

Sept. 4, 1951

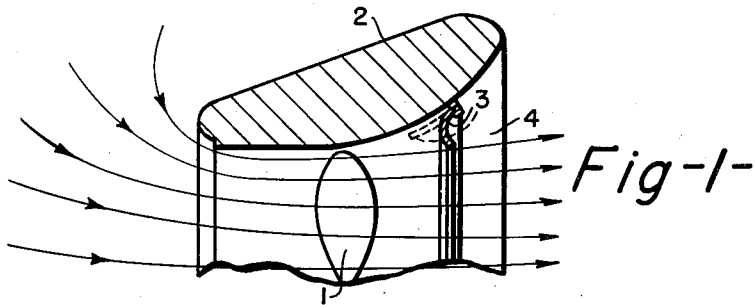
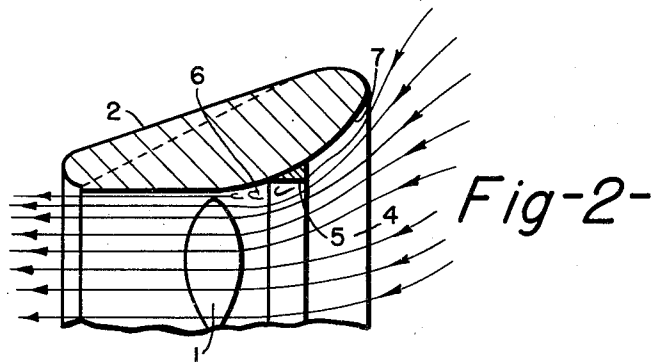
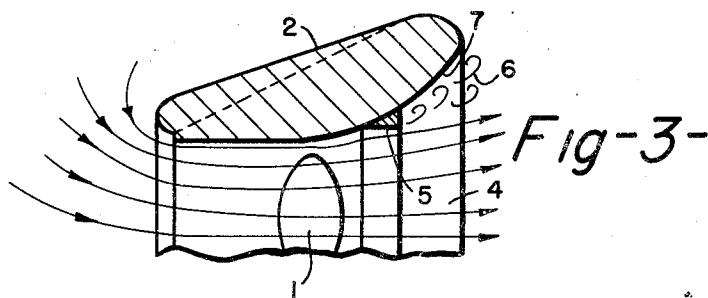
L. KORT

2,566,525

SCREW PROPELLER AND NOZZLE SHIP PROPULSION ASSEMBLY

Filed Nov. 3, 1949

2 Sheets-Sheet 1



INVENTOR.
LUDWIG KORT

BY

W. Freeman

ATTORNEY

Sept. 4, 1951

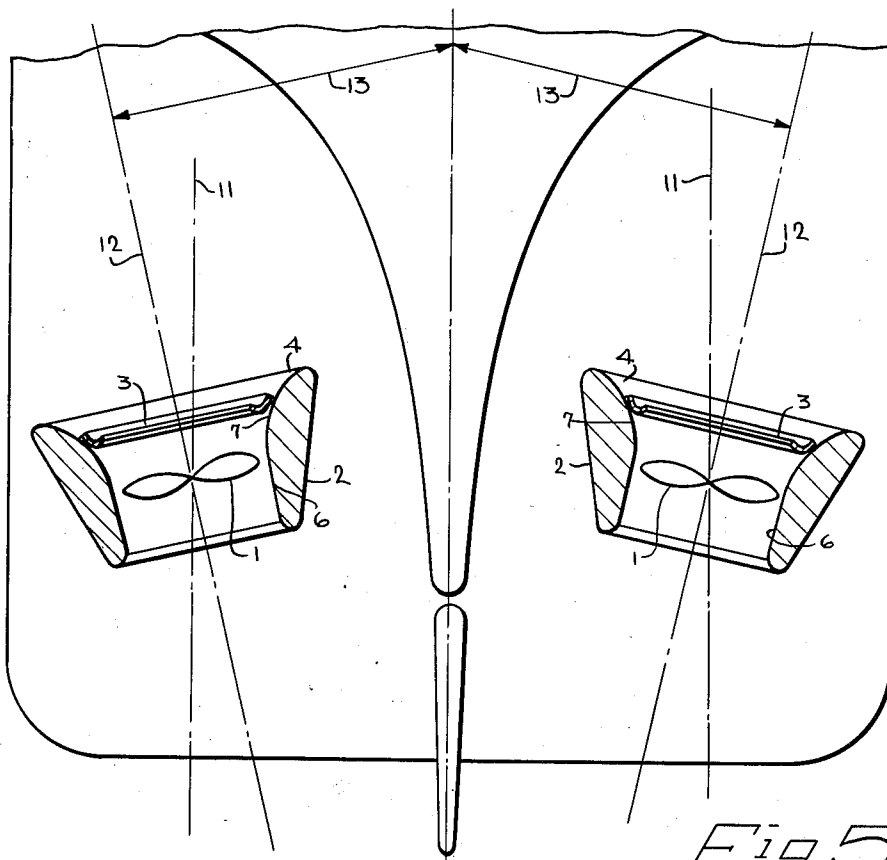
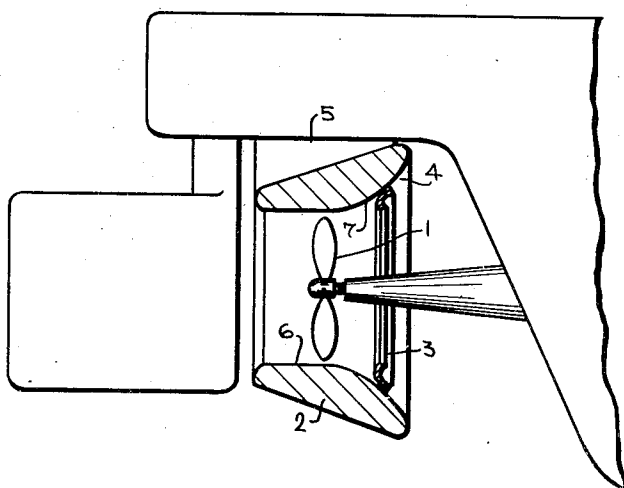
L. KORT

2,566,525

SCREW PROPELLER AND NOZZLE SHIP PROPULSION ASSEMBLY

Filed Nov. 3, 1949

2 Sheets-Sheet 2



BY

INVENTOR:
Ludwig Kort,

[Signature]

HIS ATTORNEY.

UNITED STATES PATENT OFFICE

2,566,525

SCREW PROPELLER AND NOZZLE SHIP
PROPULSION ASSEMBLY

Ludwig Kort, Hannover, Germany

Application November 3, 1949, Serial No. 125,312
In Germany February 24, 1949

3 Claims. (Cl. 115-42)

1

The invention relates to a propelling device which prevents the side-swinging of ships during astern propulsion.

In order to improve the propulsion of ships the propellers or ship screws have been provided with a nozzle which is generally known as the "Kort" nozzle.

Experience has proven that these screw nozzles during astern propulsion do not operate satisfactorily; this is particularly true during the manoeuvring of the ships in harbors and by tug boats.

It is a peculiarity of a screw or propeller nozzle that its diameter increases from the inlet towards the outlet opening of the water.

If the direction of the screw rotation during astern propulsion of the ship is reversed the inlet opening of the nozzle becomes the outlet opening for the water flow or jet. This water jet which during forward propulsion of the ships is reduced in cross section after it has passed the ship's screw will widen out and be forced to separate from the inner wall face of the nozzle during astern propulsion; in consequence thereof eddies will be formed in this free space between the nozzle wall and the outer face of the water jet.

This detachment of the water jet from the nozzle wall during astern propulsion does not occur uniformly over the circumference of the nozzle but always on one side of the nozzle since the water jet is inclined to follow either the port or starboard side of the ship; in other words, the water jet passing the nozzle will adhere either to the port or the starboard side of the nozzle opening. As a result thereof the ship when going astern has the tendency not controlled by the pilot to swing with its stern either to port or starboard.

It is the main object of this invention to prevent the non-uniform or one-sided detachment of the water jet from the nozzle wall during the astern propulsion of the ship.

It is a further object of the same to eliminate the formation of whirls and eddies in the nozzle or to reduce the same in such a manner that they do not interfere with the navigation of the ship.

It is another object of the invention to prevent the swinging of the ship to port or to starboard during its astern travel.

In compliance with the above recited and additional objects which will become apparent as this description proceeds the nozzle shrouding the ship's screw is, in conformity with this invention, provided with an inwardly protruding member

2

which during the astern propulsion uniformly detaches the water jet from the inner nozzle surface after the water jet has passed the screw. The water, therefore, escapes from the nozzle as a closed flow and at a greater velocity in dependence upon the inclination of the screw blades and the speed of rotation. Not only is the non-uniform or one-sided adherence of the water jet to the nozzle wall eliminated but the astern or backward thrust of the same is considerably increased and the undesirable arbitrary swinging of the stern to one or the other side of the ship is eliminated.

In order to realize the purposes of this invention a strip of an easily bendable material such as leather or rubber is attached in the funnel-shaped entrance portion in front of screw 1 to the inner nozzle wall so that on forward motion of the ship this strip is pressed against the inner wall of the nozzle and thus offers negligible resistance to the water.

When the direction of rotation of the screw is reversed to astern propulsion the strip is moved with its inner edge from the nozzle wall and thereby compels the water jet to uniformly separate from the wall nozzle, i. e. it is prevented from adhering to one side thereof.

Instead of a leather or rubber strip an inwardly projecting edge in front of the screw may be provided having the shape of a rigid annular angle ring which prevents the one-sided adherence of the water jet in the nozzle on reversal of the ship propulsion. Moreover, by this device the backward thrust is increased and the objectionable trend of the ship of swinging its stern to one side is further reduced.

The application of the prescribed device of the invention may, if desired, be limited to one side of the mouth of the nozzle, it is hereby ensured that the stern of the ship will only swing to one previously determined side.

The invention finds a particular important application in those cases where in conformity with the so-called swinging nozzles the nozzle is made rotatable; without the use of means to prevent one-sided adherence the water jet will not be directed towards the axis of the nozzle during astern propulsion but will most certainly adhere to the one or the opposite side of the nozzle opening and cause the above referred-to unintentional side-swinging of the stern.

The device forming the subject matter of this invention may be further improved by an increase of the hitherto customary slight rounding-off of the nozzle edge at the nozzle outlet; this

increase which, as hitherto customary, amounted to only 2 to 3 per cent of the radius of the propeller is increased up to 10 per cent and more.

Therefore, on reversal of the screw the water sucked into the nozzle escape opening adheres uniformly to the wall and the formation of eddies in the vicinity of the nozzle wall is prevented. Moreover, the amount of water when the screw or screws are reversed is increased and a correspondingly greater thrust is obtained.

This pronounced rounding-off of the outlet opening fills yet another object namely that of reducing the inclination of the conical outer surface of the nozzle while maintaining the given length of nozzle and the size of the inlet opening. That is very important, in particular for higher velocities of motion in order that the water should not detach itself from the outer surface of the nozzle, and thereby cause losses in efficiency.

If the above-referred to means to improve the maneuverability of a ship during astern propulsion be applied to ships having two screws, its effectiveness may be enhanced by arranging the nozzles on converging axes. The envelopment of the propellers by nozzles forces the water jet to flow in the direction of the nozzle axis. If two or more propeller axes extend parallel to the longitudinal ship axis and the nozzle axes form a small angle of about 5 degrees with the ship axis the propeller jets flow in the direction of the nozzle axis and not in the direction of the propeller axis.

Due to the fact that the nozzle axes rearwardly converge the steering effect of each individual nozzle will be considerably improved on account of the greater lever action relative to the rotation center of the ship under the provision that the nozzles are constructed in conformity with the invention and equipped with means to effect during the astern propulsion a uniform detachment of the water jets. The here referred-to improvement will become particularly effective if only one screw is driven during the turning of the ship or if one screw is driven forward and the other one rearwardly.

The invention is by way of example illustrated in the accompanying drawings.

In the drawings,

Fig. 1 is a schematic side view partly in section of approximately one half of a screw nozzle showing one embodiment of the invention.

Figs. 2 and 3 are schematic side views partly in section of a further modification of a nozzle, Fig. 2 illustrating the same during the forward and Fig. 3 during astern propulsion of the ship.

Fig. 4 shows in a schematic manner the attachment of one nozzle, and

Fig. 5 illustrates the attachment of two nozzles to the hull of a ship.

In Fig. 1 numeral 1 denotes a portion of a screw blade which is surrounded by nozzle 2.

The arrows indicate the flow direction of the water jet during the astern propulsion of the ship.

A strip 3 made of a flexible and preferably extensible material such as leather or rubber is fastened to the inside face of the nozzle 2 before its inlet opening 4.

During the forward propulsion of the ship where the water flows in an opposite direction to that indicated by the arrows the strip 3 will be pressed against the inner nozzle wall, as indicated by its illustration in dotted lines. The strip 3 will therefore cling to the nozzle wall when the ship

is moved forward and therefore produce a negligible flow resistance only.

When the direction of rotation of the propeller 1 is reversed, the strip 3 is flapped away from the nozzle wall by the water jet now flowing in the direction of the arrows and will take up the position shown in full lines in Fig. 1.

The strip eliminates uneven detachment of the water jet from the nozzle walls and therefore prevents the undesired one-sided swinging of the ship.

In the modification shown in Figs. 2 and 3 the flap 3 is replaced by a circular inwardly protruding rigid edge 5.

The arrows in Fig. 2 illustrate the flow of the jet through the nozzle 2 during the forward and in Fig. 3 during the astern propulsion of the ship.

The edge 5 is so shaped that on going ahead only small eddies 6 are formed, which due to the reduction of cross section behind the tearing-off edge 5 are not injurious to the forward motion.

However, on reversal of the propeller the funnel-shaped jet loosening action of the tearing-off edge 5 exerts its full effect in the strongly diverging water uniformly from the nozzle inlet 4.

Figs. 2 and 3 also show the strongly rounded-off outlet 8 of the nozzle. The water jet is uniformly detached from the entire inner circumference of the nozzle and the eddies 6 formed in the thus created vacant place cannot exert an injurious action.

Figure 3 shows the attachment of applicant's nozzle 2 to the hull 5 of a ship. The nozzle has a cylindrical portion 6 and a widely out-flaring portion 7. The nozzle surrounds the propeller 1 with the cylindrical portion 6. Directly beyond the propeller the widening-out takes place of the nozzle towards the water inlet opening 4. The water deflector 3 is provided in the widening portion 7 of the nozzle.

Figure 5 shows the attachment of two propellers and their nozzles to a ship.

The two axes 11 of the propellers are parallel, but the axes 12 of the nozzles converge towards the stern of the ship. Therefore, on astern propulsion the lever action 13 of the emanating water will be enlarged, and accordingly also the steering momentum. The loss of forward movement is accordingly very small, since it depends only on the cosine of the angle between nozzle axes and ship's axes. This loss is further diminished, since the jets of the movement of the propeller will not strike as strongly against the walls of the ship as compared with a parallel arrangement of the nozzle axes.

The reference has been described with reference to a preferred embodiment and it will be understood that many variations and modifications thereof may be resorted to without departure from the scope of the invention as defined in the following claims.

I claim:

1. A propelling device for screw-propelled ships comprising at least one screw propeller, a propeller shaft, a nozzle surrounding the said propeller being arranged longitudinally of said propeller shaft and consisting of a cylindrical portion and a portion widening out towards the water entrance opening of said nozzle, the nozzle being attached to the ship's hull with the widening out portion being positioned in front of the propeller to a water flow entrance opening whereby a funnel-shaped part is formed, said nozzle being provided with a rounded edge at the water entrance opening of the nozzle and with a similarly rounded

5

edge at the flow exit opening thereof and a water flow deflector strip attached to and projecting from the inside face of said funnel-shaped part of the nozzle.

2. In a propelling device according to claim 1, 5 the flow deflector strip consisting of a flexible material, whereby the same is pressed flat against the funnel-shaped portion of the nozzle wall by the nozzle entering water flow on forward propulsion.

3. In a propelling device according to claim 1, the deflector strip having a triangular cross section and being attached with its hypotenuse to the funnel-shaped nozzle wall.

LUDWIG KORT.

6

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,030,375	Kort	Feb. 11, 1936
2,041,793	Stalker	May 26, 1936

FOREIGN PATENTS

Number	Country	Date
11,702	Great Britain	July 9, 1891

OTHER REFERENCES

15 Koenig et al., Abstract of Appl. Ser. No. 770,836, filed Aug. 27, 1947, pub. Nov. 1, 1949, 628 O. G. 256.