of the aft planing step may also have a trapezoidal shape but more often their outline is of more complicated form.

[0019] To provide a minimum drag of the hydroplane, the travels of the forward and aft interceptors or their sections are determined depending of the speed of the hydroplane. The optimum relationship is determined from the model tests with subsequent refining based on the results of full-scale trials.

[0020] Travel of the individual interceptors or their sections is controlled by an automatic control system that provides for an increased motion stability and better maneuverability of the hydroplane in the calm sea conditions and for roll and pitch motions damping and reduction of vertical accelerations when riding in a seaway. During reverse running or stem-to mooring operations the interceptors are retracted to a position within the planing steps (or into the bottom slots) to protect them from damage.

[0021] When the hydroplane is riding with the interceptors 3 and 4 projected some distance beyond the aft planing step 5 (or the respective slot), an area of increased pressure is generated immediately ahead of the interceptors. It is within this area of increased pressure that the water-jet intake opening 7 is located, which location permits to take in water under higher pressure and thus to enhance the operating efficiency of water jets (6).

in that the deadrise angle of the hydroplane's bottom is in the range from 6° to 12° at the forward step and from 0° to 6° at the aft step.

- 5 4. The hydroplane according to Claim 3, characterized in that the bottom surface before each step has symmetrical flat areas, the flat areas before the forward step being of triangular or trapezoidal shape.

Claims

1. A hydroplane having a hull with a deadrise bottom and aft extendable interceptors and provided with a propulsive device mounted at the aft end of the hydroplane, characterized in that the propulsive device is of water-jet type and in that its water intake opening is arranged in the bottom of the hull forward of the interceptors.

2. The hydroplane according to Claim 1, characterized in that the hydroplane has forward interceptors; in that the hydroplane's bottom has an aft and a forward transverse planing steps and in that the interceptors are mounted behind the steps.

3. The hydroplane according to Claim 2, characterized

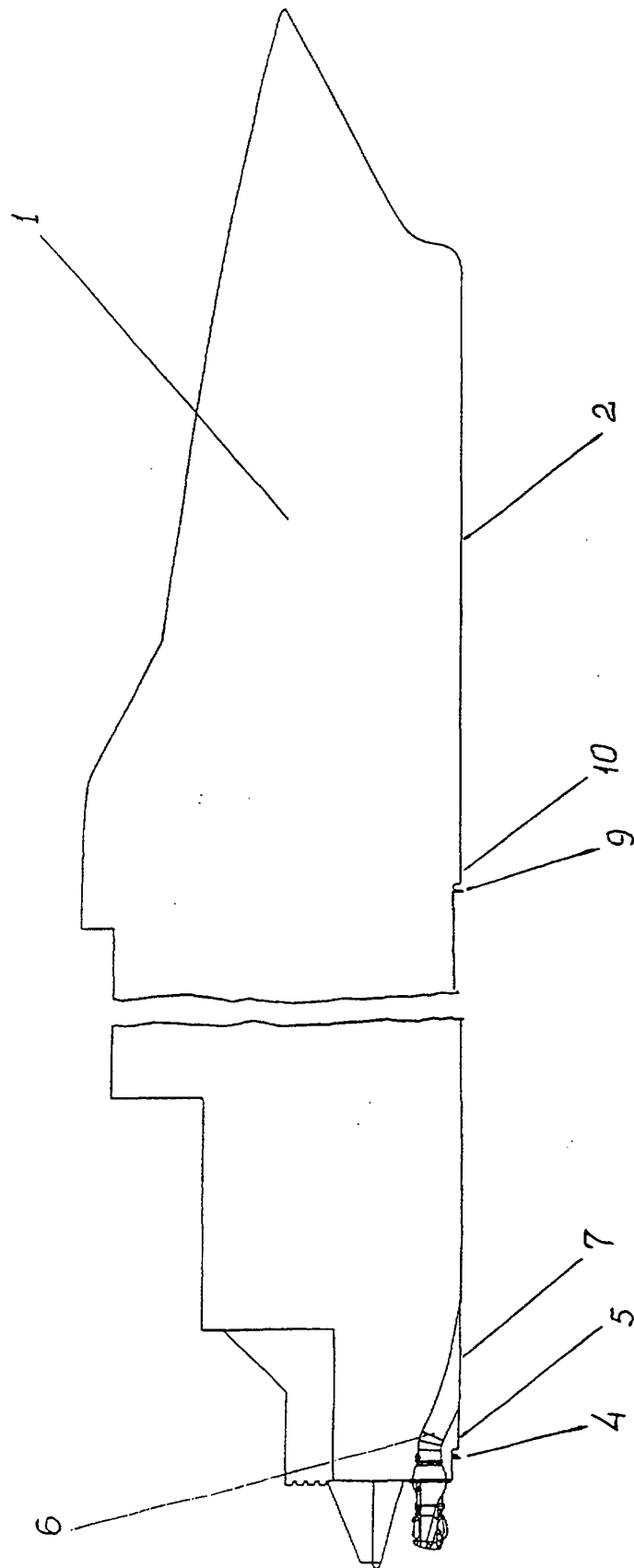


Fig.1

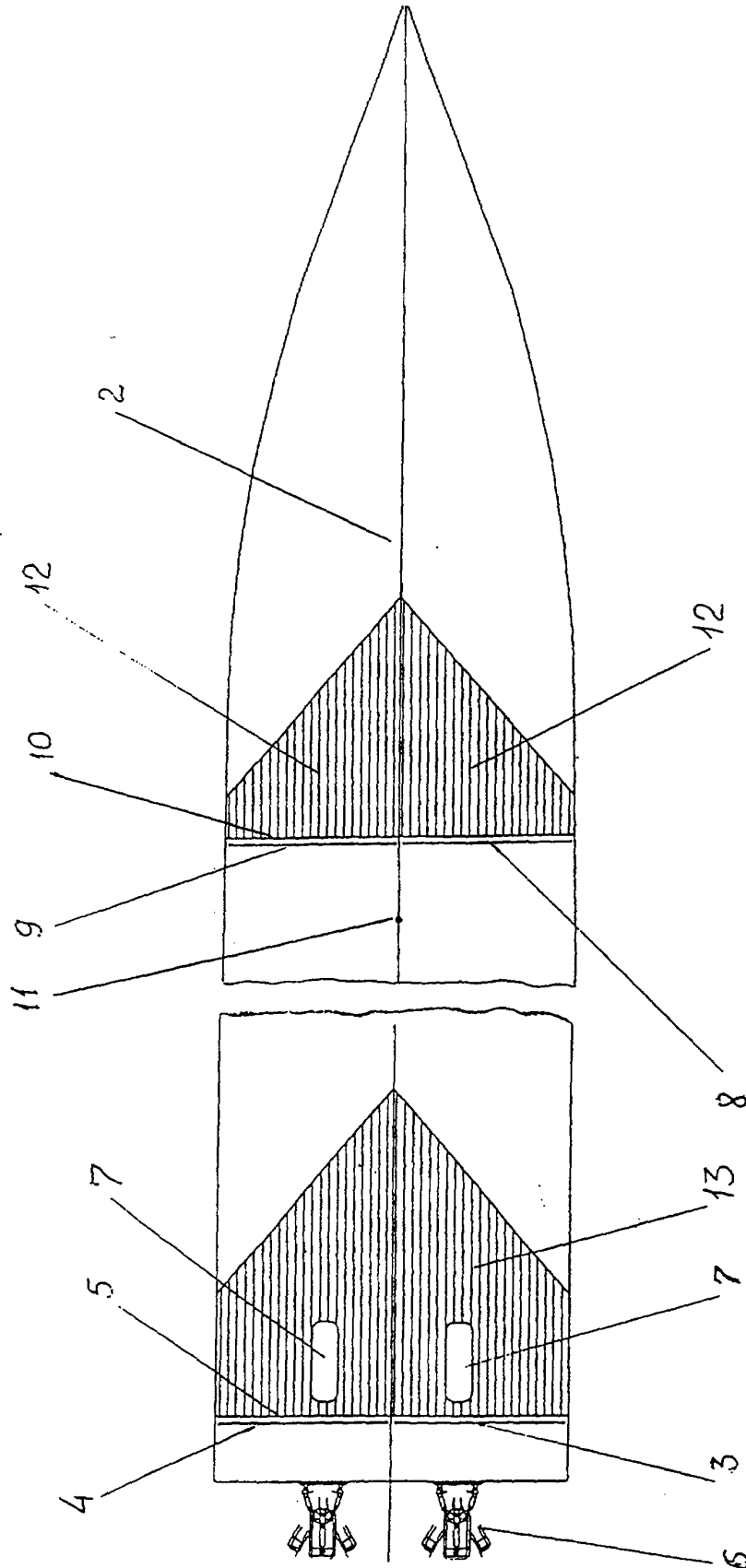


Fig.2

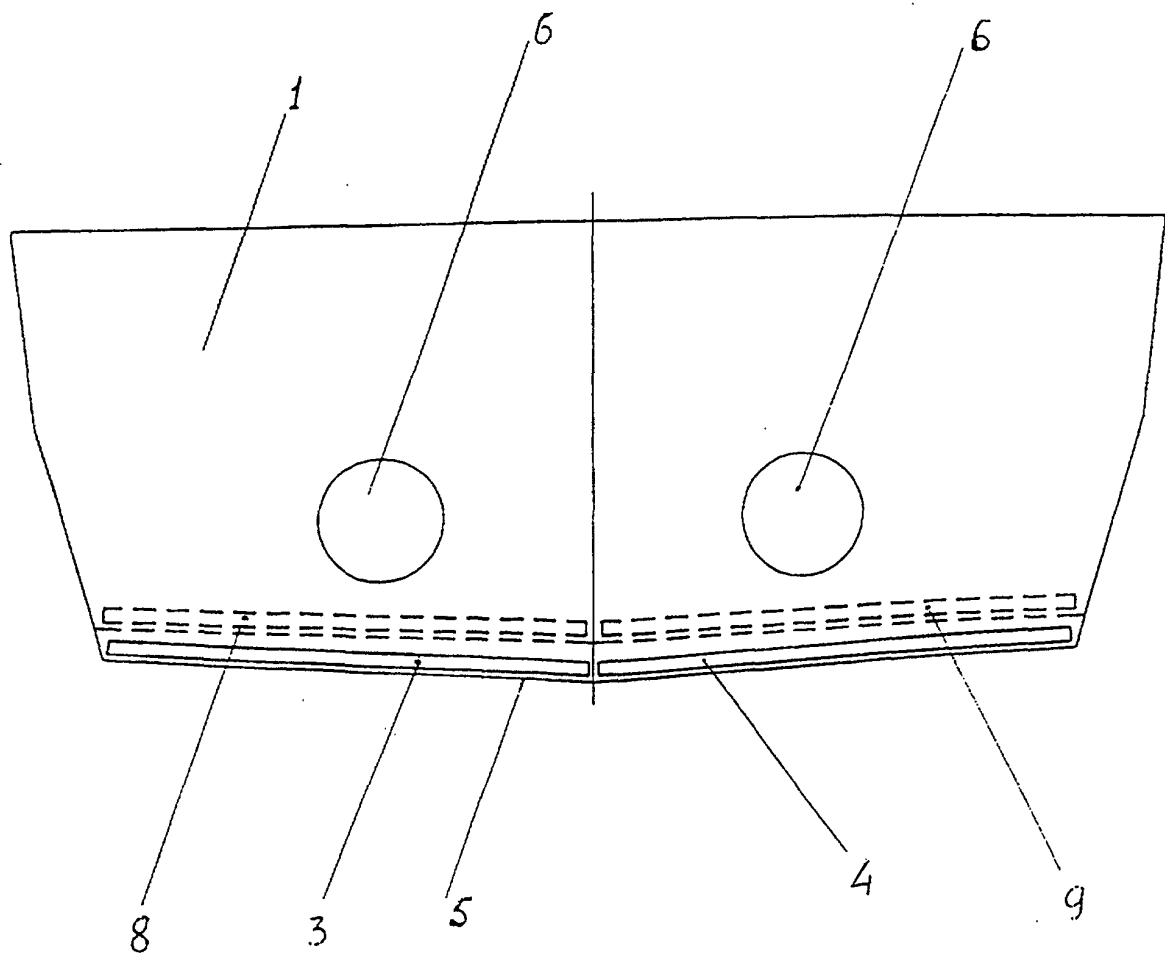


Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 99/00223A. CLASSIFICATION OF SUBJECT MATTER⁶:

IPC6: B63B 1/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B63B 1/18, 1/20, 1/22, B63H 11/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU 1113301 (S.B.SOLOVEI et al) 15 September 1984 (15.09.84), the abstract, figure 1	1-4
A	US 3998160 A (LOCKHEED AIRCRAFT CORPORATION) 21 December 1976(21.12.76), figure 8, column 5, lines 64-68, column 6, lines 1-14	1-4
A	SU 1837520 A1 (ANUFRIEV E.B. et al) 20 September 1995 (20.09.95), the abstract, column 4, lines 8-11, figure 5, column 3, lines 1-14	1-4
A	SU 407783 A (V.A. LUKASHEVSKY et al) 22 April 1974 (22.04.74), figures 1,2, column 1, lines 3-4, 21-30, the claims	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
19 October 1999 (19. 10.99)Date of mailing of the international search report
28 October 1999 (28.10.99)

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