CLAIMS

1. A propulsion unit comprising:

a support strut extending downwards from a hull of a vessel;

a casing attached to a lower end of the support strut, a propeller being arranged to an end of the casing; and

an annular nozzle surrounding the outer perimeter of the propeller blades and being fixedly supported on the casing with a support construction comprising at least three vanes, said nozzle having an inlet opening and an outlet opening, whereby a duct for water flow is formed between the inlet opening and the outlet opening through the interior of the annular nozzle;

wherein the propeller pulls the vessel in a driving direction;

wherein the water enters the blades of the propeller freely from the inlet opening of the nozzle, and

wherein the support construction is positioned between the propeller and the support strut in the driving direction of the vessel, and the vanes of the support construction are arranged between an outer perimeter of the casing and an inner perimeter of the nozzle to receive the water flow from the blades of the propeller.

2. The propulsion unit according to claim 1, wherein the upper end of the support strut is rotatable supported at a bottom portion of the hull.

3. The propulsion unit according to claim 1 or 2, wherein the propulsion unit comprises a first electric motor positioned within the casing.

4. The propulsion unit according to any one of claims 1 to 3, wherein the propulsion unit comprises a hub attached to a first end of the casing and the propeller is attached to the hub.

5. The propulsion unit according to any one of claims 1 to 4, wherein the propulsion unit comprises a first shaft having a first end attached to the first electric motor and a second end attached to the hub.

6. The propulsion unit according to any one of claims 1 to 5, wherein the vanes in said support construction are configured to redirect rotational flow components of the flow produced by the propeller into an axial thrust.

7. The propulsion unit according to any one of claims 1 to 6, wherein the vanes in said support construction are configured to compensate for the rotational effect caused by the propeller so that flow after the vanes is returned to an at least substantially axial thrust.

8. The propulsion unit according to any one of claims 1 to 7, wherein the vanes in said support construction are arranged to extend in the radial direction of the nozzle.

9. The propulsion unit according to any one of claims 1 to 8, wherein the number of vanes in the support structure is greater than number of blades in the propeller.

10. The propulsion unit according to any one of claims 1 to 9, wherein the first end of the casing has a more blunt form than the second end whereby the casing is configured for propagation in the driving direction the first head ahead.

11. The propulsion unit according to any one of claims 1 to 10, wherein the propulsion unit comprises a gearing assembly for receiving propulsion power from a motor external to the casing.

12. The propulsion unit according to any one of claims 1 to 11, wherein a length of the nozzle is in a range from 0.45 to 0.65 times a diameter of the propeller.

13. The propulsion unit according to any one of claims 1 to 12, wherein a centre of the propeller in a longitudinal direction of the nozzle is in a range from 0.30 to 0.45 times a diameter of the propeller from the inlet opening of the nozzle.

14. The propulsion unit according to any one of claims 1 to 13, wherein the support structure comprises 3 to 7 vanes.

15. The propulsion unit according to any one of claims 1 to 14, wherein a leading edge of the support strut is inclined by an angle towards the incoming water flow, said angle of the leading edge of the support strut being in the range of 3 to 7 degrees.

16. The propulsion unit according to any one of claims 1 to 15, wherein an inclination angle of at least one vane with respect to a rotation axis of the propeller is between 3 to 10 degrees.

17. The propulsion unit according to any one of claims 1 to 16, wherein a section area between the pod and the nozzle at the front of the nozzle is 1.15 to 1.35 times the section area between the rotor disk and the nozzle.

18. The propulsion unit according to any one of claims 1 to 17, wherein a section area between the pod and the inner surface of the nozzle at a rear of the nozzle is 1.00 to 1.15 times the section area between the rotor disk and the nozzle.

19. The propulsion unit according to any one of claims 1 to 18, wherein the support construction is positioned fully inside the nozzle.

20. The propulsion unit according to any one of claims 1 to 19, wherein the propeller comprises a substantially cylindrical middle portion, rotor disk, to which the blades are fixed, and the base portion of the blades which is fixed to the rotor disk is tilted from the rotation axis of the propeller, and the form of the blade has a twisted form such that at the tip of the blade, the rear end is radially further away from the base of the blade than the front end of the blade.

21. The propulsion unit according to any one of claims 1 to 20, wherein the vanes are inclined with respect to the rotation axis of the rotor, which tilting of the vanes is to opposite direction than the tilting of the rotor blades.