



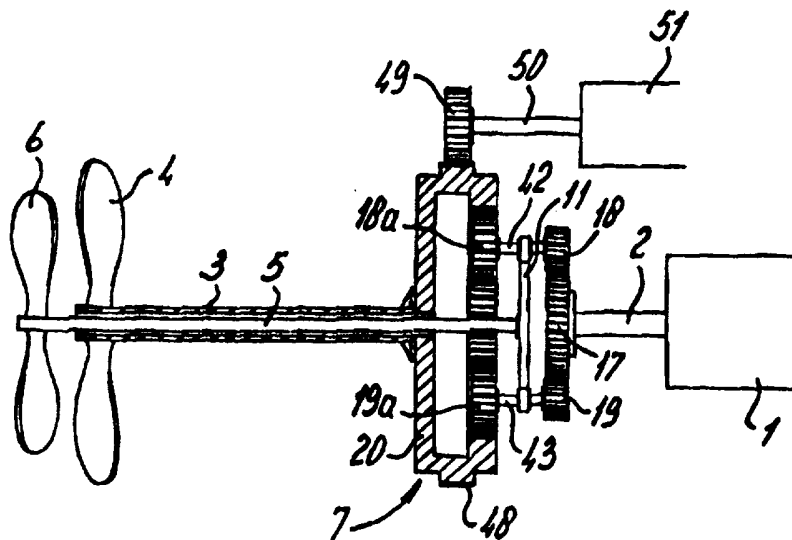
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/NL97/00357 (22) International Filing Date: 25 June 1997 (25.06.97) (30) Priority Data: 1003434 26 June 1996 (26.06.96) NL (71) Applicant: SCHELDE MARITIEM B.V. [NL/NL]; P.O. Box 555, NL-4380 AN Vlissingen (NL). (72) Inventor: LUDOLPHIJ, Johannes, Wilhelmus, Lubbertus; Luzacstraat 7, NL-4384 EW Vlissingen (NL). (74) Agent: DE BRUIJN, Leendert, C.; Nederlandsch Octrooibureau, Scheveningseweg 82, P.O. Box 29720, NL-2502 LS The Hague (NL).		(81) Designated States: NO, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>With amended claims.</i>

(54) Title: DIFFERENTIAL DRIVE FOR A SHIP HAVING TWO SHIP'S SCREWS

(57) Abstract

A ship has two ship's screws (4, 6). One screw (4) is fixed to a first hollow screw shaft (3) and the second screw (6) is fixed to a second screw shaft (5) which runs concentrically inside the first screw shaft (3). To drive the screw shafts, use is made of a main drive engine (1) and a differential (7), which is mounted between the shaft (2) of the engine (1) and the screw shafts (3, 5) and is able to make the screws (4, 6) rotate in opposing directions and can distribute the engine power dynamically over the screw shafts. In order to compensate for too high or too low a torque on one of the two screw shafts by being able to supply or take off power, the differential is connected via a gear transmission to a second engine or power take-off (51).



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Title: Differential drive for a ship having two ship's screws

The invention relates to a ship having two ship's screws, one of which is fixed to a first screw shaft of hollow construction and the other runs concentrically inside the first screw shaft, a main drive engine for the screw shafts and a differential which is mounted between
5 the shaft of the engine and the screw shafts and which is able to make the screws rotate in opposing directions and can distribute the engine power dynamically over the screw shafts.

10 A ship of this type is disclosed in EP-A 0 132 220.

The aim of the invention is to supplement this installation in such a way that too high or too low a torque on one of the two shafts can be compensated for by being able to supply or take off power.

15

According to the invention, the ship mentioned in the preamble is, to this end, characterised in that the differential is connected via a gear transmission to a second engine or to a power take-off (PTO).

20 Preferably, use is made of an embodiment wherein a pinion mounted on the shaft of the main drive engine engages with a number of planetary gears which are connected to one another by means of a coupling element and are connected via shafts to auxiliary planetary gears which engage in inward-facing toothing on an annular gear with which the hollow screw shaft is in direct connection, wherein the other screw shaft has a direct connection
25 to the coupling element and a gear mounted on the shaft of a second engine or PTO engages in toothing on the outside of the annular gear or of the coupling element.

The invention also relates to a differential for an abovementioned ship.

30 When a second engine is used, the entire system can be driven by the second engine, it being possible to operate at low power.

The invention will now be explained with reference to the figures.

Figures 1 and 2 show, partially in cross-section, embodiments of drive mechanisms for a ship according to the invention.

The ship's drive shown in the figures comprises an engine 1, an output shaft 2 of the engine, a hollow screw shaft 3 which has a first ship's screw 4 at the rear end, a screw shaft 5 which extends through the hollow shaft 3 and has a second ship's screw 6 at the rear end, and a differential 7 which ensures that when the engine is running the screws rotate in opposing directions and that the power of the engine is distributed dynamically over the screw shafts in such a way that a higher torque or lower speed of the one screw shaft corresponds to a lower torque or higher speed of the other screw shaft.

The differential mechanism according to Figure 1 is of the planetary type and has a pinion 17 which is mounted directly on the engine shaft 2 and engages in at least two planetary gears 18, 19, which are connected to one another by means of a coupling element 11. The hollow shaft 3 is fixed to an annular gear 20. The planetary gears 18, 19 are connected via shafts 42, 43 to auxiliary planetary gears 18a, 19a, which engage in inward-facing toothing on the annular gear 20. Incidentally, three or more planetary gears can also be present.

Toothings 48 is provided on the outer edge of the annular gear 20, in which toothing a gear 49 engages which, via a shaft 50, either takes off power from the unit 51 operating as second engine or supplies power to the unit 51 operating as PTO.

In the embodiment according to Figure 2, the gear 49 does not engage in external toothing on the annular gear 20 but in a relatively large gear 52, through which the connecting shafts 41 and 42 extend between, respectively, the gears 19 and 19a and the gears 18 and 18a.

The gear 52 thus connects the planetary gears 18, 19 and in this respect has the same function as the coupling 11 in Figure 1. The shaft 5 is connected to the centre of the gear 52.

With this embodiment as well, the units 1 and 51 can act both as engine and as PTO, the condition being, of course, that when one unit functions as the engine, the other unit

functions as the PTO.

The features essential to the invention are, on the one hand, that the differential is of such construction that neither of the drive shafts 3, 5 extends as far as the engine 1 and, on the
5 other hand, that an additional engine or PTO is integrated. A positive or negative surplus of torque in one of the two shafts can be compensated for by supplying power or taking off power.

If the unit 51 is an additional engine, the entire system can be driven by said engine, in
10 which case, for example, it is possible to operate at low power.

Claims

1. Ship having two ship's screws, one of which is fixed to a first screw shaft of hollow construction and the other runs concentrically inside the first screw shaft, a main drive
5 engine for the screw shafts and a differential which is mounted between the shaft of the engine and the screw shafts and which is able to make the screws rotate in opposing directions and can distribute the engine power dynamically over the screw shafts, characterised in that the differential is connected via a gear transmission to a second engine or to a power take-off (PTO).
- 10 2. Ship according to Claim 1, characterised in that a pinion (17) mounted on the shaft (2) of the main drive engine (1) engages with a number of planetary gears (18, 19) which are connected to one another by means of a coupling element (11; 52) and are connected via shafts (42, 43) to auxiliary planetary gears (18a, 19a) which engage in inward-facing
15 tothing on an annular gear (20) with which the hollow screw shaft (3) is in direct connection, in that the other screw shaft (5) has a direct connection to the coupling element (11; 52) and in that a gear (49) mounted on the shaft (50) of a second engine or PTO engages in tothing on the outside of an annular gear (20) or of the coupling element (52).
- 20 3. Differential for a ship according to Claim 2, comprising a pinion (17) which can be driven and which engages with a number of planetary gears (18, 19) which are connected to one another by means of a coupling element (11; 52) and are connected via shafts (42, 43) to auxiliary planetary gears (18a, 19a) which engage in inward-facing tothing on an annular gear (20), and a gear (49) which is mounted on a shaft (50) of a second engine or
25 PTO and engages in tothing on the outside of the annular gear (20) or of the coupling element (52).

AMENDED CLAIMS

[received by the International Bureau on 27 October 1997 (27.10.97);
original claims 1-3 replaced by new claims 1-3 (1 page)]

1. Ship having two ship's screws, one of which is fixed to a first screw shaft of hollow construction and the other runs concentrically
5 inside the first screw shaft, a main drive engine for the screw shafts and a differential which is mounted between the shaft of the engine and the screw shafts and which is able to make the screws rotate in opposing directions and can distribute the engine power dynamically over the screw shafts, the differential being connected via a gear
10 transmission to a second engine or to a power take-off (PTO), characterised in that a pinion mounted on the shaft (2) of the main drive engine (1) engages with a number of planetary gears (18, 18a; 19, 19a) which are connected to one another by means of a coupling element (11; 52) and which engage in inward-facing toothing on an
15 annular gear (20) with which the hollow screw shaft (3) is in direct connection, in that the other screw shaft (5) has a direct connection to the coupling element (11; 52) and that a gear (49) mounted on the shaft (50) of a second engine or PTO engages in toothing on the outside of an annular gear (20) or of the coupling element (52).
20
2. Ship according to claim 1, characterised in that each planetary gear comprises a first gear (18, 19) engaging with said pinion (17) and a second auxiliary gear (18a, 19a) engaging with said inward-facing toothing on said annular gear (20), both gears (18, 18a; 19, 19a respectively) of each planetary gear being connected to one
25 another by shafts (42, 43 respectively).
3. Differential for a ship according to claim 2 or 3, comprising a pinion (17) which can be driven and which engages with a number of
30 planetary gears (18, 18a; 19, 19a) which are connected to one another by means of a coupling element (11; 52) and which engage in inward-facing toothing on an annular gear (20), and a gear (49) which is mounted on a shaft (50) of a second engine or PTO and engages in toothing on the outside of the annular gear (20) or of the coupling
35 element (52).

fig-1

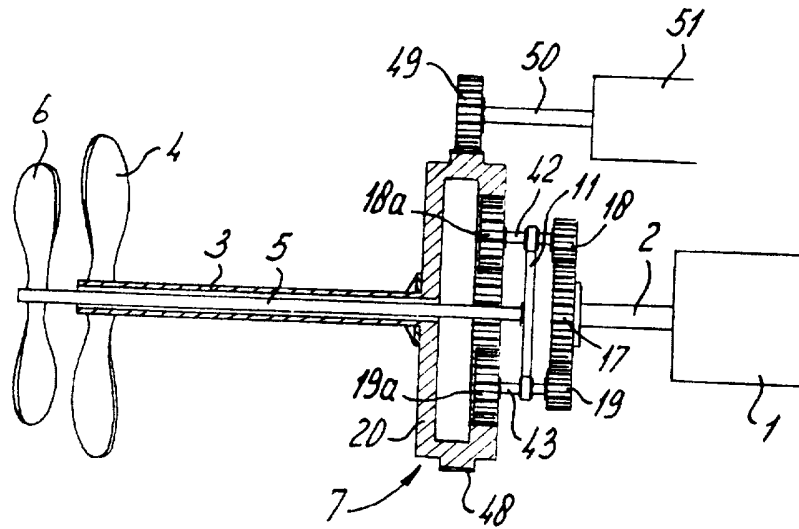
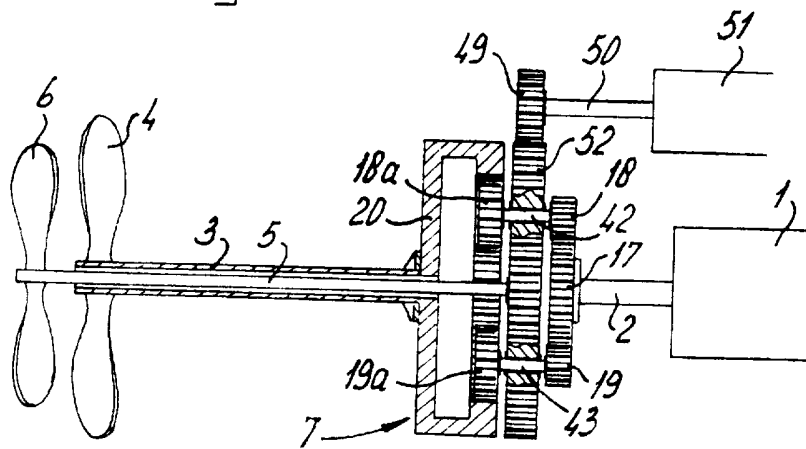


fig-2



INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 97/00357

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B63H5/10 B63H23/12 B63H23/18 F16H37/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B63H F16H B64D B64C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 3 447 611 A (P.LARSSON) 3 June 1969 see column 1, line 66 - column 2, line 22; figures ---	1 2,3
X	GB 2 031 549 A (CURTISS-WRIGHT CORPORATION) 23 April 1980 see abstract; figures ---	1
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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/NL 97/00357

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