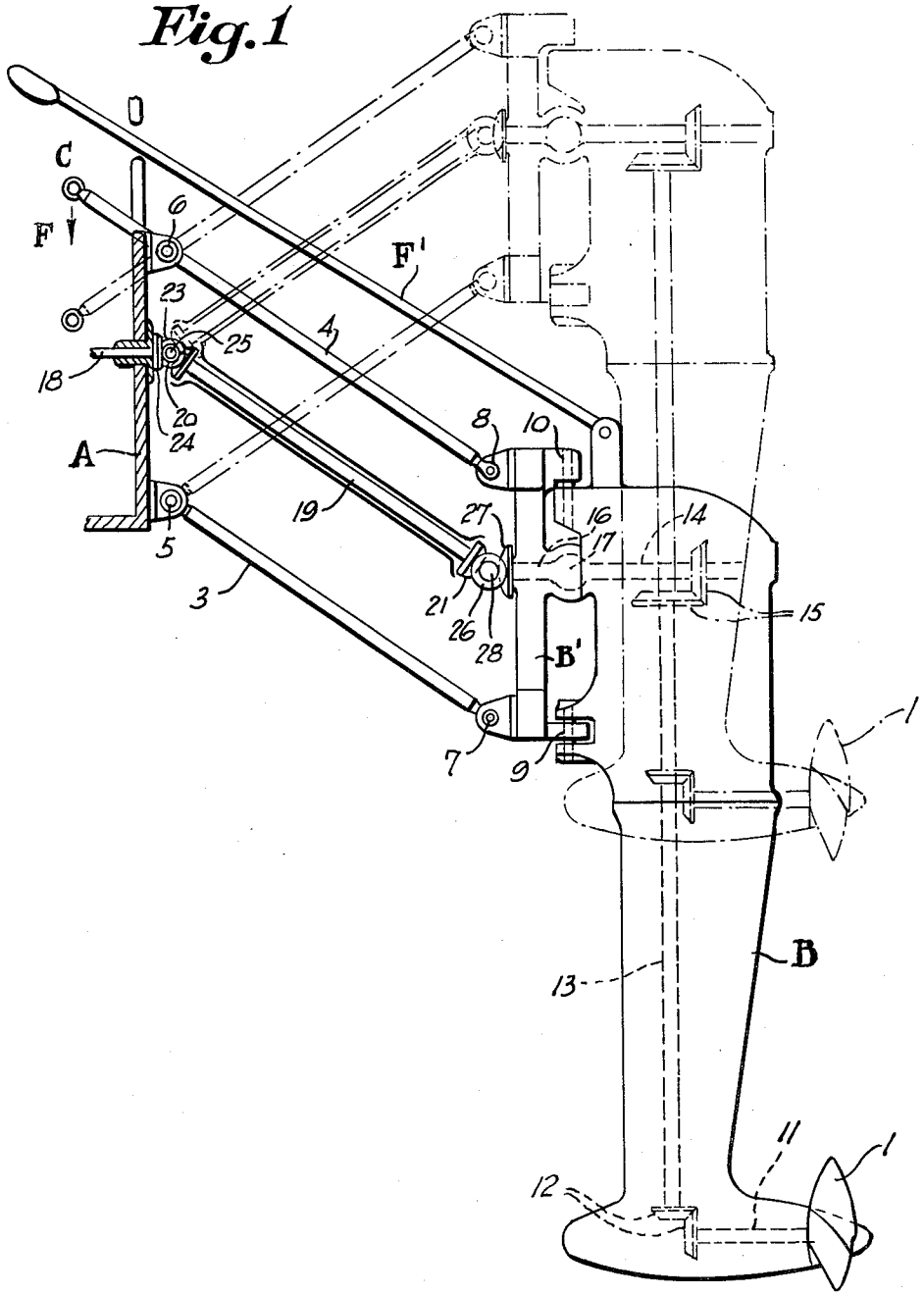
Aug. 23, 1960 G. CATTANEO ET AL 2,949,791

MOTION TRANSMITTING DEVICE FOR MARINE PROPELLERS HAVING THEIR THRUST AXIS VERTICALLY MOVABLE

Filed Dec. 14, 1956 2 Sheets-Sheet 1

Fig. 1



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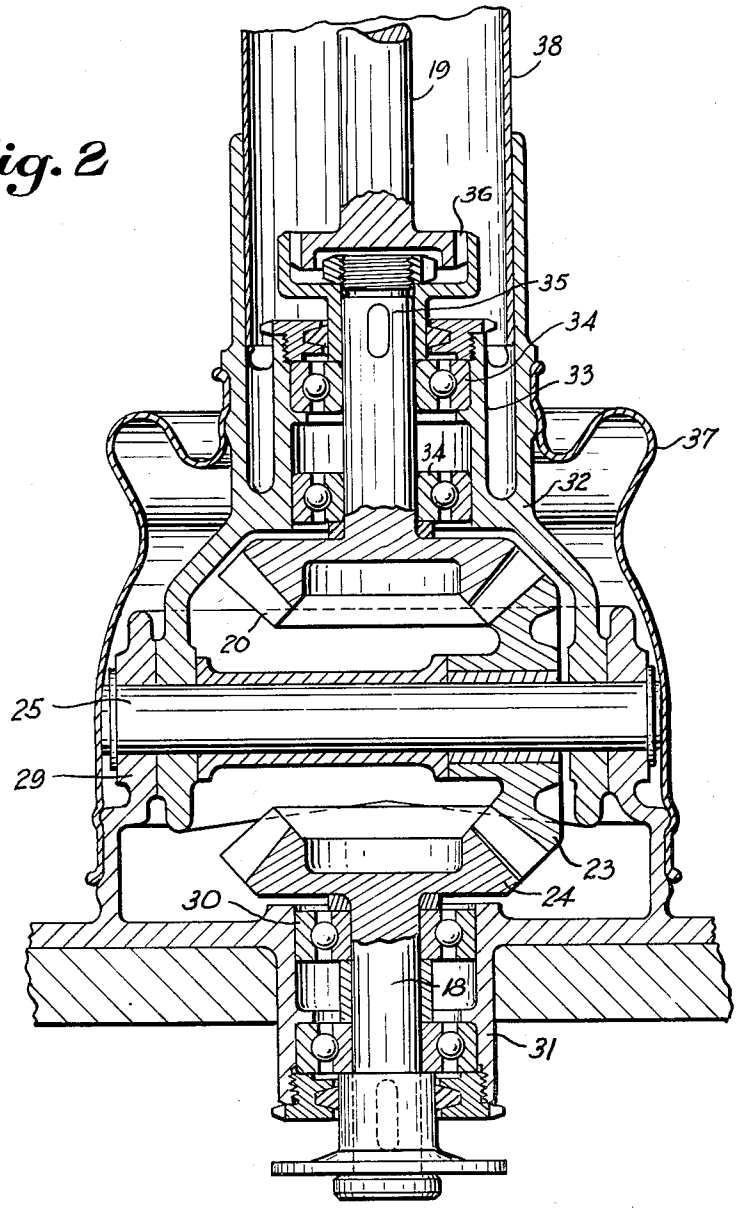
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Fig. 2



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MOTION TRANSMITTING DEVICE FOR MARINE PROPELLERS HAVING THEIR THRUST AXIS VERTICALLY MOVABLE

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3 Claims. (Cl. 74—385)

The present invention relates to a motion transmitting device for marine propellers having a vertically movable thrust axis, especially for hydrodynamic water craft, wherein it is necessary to vary the position of the propelling organ relatively to the hull in order to realize the required immersion conditions of the said propelling organs.

The object of the invention is substantially characterized by the fact that between motor and propeller shaft an intermediate transmission shaft is provided, carrying at its ends two bevel gears, cooperating—each through a loose planet pinion, with its axis perpendicular to the intermediate shaft and to the motor and propeller shaft axes respectively—with the latter, in such a way as to allow of varying the angle formed by the intermediate shaft with the motor and propeller shaft.

Further, according to the invention, means is provided for obtaining the vertical movement of the propelling organ by means of a parallelogram articulated to horizontal articulation axes fixed on one side to the stern end of the craft and on the other side to suitable brackets formed on the propeller body, preferably in the portion remaining above water.

Further, according to the invention, in the case of large power transmissions several propellers may be provided, connected to a single articulated quadrilateral element. In this case the transmission of power to the propellers may advantageously be obtained either by means of a single shaft with toothed wheels and one connecting shaft between two propellers or by means of two shafts with bevel toothed wheels.

The invention will now be described with reference to the schematic appended drawings given only by way of example.

Fig. 1 shows the device in side elevation;

Fig. 2 is a sectioned view of the bevel toothed wheel transmission means.

With reference to the said figures, A indicates the hull while B represents the supporting body of the propelling organ constituted, in the illustrated example, by the propeller 1.

The hull A and the body B are interconnected by two oscillating arms 3 and 4, hinged at 5 and 6 to the hull A and at 7 and 8 to the body B.

The horizontal oscillation axes of the ends of the arms 3 and 4 constitute a parallelogram, so that it is possible to vertically displace the body B with respect to the hull A between the two positions by acting upon the end C of the arm 4 in the direction of the arrow F or actuating the lever F' pivoted to the casing B. These extreme positions are indicated in Fig. 1 by continuous and dash lines respectively, the axis of the propeller 1, which is arranged substantially horizontally, being maintained practically parallel to itself. It is understood, of course, that the propeller's thrust is transmitted by the propeller 1 to the hull 4 through the oscillating arms 3 and 4.

In the particular constructional embodiment illustrated in the drawings, the body B can also turn around a practically vertical axis, relatively to the rigid element B' to which the ends 7 and 8 of the arms 3 and 4 are linked. Two coaxial vertical pins 9 and 10 interconnecting the parts B and B' are provided, thereby varying the direction of the propeller axis 1 and consequently the thrust direction relatively to the vertical longitudinal plane of the hull in order to obtain a transversal thrust component capable of providing a variation in the direction of the said hull.

The shaft 11 of the propeller 1 is operatively connected through the orthogonal axis bevel gears 12 to the vertical shaft 13 and the latter is in turn driven by the horizontal shaft 14 through the bevel gear couple 15.

The shaft 16, carried by the intermediate element B', drives the shaft 14 through a universal joint 17 intended to permit the free oscillation of the two parts B and C around the common axis of the pins 9 and 10, that is to provide a variation of the steering angle.

The driving or motor shaft 18, carried by the hull A, transmits motion to the shaft 14 through an intermediate shaft 19. The latter carries at its ends two bevel gears 20 and 21. The gear 20 cooperates with a bevel pinion (for orthogonal axes) 23 free to turn around its axis and meshing with a bevel pinion 24 keyed to the end of the driving shaft 18.

The rotation axis of the loose pinion 23 is provided by a pin 25 which is fixed in the hull and parallel to the axes of the pins 5 and 6 and located in the same plane as the latter. An analogous arrangement is provided at the other end of the shaft 18; with the bevel gear 21 cooperates a pinion 26 meshing with the bevel gear 27 keyed on the shaft 16.

The axis of the pinion 26 is provided by a pin 28 fixed in the element B', and the axis of which is coplanar with the axes of the pins 7 and 8. The supports of the shaft 19 (not illustrated in Fig. 1 and to be described in connection with the construction illustrated in Fig. 2) are in turn oscillatingly connected with respect to the axes of the pins 25 and 28, in such manner that, during the oscillation of the arms 3 and 4 the axis of the shaft 19 remains parallel to the lines connecting the centers of the pairs of pins 6—8 and 5—7 and incident with the axes of the pinions 23 and 26.

In the construction illustrated in Fig. 2, the pin 25 is supported at its ends by the fork 29 rigidly connected to the hull A. The axis of the pin 25 is horizontal and coplanar with the axis of the driving shaft 18 carried by the antifriction bearings 30 housed in a tubular projection 31 of the fork 29. A second fork 32 is articulated with its arm to the pin 25 and is also provided with a tubular projection 33 designed to house the antifriction bearings 34 supporting the shaft 35, perpendicular and coplanar with the axis of the pin 25. The axis of the shaft 18 also is perpendicular to the axis of the pin 25 and the two axes of the shafts 18 and 35 are coplanar, so that the shaft 35 can oscillate around the axis of the pin 25, remaining in the plane of the axes of the shafts 18 and 35, which plane is perpendicular to the axis of pin 25.

Upon the pin 25 is freely mounted the bevel pinion 23 for orthogonal axes which meshes with the bevel gear 24 integral with the end of shaft 18 and with the bevel gear 20 integral with the end of shaft 35. The latter transmits motion to the shaft 19 coaxial with it, through a toothed coupling 36 which provides for the termic expansions of the parts and the clearances.

The arrangement of the members 21, 26, 27, 28 is identical with the one just described.

The two forks 29 and 32, reciprocally oscillating around the axis of pin 25 are preferably interconnected

by an elastic sheath 37 protecting the internal sets of gears and ensuring the best lubrication conditions. The tubular ends of the forks 32 of the two transmission systems at the ends of the shaft 19 are preferably interconnected by a rigid tubular sheath 38, enclosing the shaft 19 itself and reacting to the stresses due to the transmitted couple.

The described arrangement practically replaces the usual universal joints, which, given the high angular range required in the described instance (which can be greater than 40°) cannot be utilized even if they are of the homologous type, as the device must constantly operate under a wide angle (and not for a short while) under maximum power. It is in fact known that in such conditions besides having a low transmission efficiency the universal joint is subject to an intolerable irregularity of rotation.

The device according to the invention permits, on the contrary, the transmission of motion under the best conditions even with large inclination angles between the shafts; for whatever angle the mechanical efficiency of the transmission is constant and defined by the transmission efficiency of the bevel gears of the mechanism.

During operation there are no cyclic variations of the angular velocity with respect to the velocity of the driving shaft.

In practice the constructional particulars may vary from those of the illustrated example, without departing from the ambit of the invention, and therefore from the scope of the Letters Patent thereof.

We claim:

1. A device for transmitting motion between a hull-carried driving shaft and a marine-propeller shaft, said device comprising a vertical shaft, means operatively connecting said vertical shaft with said marine-propeller shaft, a first horizontal shaft, means operatively connecting said vertical shaft with said horizontal shaft, a second horizontal shaft, a universal joint operatively interconnecting the two horizontal shafts, whereby said first horizontal shaft may be rotated horizontally with respect to said second horizontal shaft while said horizontal shafts remain operatively interconnected, an intermediate shaft, bevel gears upon opposite ends of said intermediate shaft, a pinion keyed to an end of said hull-carried driving shaft, a loosely mounted bevel pinion meshing with one of said bevel gears and said pinion, another pinion keyed to an end of the second horizontal shaft, another loosely mounted bevel pinion meshing with the other one of said bevel gears and said other pinion, a casing body carrying said marine-propeller shaft, said vertical shaft, the first- and second-mentioned connecting means and the first horizontal shaft, and means connected with said casing body for swinging the same.

2. A device in accordance with claim 1, comprising a hull-carried fork, a pin carried by said fork and loosely supporting the first-mentioned bevel pinion, bearings carried by said fork and carrying said driving shaft, a second fork carried by said pin, bearings carried by said second fork and carrying one of the first-mentioned bevel gears, and an elastic sheath enclosing the two forks.

3. A device for transmitting motion between a hull-carried driving shaft and a marine-propeller shaft, said device comprising a vertical shaft, bevel gears operatively connecting said vertical shaft with said marine-propeller shaft, a first horizontal shaft, bevel gears operatively connecting said vertical shaft with said horizontal shaft, a second horizontal shaft, a universal joint operatively interconnecting the two horizontal shafts, whereby said first horizontal shaft may be rotated horizontally with respect to said second horizontal shaft while said horizontal shafts remain operatively interconnected, an intermediate shaft, bevel gears upon opposite ends of said intermediate shaft, a pinion keyed to an end of said hull-carried driving shaft, a bevel pinion meshing with one of said bevel gears and said pinion, hull-carried means loosely supporting said bevel pinion, another pinion keyed to an end of the second horizontal shaft, a casing body carrying said marine-propeller shaft, said vertical shaft, the first- and second-mentioned connecting means and the first horizontal shaft, a casing element carrying said universal joint and the second horizontal shaft, vertical pins pivotally interconnecting said casing body and said casing element, another bevel pinion meshing with the other one of said bevel gears and said other pinion, a pin carried by said casing element and loosely supporting said other bevel pinion, two arms extending parallel to said intermediate arm, hull-carried means pivotally supporting adjacent ends of said two arms, and means carried by said casing element and pivotally supported by said other ends of said two arms, one of said arms comprising an extended portion for actuating said casing body and said casing element.

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