

"WATERCRAFT HAVING A THRUSTER"

This invention relates to a watercraft having a thruster comprising a duct and means for causing water to flow through the duct.

5 Transverse thrusters are known in which a water displacing device for producing a thrust, e.g. a propeller, is drivably mounted in a transverse duct which leads from one side of the craft to the other. Transverse thrusters are also known in which the duct system is to some extent of T-shaped construction, so
10 that the water is drawn in at the bottom or at the bow, for example, and expelled at the selected side. Such transverse thrusters serve to give the ship a lateral thrust according to the direction of the water expelled from the transverse duct, so as to facilitate the
15 manoeuvring of the craft. Transverse thrusters are known in which the duct openings can be closed by flaps or the like.

The openings of the ducts which lead from one side of the craft to the other, are alternately inlet
20 and outlet openings on account of the necessary changes in direction. Although an inlet should be formed in a manner different from that of an outlet with respect to the flow, both duct ends always have to be of the same shape and the same size. The water can therefore
25 no longer be accelerated inside the transverse duct,

but receives its necessary acceleration when entering at the suction side of the propeller. Apart from the low degree of efficiency which is caused thereby, there is also a danger of an inrush of air with sudden failure of the thrusting force as well as cavitations with all the usual accompanying phenomena. Furthermore, the thrusting force rapidly decreases as the speed of the craft increases; as a result of the Bernoulli effect of the water which is flowing by, thrusting fails completely even when the craft is travelling at moderate speed.

It would be desirable to avoid these disadvantages, particularly to improve the efficiency and to prevent the cavitation, or at least to greatly reduce it.

The present invention provides a watercraft having a thruster comprising a transverse duct extending between two openings below the water line, and means for causing water to flow through the duct from the opening to the other, at least one end of the duct being provided with a guide blade which projects into the duct from a mounting allowing swinging of the blade about a substantially horizontal axis, the length of the part of the guide blade projecting into the duct from the said axis being greater than the minimum distance between the said axis and the bottom of the duct, _____

the blade being swingable between an intake position in which it extends along the duct and a discharge position in which the said part of the blade is in contact with the bottom of the duct and in which the blade covers only part of the corresponding opening in order to define an upwardly narrowing passage for water flowing along the duct towards the said opening.

The guide blade is usually held in a neutral position by the stream of water at the inlet side, whereas it is adjusted to a suitable position at the outlet side by its own weight and, to a certain extent, by an unstable equilibrium. However, an additional manual or motor drive might also be necessary in order to cause (e.g. to start) the movement of the blade from the neutral position.

Preferably, one guide blade is provided at each opening of the transverse duct.

For the purpose of improving the flow conditions, it is advantageous in many circumstances if the part _____

of the opening which will be covered by a guide plate, during out flow of water, is funnel shaped or rounded.

The invention will be described further, by way of example, with reference to the accompanying drawing, whose sole Figure is a diagrammatic transverse section through a watercraft 1 having a transverse thruster.

The transverse thruster comprises a transverse duct 2 containing a propeller 3. The mounting and the reversible driving device for the propeller are known and not therefore shown. The transverse duct can have a circular, square, or differently shaped cross-section. A respective guide blade 10, 11 is swingably mounted in a respective hinged bearing 12 at each end of the duct 2 so that the centre of gravity lies inside the transverse duct. Each blade 10, 11 is formed so that it projects obliquely inwards in the lowered state (see the right-hand side of the drawing) and covers the lower part of the corresponding opening of the transverse duct. The duct openings are sharp-cornered in the upper part 8, 9 and funnel-shaped or rounded or formed in another way which is favourable to flow in the lower part 6, 7.

When the propeller 3 conveys the water from left to right (as shown), for example, the guide blade 10, which was until then in the lowered rest position (as shown for the blade 11 on the right-hand side of the

drawing), is raised by the flow. It is adjusted in a manner favourable to flow. However, the other guide blade 11 remains in the rest or discharge position and is retained there by the flow. As the lower part of the intake opening is rounded in a manner favourable to flow, the water mainly flows in from below on the inlet side 13. Only the sharp-cornered upper part 9 of the other opening is open, at the outlet side 14. An ideal nozzle is formed here and produces a narrowed water jet. The water layer 5 in the region of the water surface 4 therefore remains motionless. When there is a change in direction of flow through the duct the guide blades automatically reverse their function. If, for any reason, the actual weight of the guide blades is not sufficient to cause this, a special drive (not shown) can be provided.

The transverse thruster described above has the following advantages. The efficiency is considerably improved by the construction of the duct openings, which is favourable to flow, as they alternately serve as a water inlet and a discharge nozzle. The conversion of energy and/or the water acceleration also principally takes place on the respective blade face of the propeller. Cavitations are avoided by the improved water flow. As a result of the improved efficiency, smaller and therefore energy-saving transverse thrusters with the same

thrust strength can be selected. The danger of an
inrush of air is reduced, as the water mainly flows in
from below. The height of the water level above the
duct ends can therefore be kept lower. This fact,
5 together with the reduced dimensions of the transverse
thruster, often makes installation in ships with a
restricted draught possible. The thrust effect while
the ship is travelling is improved, as the Bernoulli
effect is reduced, relatively speaking, by the favourable
10 construction of the openings. The guide blades are in-
expensive and do not usually require any operator
attention or maintenance. They normally operate
completely automatically without control devices.
Installation of the guide blades, as well as an improved
15 construction of the duct ends, in existing transverse
thrusters, is usually possible without any great expense.

The invention is not restricted to the use of a
propeller as a water displacing device; any other device
which produces a thrust can be provided, an example of
20 which is a cycloidal propeller.



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CLAIMS

1. A watercraft having a thruster comprising a transverse duct extending between two openings below the water line, and means for causing water to flow through the duct from one opening to the other, at least one end of the duct being
5 provided with a guide blade which projects into the duct from a mounting allowing swinging of the blade about a substantially horizontal axis, the length of the part of the guide blade projecting into the duct from the said axis being greater than
10 the minimum distance between the said axis and the bottom of the duct, the blade being swingable between an intake position in which it extends along the duct and a discharge position in which the said part of the blade is in contact with the bottom of the duct and in which the blade covers only part of the
15 corresponding opening in order to define an upwardly narrowing passage for water flowing along the duct towards the said opening.

2. A watercraft as claimed in claim 1, in which the lower part of the opening which is covered by the guide blade
20 when swung to its discharge position is defined by a duct wall whose distance from the duct axis increases gradually adjacent the said opening.

3. A watercraft substantially as described with reference to, and as shown in, the accompanying drawing.

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