Oct. 7, 1930. G. E. CORCORAN 1,777,912

RUDDER

Filed Sept. 11, 1929

Fig. 1.

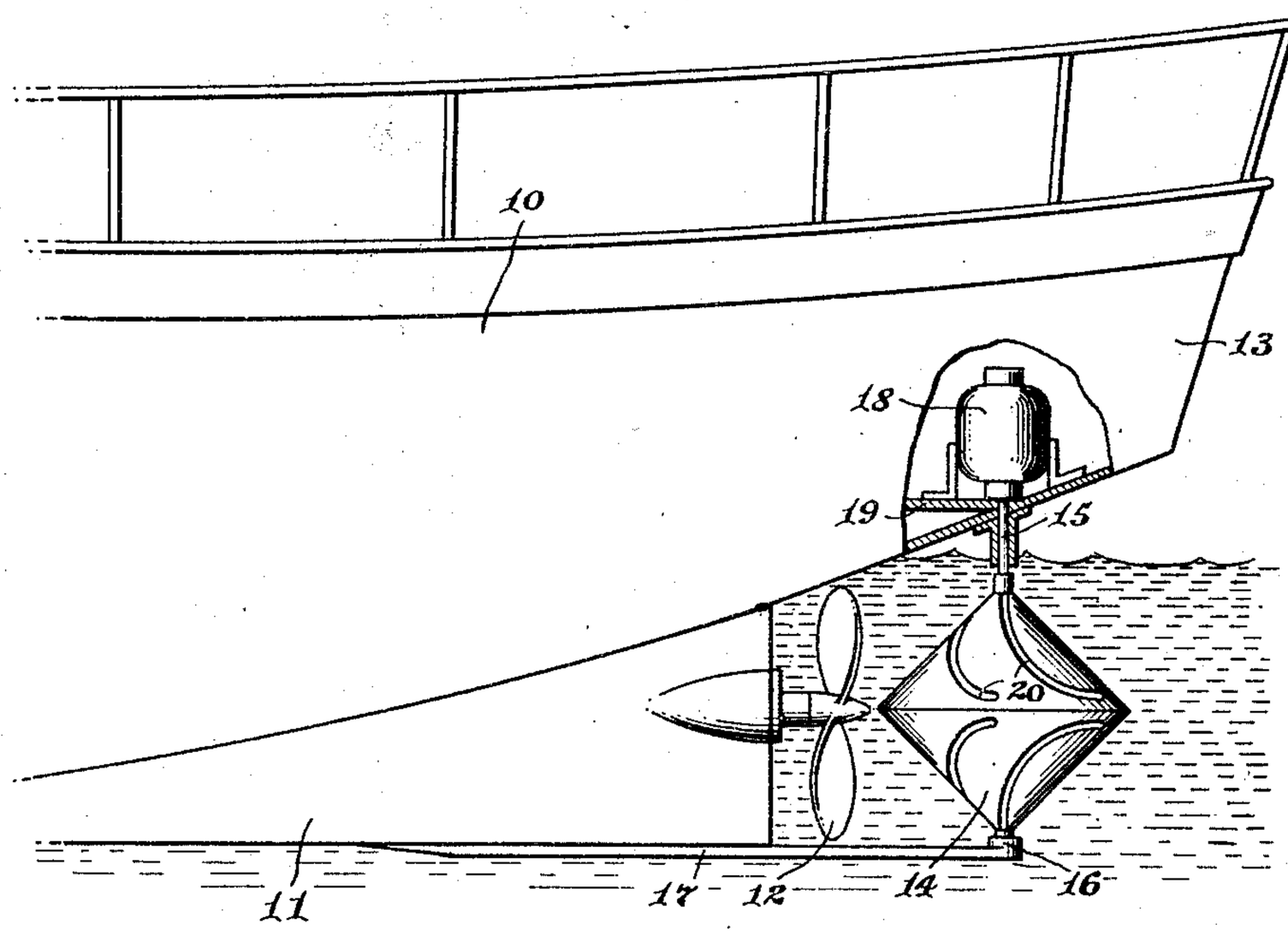
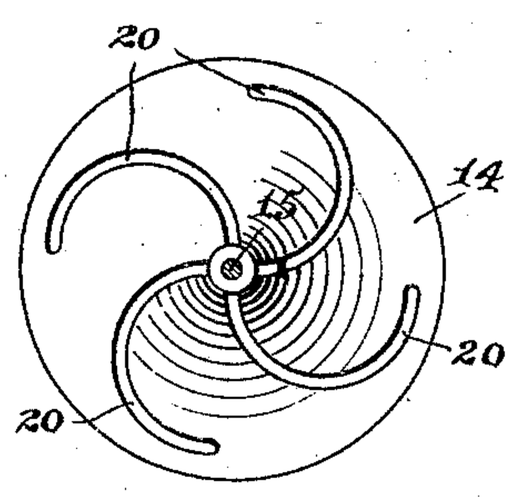


Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE

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RUDDER

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This invention relates to rudders.

Among the objects of the present invention is to provide an improved ship rudder which is adapted to impart directional movement to the ship through the rotation thereof.

It is a further object of the present invention to provide a novel and improved rudder which will act to steer a ship by skin friction thereof, the arrangement being such that the rotation of the rudder will effect a pressure upon the rudder at right angles to the path of the ship in a direction controlled by the direction of rotation of the rudder.

A still further object of the present invention is to provide a rotary rudder of tapered construction which will provide increased skin friction surface and which will present minimum resistance to the water crossed rearwardly by the propeller.

Another important object of the present invention is to provide in a rudder of the type described, a plurality of skin friction increasing elements which will act to materially increase the efficiency of the device.

A further object of the present invention is to provide in a rotary rudder, a plurality of spiral grooves, spiraling in opposite directions to increase resistance of the device on one side as it rotates and to decrease resistance on the opposite side.

Numerous other objects of the present invention will be apparent from a consideration of the specification taken in conjunction with the accompanying drawings, in which

Figure 1 is a side elevation of a ship embodying one form of the present invention, and

Fig. 2 is a detail enlarged top plan view thereof.

Referring more particularly to the drawings, a ship of conventional design has been indicated by the numeral 10, Figure 1, and includes the usual keel 11 from which extends a propeller 12. The stern of the ship, as is common practice, extends rearwardly over the propeller, as at 13.

In connection with the present invention it will be understood that the rudder is of particular configuration for providing most efficient steering in combination with the propeller 12. The invention, however, is not confined to the specific type of ship here shown, it being readily seen that the rudder may be mounted at other portions of the ship, as, for instance, the bow, and the device may be used in conjunction with plural propeller ships without departing from the spirit or scope of the invention.

The rudder of the present invention includes a body 14 mounted upon a suitable operating shaft 15, the lower extremity of which is mounted within a bearing 16 carried by an extension 17 on the keel. For rotating the shaft 15 and the body 14 any desired mechanism may be provided, the present form of the invention using an electric motor. The electric motor 18 is mounted upon a suitable base 19 carried on the stern of the ship. This form of drive provides for electric control of the ship from a remote steering point. The body 14 of the rudder is, as illustrated, of angular cross section. In the preferred embodiment of the invention the device is preferably rectangular in vertical cross section. The device is of round horizontal cross section throughout, thus resembling a pair of cones joined at their base.

As seen in the drawings, the rudder is provided with a plurality of thread-like grooves 20, the upper conical face of the rudder having the grooves in opposite pitch as seen in side elevation in Fig. 1 from those of the lower conical surface, whereby on each side the grooves co-operate to either increase or decrease the skin friction in accordance with the direction of rotation of the rudder. Thus, as shown in Fig. 2, if the rudder is turning in clockwise direction, the grooves act to increase the friction on the upper side of the rudder as shown in this figure, while decreasing the resistance on the opposite side, thus assisting the operation of the rudder in steering the ship. It is also within the scope of the present invention to provide other equivalent means for increasing the friction. The rudder body may be suitably corrugated or provided with projections either spiral or straight which would increase the friction of the rudder, the inven-

tion not being confined to spiral grooves which increase the resistance on one side while decreasing it on the opposite side. This, however, as illustrated, being a preferred embodiment of the invention.

In operation it is assumed that the maximum cross section of the device is in alignment with the axis of the propeller, and that the device tapers toward its upper and lower ends so that the minimum resistance is provided behind the central portion of the propeller blades, while maximum effective surface is provided in direct alignment with the propeller axis.

In marine propulsion it has been found that the rear draft of water is at its maximum intermediate the ends of the propeller blades, and that at the axis of the propeller no effective rear draft is experienced. The device thus utilizes the actual ineffective area behind the propeller to accommodate the bulk of the propeller. The angular configuration of the propeller further provides for a maximum skin friction area with minimum displacement by the propeller.

It will be understood that in the operation of the device, with a ship moving forwardly water passes evenly over the rudder when the propeller is at rest. If, however, the rudder is rotated a greater amount of water will be carried upon one side of the rudder due to skin friction thereon. The opposite side of the rudder which moves in the opposite direction to the water, and which will due to skin friction with the water build up a pressure, thus exerts pressure on the stern of the ship in an opposite direction, whereby the ship may be readily steered without the use of the flat type of rudder, the operation of which reduces the efficiency of a ship due to resistance effected when the rudder is turned at an angle with respect to the axis of the ship.

In the use of the present invention it is also possible to turn the ship without the usually required forward or rearward movement of the ship. It will be seen that with the propeller in stationary position rotation of the body 14 will act as a propeller for the ship moving the stern of the ship in sidewise direction. Thus in maneuvering a ship provided with the present invention, it will not be necessary to accompany the turning of the ship with forward movement as is necessary in the conventional rudder-steering vessel.

From the foregoing it will readily be seen that the invention provides a novel, simple and improved rudder of high efficiency.

It will further be understood that the invention is not particularly confined to the angularity in the vertical cross section of the rudder as specified, but that such angularity may be controlled in accordance with the design of the ship.

It is understood that such changes in the design of the rudder will not depart from the spirit or scope of the invention as outlined in the appended claims.

What is claimed is:

1. A rotary rudder for ships, including a double conical body having oppositely-pitched spiral friction-increasing grooves on each conical surface.

2. A rotary rudder for ships, including a double conical body having oppositely-pitched spiral friction-increasing grooves on each conical surface, the pitch of the grooves on one conical surface being opposite to the pitch of the grooves on the other conical surface.

3. In combination with a ship having a rudder, a rotary propeller associated with said rudder, said rudder being of maximum width in a horizontal plane intersected by the axis of said propeller, said rudder tapering in cross section from its portion of greatest width to its ends, the vertical cross section of the rudder being rectangular, the upper and lower surfaces of said rudder including independent sets of friction-increasing grooves.

4. In combination with a ship having a rudder, a rotary propeller associated with said rudder, said rudder being of maximum width in a horizontal plane intersected by the axis of said propeller, said rudder tapering in cross section from its portion of greatest width to its ends, the vertical cross section of the rudder being rectangular, the upper and lower surfaces of said rudder including independent sets of friction-increasing grooves, the sets of grooves being spiral, the pitch of one set being oposite to the pitch of the other set.

GEORGE EUSTIS CORCORAN.