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## (54) Water-jet drive with antifouling system

(57) L'invenzione riguarda un idrogetto (30; 40), in particolare per l'azionamento e/o la manovra di imbarcazioni (10), che prevede una presa (31) o una mandata (41) dell'acqua, una valvola (32; 42) ed un condotto (35; 45) dell'acqua; in particolare, l'idrogetto (30; 40) impiega una vite senza fine (36; 46) all'interno del condotto (30; 40), che ruota per azione dell'acqua e che presenta un profilo e/o un passo tali da eliminare automaticamente incrostazioni e simili all'interno dell'idrogetto (30; 40).

The invention relates to a water-jet drive (30, 40), in particular for driving or maneuvering boats (10), comprising an inlet water conduit (31) and/or an outlet water conduit (41), one valve (32; 42) and a water duct (35; 45); in particular, the water-jet drive (30, 40) employs an endless screw (36; 46) inside the duct (30, 40), being able to rotate thanks to the water action and having a profile and/or a pitch so as to automatically remove fouling and similar from the inside of the water-jet drive (30, 40).

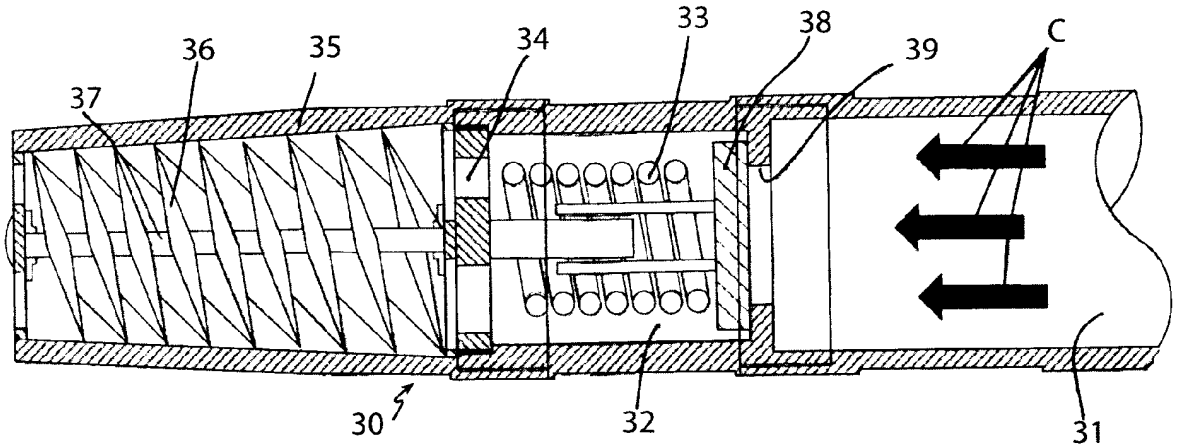


*Fig. 3*

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## Description

**[0001]** The present invention relates to an improved water-jet, in particular for the control and the drive of boats. More specifically, the invention relates to a water-jet created and structured in such a way as to be substantially self-cleaning, by automatically removing all debris traditionally formed on boats, in particular in the marine environment, that is "fouling".

**[0002]** The use of water-jets to command and drive boats has been object of a remarkable development in recent years.

**[0003]** Further to the use as elements of conventional drives, the water-jets are used for example as bow and stern propellers, in particular to equip boats of a control system that allows to maneuver easily, for example in port during docking and/or output, even boats of considerable size.

**[0004]** In some cases, these systems are also used to counter the drift phenomenon, which occurs typically in sailing boats; it is a maneuver that is not particularly pleasing to sail "purists", but it is certainly useful in certain condition.

**[0005]** Mostly, the use of this system of control is limited to the operations in port, as it requires a high consumption of batteries.

**[0006]** In the attached Figure 1 is shown an example of a boat 10 bow and stern system, which employs water-jets.

**[0007]** The system of Figure 1 is of conventional type, even if the same can be applied to the water-jets according to the invention.

**[0008]** In particular, the system of Figure 1 includes two groups of stern jets 1, 2 and two groups of bow jets 3, 4.

**[0009]** Each group of jets 1, 2, 3, 4, provides a socket jet 1', 2', 3', 4' and a thrust jet 1", 2", 3", 4", respectively, connected by conduits 5, with the interposition of a valve assembly 6 of adjustment and flow rate.

**[0010]** Both the complex of bow and of stern provide a motor 7 and a diaphragm pump 8.

**[0011]** In the attached figures 2a, 2b, 2c, 2d it is schematically shown typical maneuvers that can be performed using a system of command and actuation of boats using bow and stern waterjets, such as those illustrated in the attached Figure 1, with arrows A it is indicated the direction of thrust and with arrows B, it is indicated the direction of displacement of boat 10.

**[0012]** In this context it is included the solution proposed according to the present invention, which proposes an improved water-jet, equipped with a system of automatic deletion of scaling and other materials which accumulate in it, greatly improving the performance and useful life of the water-jet itself.

**[0013]** These and other results are obtained according to the present invention proposing a water-jet which provides a bronze screw, which turns due to the action of water and which eliminates all scaling (fouling) from the water-jet itself.

**[0014]** The proposed technical solution according to the present invention is best identified in the attached independent claim 1.

**[0015]** Further technical features of the water-jet according to the invention are described in the following dependent claims.

**[0016]** The present invention will be now described, for illustrative but not limitative purposes, according to its preferred and illustrative, but not limitative, embodiments, with particular reference to the figures of the attached drawings, in which:

- Figure 1 shows schematically a boat provided with control and drive system with bow and stern water-jet thrusters, according to the prior art;
- Figures 2a, 2b, 2c and 2d show schematically the movement of a boat provided with the control system as showed in Figure 1, according to the prior art;
- Figure 3 is a horizontal sectional view of a first embodiment of an improved water-jet according to the present invention;
- Figure 4 is a horizontal sectional view of a second embodiment of an improved water-jet according to the present invention.

**[0017]** With particular reference to Figures 3 and 4 of the attached drawings, two improved water-jets according to the present invention, which can be used, for example, in the drive system of Figure 1, are generally indicated by numbers 30 and 40.

**[0018]** The two water-jets 30, 40 are substantially structurally identical to each other and they constitute, respectively, a seawater intake water-jet 30 and a thrust water-jet 40.

**[0019]** The water-jet 30 shown in the attached Figure 3 comprises an inlet water conduit 31, from which the water enters, through the opening 39, according to the direction of the arrows C, and a diaphragm valve 32, comprising a return spring 33, with holes 34 to enter in the water duct 35, inside which is provided an endless screw 36, which rotates about a shaft 37.

**[0020]** In practice, the water entering into the opening 39, moving along the direction and the orientation of the arrows C, moves the diaphragm 38 of the valve 32, overcoming the force of spring 33, and passes through the holes 34 to enter into the water duct 35.

**[0021]** The rotation of the endless screw 36, caused by the water pressure, determines the removal, by scraping, of the scaling (fouling) and any other bodies, so that the water-jet is always clean; preferably, said screw 36 is made of metal material such as bronze, and, moreover, the duct 35 is conical in shape, in order to increase the thrust of the water.

**[0022]** Again preferably, the pump 8 of the drive system illustrated in Figure 1 is a pump which allows grinding the residues caused by the cleaning work of the endless screw 36.

**[0023]** With particular reference to the attached Figure 4, in the water-jet 40 the water comes out from the holes 44 moving along the direction of arrows D through the outlet water conduit 41, thus obtaining a thrust effect as shown in Figures 2a, 2b, 2c, 2d.

**[0024]** In this case, the water duct 45, from which the water comes, has a cylindrical section (and not conical as in the case of the water duct 35) and, obviously, the diaphragm 48 valve 42 is mounted in the opposite direction with respect to the valve 32 of Figure 3, i.e. it is mounted according to the direction of passage of the water.

**[0025]** For the rest, the water-jet 40 is structurally equal to the water-jet 30 and it includes a return spring 43, which is provided inside the valve 42, holes 44 which allow the water to enter into the outlet water conduit 41, an opening 49 which puts in communication the valve 42 with the water duct 45, and an endless screw 46, which rotates about a shaft 47, which is provided inside the water duct 45.

**[0026]** From the above description the technical characteristics of the improved water-jet, which is the object of the present invention, are clearly outlined as well as the advantages are clear too.

**[0027]** It should be noted, however, that the present invention has been described, for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that variations and/or modifications may be made by those skilled in the art without departing from the scope protection as defined in the attached claims.

## Claims

1. Improved water-jet drive (30, 40), in particular for driving or maneuvering boats (10), comprising an inlet water conduit (31) and/or an outlet water conduit (41) which communicates, through at least one first hole or opening (39, 44), with at least one valve (32, 42) and, through at least one second hole or opening (34, 49), with at least one water duct (35, 45), said water jet drive (30, 40) being **characterized in that** an endless screw (36, 46) is placed inside said duct (35, 45), said screw being able to rotate thanks to the water action and having a profile and/or a pitch so as to automatically remove fouling and similar from the inside of the water-jet drive (30, 40).

2. Water-jet drive (30, 40) according to claim 1, **characterized in that** said endless screw (36, 46) is made of metallic material, such as bronze.

3. Water-jet drive (30, 40) according to claim 1, **characterized in that** said endless screw (36, 46) is connected to a central shaft (37, 47).

4. Water-jet drive (30, 40) as claimed in at least one of the previous claims, **characterized in that** said duct (35, 45) has a tapered or cylindrical section.

5. Water-jet drive (30, 40) as claimed in at least one of the previous claims, **characterized in that** said valve (32, 42) is a diaphragm valve (38, 48) and is provided with at least one return spring (33, 43).

6. Drive and control system for boats (10), **characterized in that** said system is provided with a plurality of water-jet drives (1, 2, 3, 4) which are made according to at least one of claims 1 to 4.

7. System according to claim 6, **characterized in that** said system includes at least one motor (7), connected to at least a diaphragm pump (8) and to a valve assembly (6).

8. Boat (10) with a drive and control system according to claim 6.

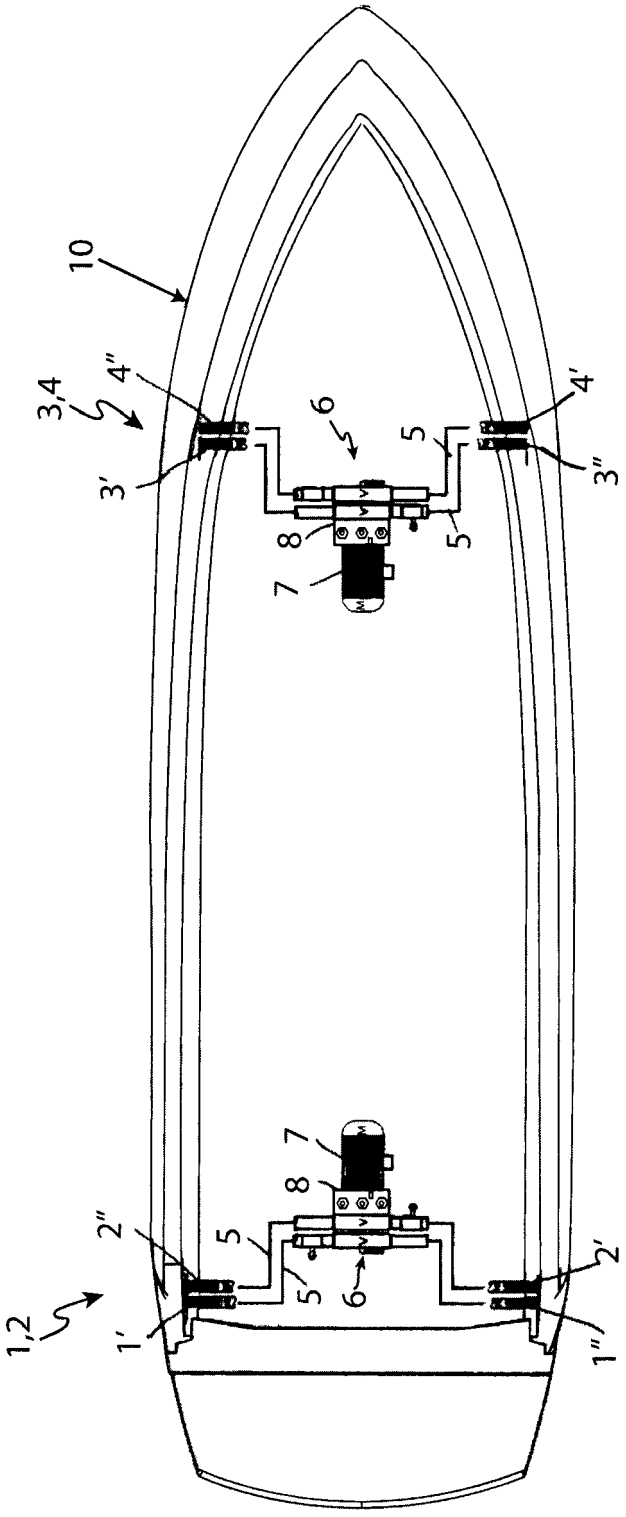


Fig. 1

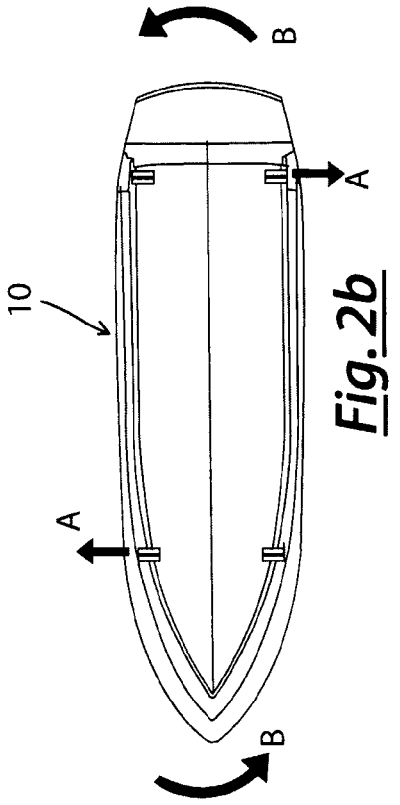


Fig.2b

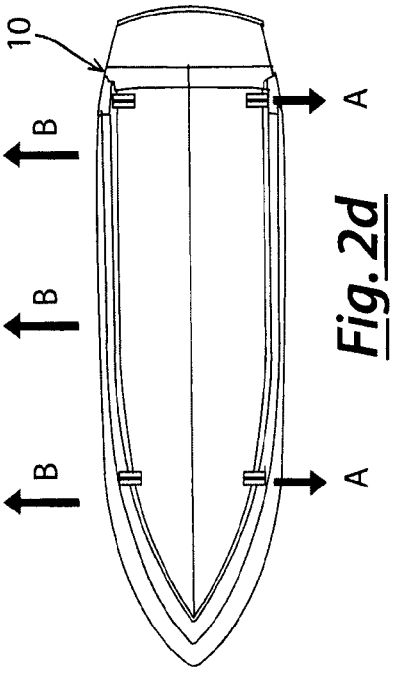


Fig.2d

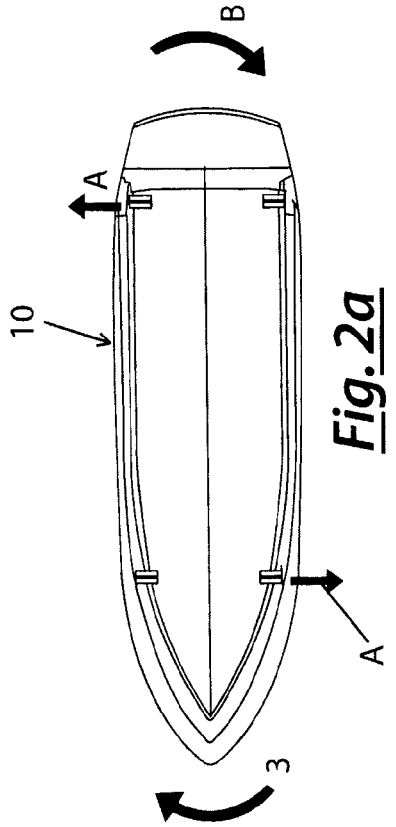


Fig.2a

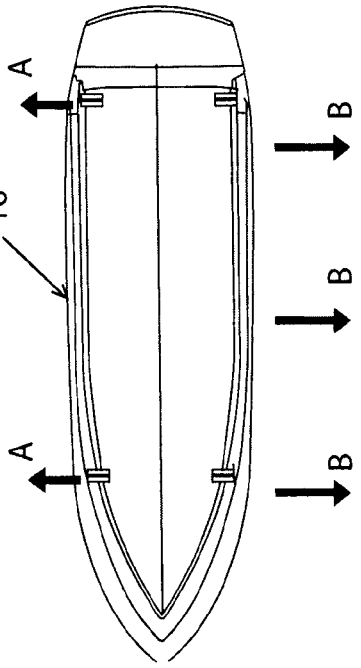


Fig.2c

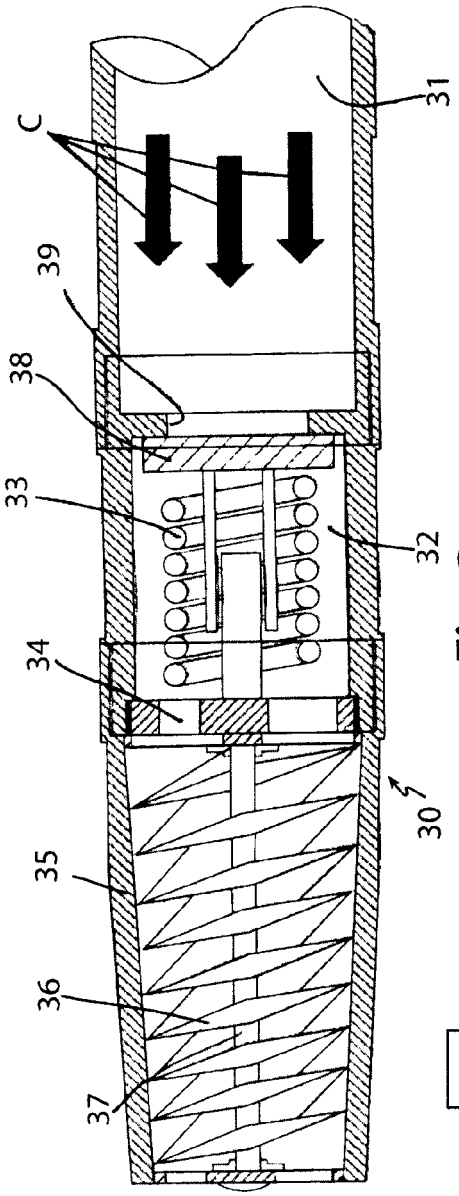


Fig.3

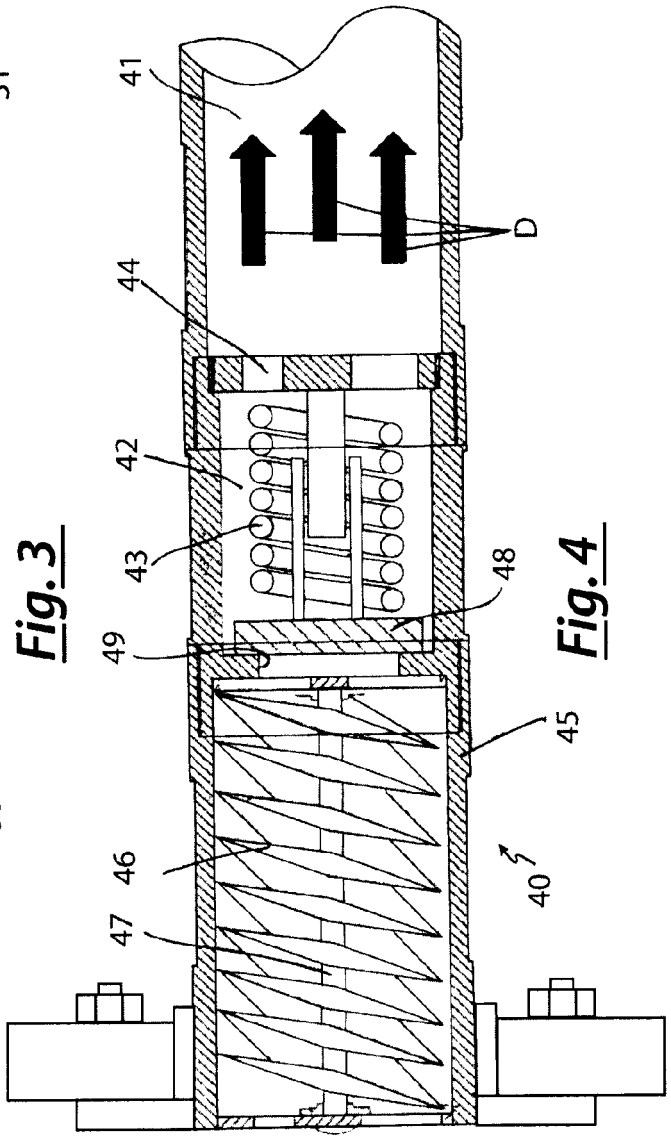


Fig.4

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# EUROPEAN SEARCH REPORT

Application Number
EP 13 42 5012

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | US 7 377 826 B1 (WENGREN JR RICHARD E [US]) 27 May 2008 (2008-05-27)<br>* column 6, line 34 - column 7, line 29; figures 4-7 * | 1,6,8 | INV.<br>B63H11/01 |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 22 April 2013 | Brumer, Alexandre |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1 EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 42 5012

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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22-04-2013

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