June 24, 1924. 1,498,919

H. JENSEN

HYDRAULIC PROPULSION ARRANGEMENT FOR SHIPS

Filed June 19, 1923

Fig. 1.

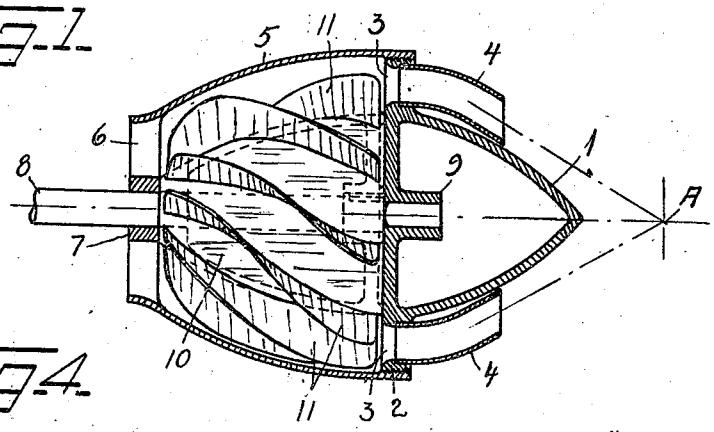


Fig. 4.

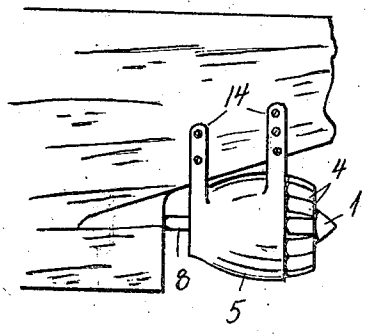


Fig. 2.

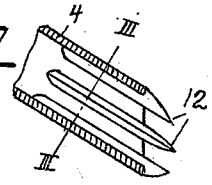


Fig. 3.

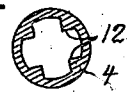
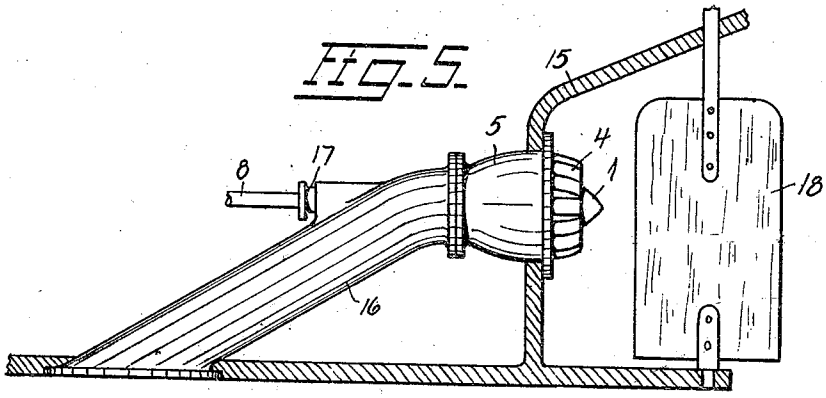


Fig. 5.



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UNITED STATES PATENT OFFICE.

HARALD JENSEN, OF KRAGERØ, NORWAY.

HYDRAULIC PROPULSION ARRANGEMENT FOR SHIPS.

Application filed June 19, 1923. Serial No. 646,461.

To all whom it may concern:

Be it known that I, HARALD JENSEN, citizen of Norway, residing at Kragerø, Norway, have invented certain new and useful Improvements in Hydraulic Propulsion Arrangements for Ships, of which the following is a specification.

The present invention relates to hydraulic propulsion arrangements for ships and vessels, of the type in which the propulsion of the ship is caused by the reaction of water which is forced out through one or several nozzles.

Hitherto, in such systems, one or several nozzles have been used, which causes one or several jets of water to move backward parallel to the direction of movement of the ship. Such arrangement, however, has the drawback that small particles of water, due to the low viscosity of the water, will successively separate from the periphery of the jet, and move more or less laterally to some point where the pressure is the least possible, thereby the effective pressure area of the jet is reduced. Said separation will take place to some extent already as soon as the jet leaves the nozzle.

In order to make the force of the jets of water as effective as possible, it is necessary that the largest possible pressure area of the jet is effectively utilized, it being previously proved that the water recedes faster when subjected to a certain pressure upon a small area, than when subjected to the same total pressure upon a larger area.

The object of the present invention is to provide an arrangement by which the above is attained.

According to the present invitation the nozzle for the propulsing jet is sub-divided into several nozzles, each consisting of a tube portion or channel the axis of which, at the outlet point thereof, is so positioned and directed, that all of the said axes lie on a conical surface, and, if extended backward, will meet at one and the same point. The several nozzle axes thus enclose a conically shaped space. Also in this case each of the several sub-jets is directed into resting water, having the tendency above named to spread and thereby reduce its effective area, but, in the present case, the tendency to spread will be materially reduced due to the fact that water through which the jet moves, is imparted with a movement that is more or less parallel to the direction of movement of the jet. This may partly be explained as follows:

The jets will surround a certain quantity of water, which has the shape of a cone, and said cone will, due to the viscosity of the water forming the same, be made to move backward together with the jets, thereby being lengthened, which causes the jets to assume a direction more parallel to that of the ship's movement.

The said cone of water, when being dragged along with the jets, will cause a lower pressure to be created within the volume surrounded by the jets, thus causing the water outside of the jets to flow into the cone, through the wedge-shaped portions which will be formed between adjacent jets. The water surrounding the jets thus is liable to flow in toward the axis of the cone, thereby preventing the particles of water which would otherwise have spread outwardly, from making such movement. The liability of the water to flow inward decreases toward the apex of the cone, where the several jets unite to form an even flow, thereby incorporating the water dragged with the water cone, surrounded by the jets.

A further object of the invention is to combine the nozzle arrangement with a rotating pump, the rotor of which is so shaped that the water moved thereby will flow from the apex of a cone towards the periphery of the base thereof. Said pump is preferably so situated in relation to the nozzle arrangement that the water is caused to flow directly from the blades of the rotor and into the nozzle tube portions. Hereby is gained that the pressure imparted to the water during the rotation movement from the apex of the said cone to the periphery of the base thereof, is fully utilized when the water flows through and out of the tube portions forming the jet nozzles.

Other objects of the invention will be understood from the following description of the figures and from the claims.

Fig. 1 shows the nozzle and pump arrangement in longitudinal section.

Fig. 2 shows the outer or rear portion of one of the nozzle tubes in longitudinal section.

Fig. 3 is a section on the line III—III in Fig. 2.

Fig. 4 shows the arrangement mounted entirely outside the hull of a ship.

Fig. 5 shows an arrangement according to the invention when mounted inside and in the hull of a ship.

Referring to Fig. 1, 1 is a conoidal portion, which at the base thereof is formed with a flange 2. The flange 2 is provided with a series of apertures 3, properly spaced along the peripheric portion of the flange, and adapted to receive the nozzle tubes 4. The nozzle tubes converge from the flange and backward, in such manner that the axis of the tubes, at the rear ends thereof, if extended backward, will be situated on a conical surface, the apex of the cone thus formed being situated outside of the nozzle arrangement in a point designed with the letter A at the drawing. The conoidal member 1 thus is situated within the space surrounded by the tubes 4 and prevents thereby undesirable eddies. That part of the aperture 3 which is remote to the tubes 4 has a greater diameter equal to that of the bore of the tubes, so that when the tubes have been inserted no protruding edges are formed, which might obstruct the free flow of the water. For the same reason edges of the apertures 3, at the inlet side thereof are well rounded off. The rear end of the tubes 4 are not cut off vertically to the axis of each tube but vertically to the direction of movement of the ship, thereby making it more easy for the converging jets to deflect a direction more parallel with the ship's axis.

The flange 2 is externally threaded to be received in a housing 5 that acts as stator for the pump arrangement. The foremost end of the housing is open allowing the water to flow into the housing, it only being connected to a spider 6 which carries a bearing 7, in which is journalled the driving shaft 8. The rear end of the shaft 8 is journalled in a bearing 9 formed in the conoidal member 1. Ball or roller bearings may, of course, be used in lieu of the common bearings shown at the drawing, in order to reduce the friction as much as possible.

Upon the shaft 8 and within the housing 5 is arranged a rotor 10 having a number of conveniently shaped wings or blades 11. The housing 5 and the rotor 10 are so shaped that the water moved through the housing will flow more or less from the apex of a cone to the periphery of the base thereof, thus ensuring that the pump arrangement delivers the water directly into the apertures 3, whereby the pressure imparted to the water during its rotation and flow along the cone (the rotor) is maintained in the apertures 3 and the tubes 4.

In order to increase the outer surface of each sub-jet, the tubes 4 are, at the rear ends thereof, provided with internal ribs 12 as shown in Figs. 2 and 3, which ribs cause the sectional shape of the jets to become somewhat cross or star shaped. Said ribs 12 may extend somewhat outside of the outlet end of the tubes.

The nozzle arrangement of course need not be constructed with the special tubes shown, but the flange might be extended backward and formed with channels taking the place of the tubes 4.

In Fig. 4 the apparatus is shown mounted outside of the hull of a ship. The shaft 8 is connected to the ship's machine, the housing or stator 5 being connected to the ship 13 by means of suitable straps 14 or other mountings. When the shaft 8 is rotated the pump sucks water through the foremost, open end of the housing 5 and presses the water out through the tubes 4.

According to Fig. 5 the apparatus is mounted inside of the ship's hull. The pump stator or housing 5 is fitted into an opening in the rear portion 15 of the hull, only the tubes 4 extending outside, and the foremost end of the housing is connected to an inlet tubing or funnel 16, which is provided with a branch having a stuffing box 17 through which the shaft 8 passes into the funnel. The funnel 16 is so directed and placed that it lies as nearly parallel to the axis of the ship as possible, whereby the way of the water becomes as straight as possible. The ship is steered by means of a rudder 18 that may be turned about the vertical middle axis thereof. It thus is possible to utilize the rudder for obtaining backward movement of the ship, viz. by turning the rudder so that the blade thereof extends laterally to the ship's axis.

The scope of the invention is not limited to the exact constructions here shown and described in detail, but the full extent of the invention may be understood from the claims.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:

1. In a hydraulic propulsion apparatus for ships, of the type in which the propulsion of the ship is caused by the reaction of water which is forced out through one or more nozzles, a casing, means for forcing water through the casing, an outlet for the casing sub-divided into a plurality of tubes, the axes of the outlet ends of the tubes converging toward a common point which is situated beyond the ends of the tubes.

2. A hydraulic propulsion apparatus as claimed in claim 1 in which the outlet ends of the tubes have cross-shaped bores for increasing the external surface of each propelling jet passing therethrough.

3. A hydraulic propulsion apparatus as claimed in claim 1 in which each outlet tube has its other end arranged vertically

to the direction of movement of the ship and obliquely relatively to the outlet direction of each tube.

4. A hydraulic propulsion apparatus as claimed in claim 1 in which each tube is provided at its outlet end with internal ribs which extend outwardly beyond the end of the tubes.

5. An apparatus as claimed in claim 1 in which the means for forcing water through the casing includes a substantially conical rotor provided with external blades, adapted to move the water from the apex of the conical rotor outward to the periphery of the base of the rotor and then through said tubes.

6. An apparatus as claimed in claim 1 including a conical member arranged between the tubes and having its apex directed outwardly to suppress eddies.

7. An apparatus as claimed in claim 1 including a conical member arranged between the tubes and having its apex directed outwardly, and a flange provided with a series of apertures into which the inner ends of the tubes extend, the front edges of the apertures being rounded to facilitate the flow of water into the tubes.

8. An apparatus as claimed in claim 1 including a conical member arranged between the tubes and having its apex directed outwardly, a flange arranged at the base of said conical member and provided with apertures into which the inner ends of the tubes extend, and means connecting said flange to said casing.

9. An apparatus as claimed in claim 1 including a conical member arranged between the tubes and having its apex directed outwardly, bearings in said casing and said conical member, and a shaft mounted in said bearings and carrying the water forcing means.

10. A hydraulic propulsion apparatus including a casing having a substantially frusto conical bore, a substantially frusto-conical rotor arranged in the casing and having blades for drawing water in at the apex of the rotor and discharging the same at the base of the rotor, and a substantially circular series of tubes arranged at the rear end of the casing to receive the water discharged by the rotor, all of said tubes having the axes of their outlet ends converging substantially toward a common point.

11. A hydraulic propulsion apparatus as claimed in claim 10 including a substantially conical member arranged at the rear end of the casing, located between the tubes and having its apex arranged forward of said common point.

In testimony whereof I affix my signature in presence of two witnesses.

HARALD JENSEN.

Witnesses:
EVEN LARSEN,
NILS KRISTIANSEN.