United States Patent

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[72] Inventor **Kiyoshi Shima**
No. 1917, Tsujido, Kanagawa-ken,
Fujisawa-shi, Japan

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[54] **MARINE PROPULSION DRIVE**
3 Claims, 3 Drawing Figs.

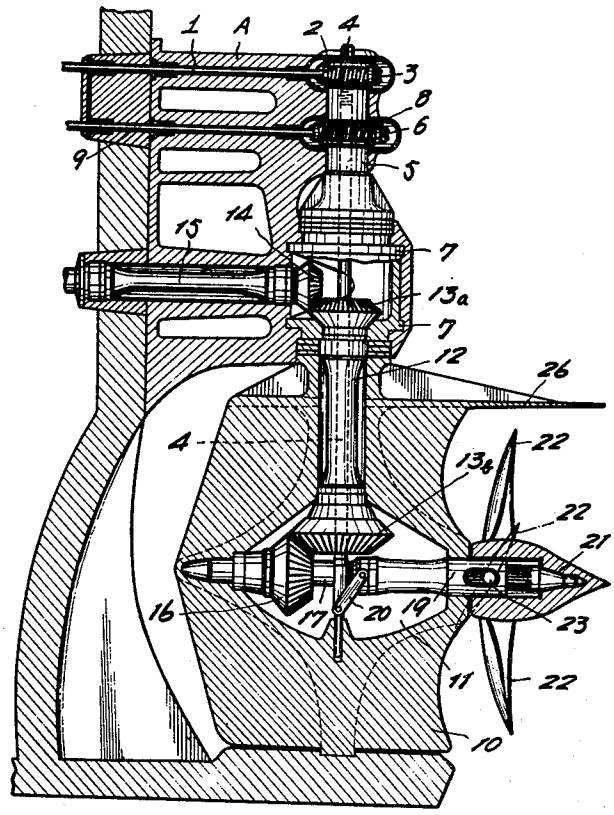
[52] **U.S. Cl.** **115/35,**
416/166; 115/41
[51] **Int. Cl.** **B63h 3/02**
[50] **Field of Search** 115/35, 34,
34C, 41; 416/164—168, 147, 198

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Primary Examiner—Milton Buchler
Assistant Examiner—C. A. Rutledge
Attorney—Watson, Leavenworth & Kelton

ABSTRACT: A simple steering gear wherein a cylindrical member, into which a propeller shaft is slidably inserted, is connected to a rod in such a manner that the movement of the rod is transmitted to the member to move it. The member is provided with long holes having teeth, each of which being engaged with a blade at the teeth so as to rotate the blade in accordance with the movement of the member.



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SHEET 1 OF 2

FIG. 1

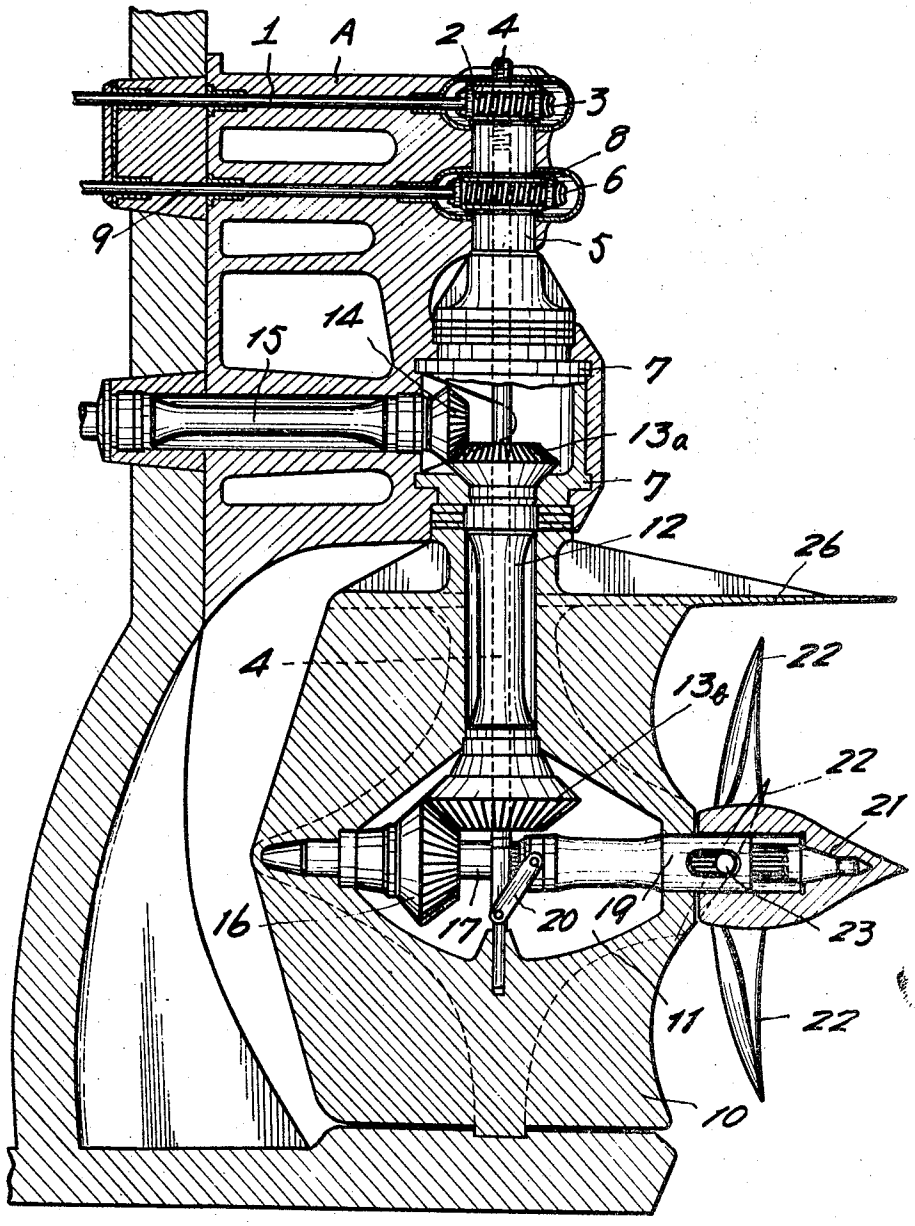


FIG. 2.

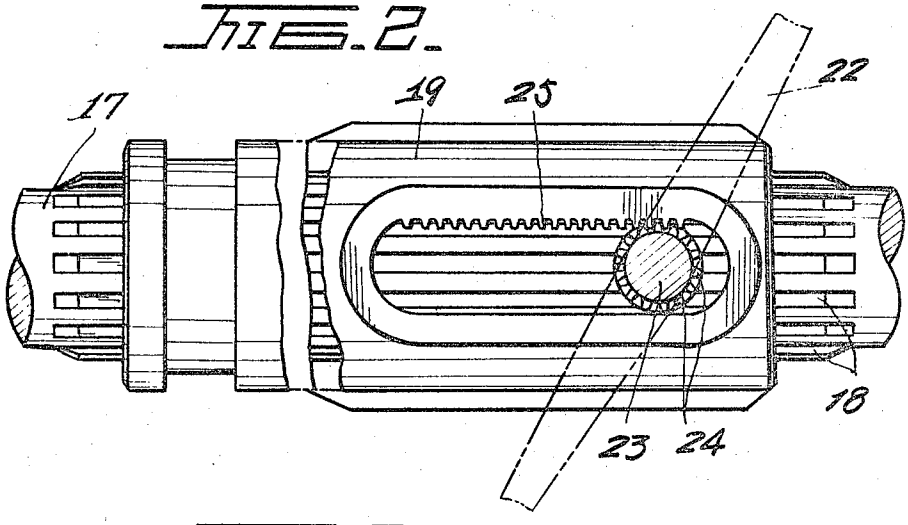
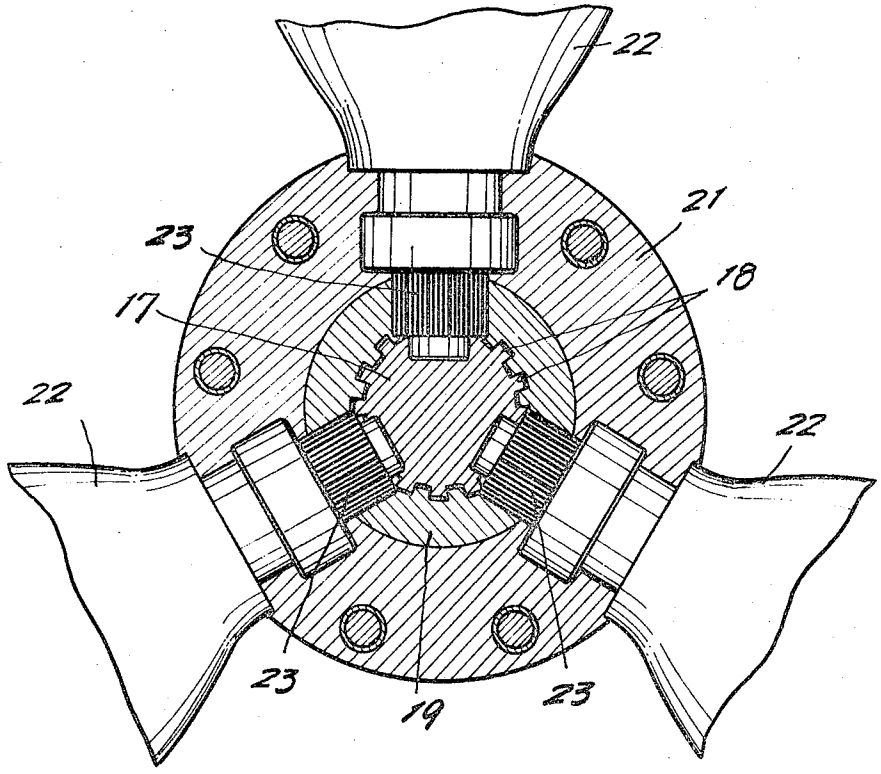


FIG. 3.



MARINE PROPULSION DRIVE

This invention relates to a simple steering gear which can be mounted at the stern side of a ship.

It has already been proposed the simple steering gears wherein each of blades of propeller is adjustably fitted to a rotating shaft so as to adjust the angle ranges of each blade to the axis of the shaft by means of hydraulic mechanism. Such a type of simple steering gears has an advantage that the resistance of the blades can be controlled with the navigating condition which is changed due to, for example, changes of the height of waves. However, the controlling means which has been used to adjust the angle ranges of the blades of the propeller is not to be sufficient in that it has to be complicated in the construction thereof and requires troublesome operations.

A primary object of the present invention is to provide a simple steering gear with a simple construction, which is capable of adjusting the angle of each blade to the axis of a propeller shaft to control the resistance to water of the blade.

According to the present invention there is provided a simple steering gear comprising a rudder member having a chamber formed therein, a cylindrical shaft extending at one end into said chamber, said shaft being connected to the driving means, a propeller shaft rotatably mounted in said rudder member and extending into said chamber, a gear assembly arranged in said chamber and engaging said cylindrical shaft and propeller shaft, a tubular member having long holes penetrating through the peripheral all thereof, the inner wall of each hole having teeth arranged in parallel to the axis of said propeller shaft, said propeller shaft being slidably inserted through said tubular member, a plurality of blades rotatably supported to the propeller shaft and having teeth engaged with said teeth of each long hole, a rod penetrating through said cylindrical shaft and extending into said chamber, and an arm connected between said rod and tubular member, whereby the movement of said rod controls movement of said tubular member.

In the drawings:

FIG. **1** is a longitudinal section of a simple steering gear embodying this invention;

FIG. **2** is a section showing a propeller shaft and an adjusting member used in the steering gear of FIG. **1**; and

FIG. **3** is a section showing a rotating mechanism for blades utilized in the steering gear.

Referring to the drawings attached hereto, reference numeral **1** generally represents a controlling shaft pivotally supported on a base member A mounted at the stern side of a ship in an arrangement that it can be rotated in both directions through a suitable rotating mechanism (not shown). At one end portion of the shaft **1** is provided a worm gear **2** engaged with a worm wheel **3** having threads formed on the inner peripheral surface thereof. A threaded rod **4** is inserted vertically through the central portion of the worm wheel **3**, the threads of the rod being engaged with the threads formed on the inner surface of the worm wheel **3** so as to lifting or lowering the shaft in accordance with the rotation of the worm wheel. On the outer surface of the rod **4** is arranged coaxially a steering shaft **5** which has a worm wheel **6** and a column **7**. The worm wheel **6** is positioned slightly lower than the described worm wheel **3** and engaged with a worm gear **8** having a steering rod **9**.

At the lower end of the steering shaft **5** is fitted a rudder member **10** having a chamber **11** filled with oil. A cylindrical rotating shaft **12** is rotatably inserted into the rudder member, one end of which extends into the hollow portion of the column **7** and the other end into the chamber **11**. The upper end of the shaft **12** has a bevel gear **13***a* engaged with a bevel gear **14** which is connected to a shaft, the shaft being connected to a driving mechanism (not shown), while the shaft **12** is provided with a bevel gear **13***b* at the lower end thereof. The bevel gear **13***b* is engaged with a bevel gear **16** fitted to a propeller shaft **17**, so that the driving force of the shaft **15** is transmitted to the propeller shaft to rotate it through the shaft **12**.

The propeller shaft **17** has a plurality of ribs **18** parallel to each other and extending along the axis of the shaft. The shaft is slidably inserted into a tubular member **19** which has an inner surface corresponding to, and slightly larger than the cross-sectional configuration of the shaft. The member **19** is connected to the lower end portion of the rod **4** through an arm **20** in such a manner that the lifting or lowering movement of the rod **4** actuates the member to move along the axis thereof.

The end portion of the tubular member **19** extends to the outside of the rudder member **10** together with the propeller shaft **17**, the shaft being slightly longer than the member **19**. To the protruded end of the shaft is fitted a cap member **21** having a configuration like to a shell. A plurality of blades **22** (three in this case), are radially arranged around the cap member **21**, each of which is rotatably connected to the shaft **17** through a connecting member **23** penetrating through the cap member and tubular member **19**.

As clearly shown in FIGS. **2** and **3**, each of the connecting members has a plurality of teeth **24**. The teeth are engaged with teeth **25** formed on the inner surface of long holes which penetrate through the peripheral wall of the above mentioned tubular member **19** and extend along the axis of the tubular member. Thus, the movement of the tubular member along the axis thereof actuates the each connecting member **23** to rotate it, and the blade carried by the connecting member is rotated around the axis thereof to adjust its angle to the axis of the propeller shaft **17**. Further, the upper portion of the rudder member extends to the portion above the blades **22** to form a stabilizer **26**.

In operation, when the shaft **15** is rotated by the driving means (not shown) connected thereto, the rotation of the shaft is transmitted finally to the propeller shaft **17** and blades **22** to rotate them through the bevel gears **14**, **13***a*, shaft **12**, and bevel gears **13***b*, **16**. At this time, the rotational movement is not transmitted to the threaded rod **4** because it is slidably inserted in the shaft **12** and bevel gears attached thereto. In this condition, the ship provided with the simple steering gear is controlled in speed by varying the output of the driving means, and steered by varying the angle of the rudder member through the shaft **5** having column, worm wheel **6**, worm gear **8** and rod **9**.

When the variations in navigating conditions are occured, the undesired effect can be compensated by controlling the angles of the blades, such control being carried out by rotating the shaft **1**. Thus, the rotation of the shaft **1** actuates the worm wheel **3** to rotate it through the worm gear **2**, so that the threaded rod **4** is lifted or lowered along the axis thereof. By the movement of the rod **4** is transmitted to the tubular member **19** to move it along the axis thereof, so that each blade **22** is rotated so as to adjust the pitch thereof, that is their angles to the axis of the shaft **19**. Therefore, the resistance of the blades is varied in accordance with the changes of the navigating conditions, then the speed of the ship will be controlled even though the output of the driving means is maintained constant.

I claim:

1. A marine propulsion drive comprising in combination with a rudder member having a chamber formed therein, a cylindrical shaft extending at one end into said chamber, said shaft being connected to the driving means, a propeller shaft rotatably mounted in said rudder member and extending into said chamber, a gear assembly arranged in said chamber and engaging said cylindrical shaft and propeller shaft, a tubular member having long holes penetrating through the peripheral wall thereof, the inner wall of each hole having teeth arranged in parallel to the axis of said propeller shaft, said propeller shaft being slidably inserted through said tubular member, a plurality of blades rotatably supported to the propeller shaft and having teeth engaged with said teeth of each long hole, a rod penetrating through said cylindrical shaft and extending into said chamber, and an arm connected between said rod and tubular member, movement of said rod causing sliding of said tubular member whereby said blades rotate changing the pitch thereof.

2. A marine propulsion drive according to claim 1 wherein said rod has threads formed on the peripheral surface thereof, said threads being engaged with the inner surface of a worm wheel which is connected to an adjusting shaft through a worm gear to move said rod along the axis thereof.

3. A marine propulsion drive according to claim 1 wherein a cap member is mounted at the protruded end of said propeller shaft, said blades penetrating through the wall of said cap member.