(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 535 100 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**19.02.1997 Bulletin 1997/08**

(21) Application number: **91911884.4**

(22) Date of filing: **20.06.1991**

(51) Int Cl.[6]: **B63H 20/00**, B63H 23/08

(86) International application number:
**PCT/NO91/00088**

(87) International publication number:
**WO 91/19644 (26.12.1991 Gazette 1991/29)**

(54) **AN ARRANGEMENT IN CONNECTION WITH A SWINGABLE TURN-UP INBOARD/OUTBOARD STERN AGGREGATE FOR A CRAFT**

ANORDNUNG BEZÜGLICH EINES SCHWENKBAREN UND HOCHKLAPPBAREN INNENBORD-AUSSENBORD HECKELEMENTES FÜR EIN SCHIFF

AGENCEMENT RELATIF A UN ENSEMBLE ARRIERE INTERIEUR/EXTERIEUR, PIVOTANT ET RELEVABLE POUR UN BATEAU

(84) Designated Contracting States:
**AT BE CH DE DK ES FR GB GR IT LI LU NL SE**

(30) Priority: **20.06.1990 NO 902737**

(43) Date of publication of application:
**07.04.1993 Bulletin 1993/14**

(60) Divisional application: **96102868.5**

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EP 0 535 100 B1

Printed by Jouve, 75001 PARIS (FR)

## Description

The present invention relates to an arrangement in connection with a swingable turn-up inboard/outboard stern aggregate for craft with an inboard engine and an outboard drive unit comprising a screw, and of a kind as stated in the preamble of the following independent claim 1.

Such a stern aggregate is known from the applicant's previous NO-PS No. 158 335, the object of which was to reduce dimensions, especially the transversal dimension, of the lower portion of the housing surrounding the propeler shaft and screw shaft with bearings by using universal joints between the propeler shaft and the screw shaft.

In such a stern aggregate reversal of the direction of screw rotation may either be achieved by the aid of a gearbox in said inboard engine or, if desired, in the transmission from the latter to the stern aggregate.

The last mentioned concept will require space between the engine and the stern of the craft and it will also form an independent unit which has to be mounted, i.e. inserted between the stern aggregate and the engine.

It is an object of the present invention to provide a stern aggregate where such a gear or reversing means is part of the stern aggregate, so that such space as mentioned is saved, and labour for mounting is saved, since only the stern aggregate is to be mounted on the craft and connected with the engine.

According to the present invention the above object is achieved by the features appearing from the characterizing part of the following independent claim 1. The following dependent claims describe preferred embodiments.

An embodiment of the invention will be disclosed in more detail below with reference to the drawings, in which

Figure 1 is a side view and partly a sectional view of the stern aggregate, mounted on the stern of a craft;

Figure 2 is a diagrammatical top view of a stern aggregate with a pressure cylinder for lateral displacement of the stern aggregate for steering the craft and with pressure cylinders for turning the stern aggregate up and down into the water.

Figure 1 shows an inboard/outboard stern aggregate 1 the fastening means 1a of which is mounted on the stern of craft 10, and a driving unit 2 which is swingably fastened to fastening means 1a, via a horizontal transversal axis D (Figure 2) and an approximately vertical axis E, for lifting, and lowering, respectively, of driving unit 2 and for swinging driving unit 2 to steer craft 10 in motion. In fastening means 1a an inboard driving shaft 3 is mounted for connection with output shaft 3a, via a flange coupling 3b. Via a double universal joint A driving shaft 3 is connected with a transmission shaft 6 which is divided into two sections 6a, 6b. The first section 6a is mounted at the upper end of housing 7 and connected with said universal joint A, and its second end is connected with the second section 6b of transmission shaft 6, via angular gear B. The lower end of section 6b is, via a universal joint C, preferably a double universal joint, connected with a screw shaft 4, which is mounted in the lower rear end of housing 7, with a firm angle V between screw shaft 4 and lower section 6b of transmission shaft 6, which angle V is smaller than 45°, preferably 32°, with an approximately horizontal screw shaft 4. Universal joints A and C may, e.g. be of the ball-and-socket kind which may transmit high moments of torsion relative to its moderate external dimensions. When thin transmission and screw shafts 6, 4 are used at the same time, housing 7 and a lower portion of the same which forms the screw housing 7a, may be built with small transversal dimensions. The screw housing may, thus, be made narrow to reduce its resistance to water flow.

The drawing, however, shows that universal joints of the cardan type are used in the present case, and it is especially important to be able to use a double universal joint of the cardan type forming a transmission means C for torsional moment between lower section 6b of transmission shaft 6 and screw shaft 4 so as to reduce the bending loads on the universal joint and, thus, to reduce any vibration and loss of transmitted torsional moment to screw 5.

Above screw 5 a stabilizing plate 11 is provided. It is fastened to and extends rearwards from housing 7 in an approximately horizontal plane and in the waterline when the craft is in motion.

By the aid of pressure cylinders 9, which are fastened to fastening means 1a and housing 7, below the horizontal transverse axis D, driving unit 2 may be turned up and down and the inclined position of driving unit 2 is adjustable in order to provide the most suitable angle of attack of screw 5 in the direction of motion. In order to swing driving unit 2 about vertical axis D to steer the craft, a pressure cylinder 12 is provided as shown in Figure 2.

The above mentioned reversing means for changing the direction of rotation of screw 5 as well as for cutting off the same is designated D and is arranged together with angular gear B connecting upper section 6a of transmission shaft 6 with its lower section 6b.

As shown in Figure 1 angular gear B comprises two sets B1 and B2 of conical gears 11a, 11b, and 12a, 12b, with driving gears 11a, 12a being mounted to be engageable and disengageable on first/upper section 6a of transmission shaft 6 and being engaged with the driven gearwheels 11b, 12b, which are provided in a mutually non-rotatable engagement with the second section 6b. A conical intermediate gear 12c is arranged between the driving and the driven gear 12a, 12b to provide for opposite directions of rotation of section 6b when one

or the other driving gear 11a, 12a is engaged, or disengaged, respectively.

In order to achieve said engagement and disengagement of the driving gears 11a, 12a of first section 6a clutches 13, 14 are provided in connection with respective gears 11a, 12a and are controlled from a manoeuvring central 15.

Clutches 13, 14 are preferably air-oil actuated, the compressed fluid being supplied, via conduits 16, 17 in housing 7 to annular chambers 18, 19 in section 6a and, via bores 20, 21 in section 6a to a motor (not shown) in each clutch 13, 14. The clutches may be sliding clutches with one set of disks being fastened to section 6a and the other set being fastened to driving gears 11a, 12a, which two sets of frictional disks are made to contact each other by the aid of said pressure motor in each of the clutches 13, 14 by the aid of manoeuvring central 15 which is controlled by suitable means from the driver's seat in craft 10.

In the embodiment as shown in Figure 1, annular chambers 18, 19 are provided between driving gears 11a, 12a and may either consist of annular flanges, which are provided on section 6a and cooperate with an annular surface provided in housing 7, and with conduits 16, 17 opening into a respective annular chamber. The annular chamber, obviously, may consist of annular flanges extending inwards from said annular surface and being in contact with a corresponding external bearing surface on section 6a. From each of said annular chambers 18, 19 bores 20, 21 extend in section 6a to a pressure motor in each clutch 13, 14.

The driven gears 11b, 12b on section B are connected with each other in a manner preventing relative rotation, if desired, via splines 6c, and said gears may also be connected with section 6b, via said splines 6c to be mutually nonrotating. This is so to permit movement/elongation of section 6b, among others in case of changes of temperature, without influencing the position of gears 11b, 12b relative to the driving gears 11a, 12a, and intermediate gear 12c.

A gear pump 22 is provided on section 6a, suitably at the outer end of the latter, and is, via piping 23, 24 connected with the lower portion of housing 7 comprising an oil sump 25 near propeller shaft 4 and bearing 4a, and with manoeuvring central 15. From the manoeuvring central piping 16, 17 extends to annular chambers 18, 19 and clutches 13, 14.

From manoeuvring central 15 a return conduit (not shown) extends to oil sump 25 for return of pressure fluid when the manoeuvring central is disengaged, or via pressure valves, respectively, when the manoeuvring central is engaged for forward or rearward motion of the craft, i.e. in one or the other direction of rotation of screw 5.

Due to the fact that reversing gear/manoeuvring central 15 has been moved from craft 10 adjacent to the engine or engine shaft, to the stern aggregate and is mounted with the driving means of the latter, the total dimensions are reduced, and an independent component and mounting of the same is avoided. With this arrangement of the reversing means D between the first section 6a of transmission shaft 6 and its second section 6b, a reduced torsional moment is achieved with high rpm of the first section of transmission shaft 6 and, consequently, of the first universal joint A between first section 6a of transmission shaft 6 and the driving shafts 3, because angular gears B1, B2 are designed to be reduction gears. Second section 6b of transmission shaft 6, thus, has lower rpm and a higher moment of torsion for transmission to screw 5. The first section 6a of transmission shaft 6 with associated components may, thus, be designed with smaller dimensions, whereas the second section 6b with associated components must be designed with larger/stronger components for transmission of said higher moment of torsion.

## Claims

1. An arrangement in a swingable turn-up inboard/outboard stern aggregate (1) for craft with an inboard engine and outbord driving unit (2) comprising a screw (5), where an inboard driving shaft (3) of said stern aggregate (1) for connection with the engine is connected with a screw shaft (4), which is approximately horizontal in a position for use, and is mounted in a lower end region of a housing (7), via an upwardly directed transmission shaft (6) divided into first and second sections (6a, 6b) and surrounded by the housing (7), said first shaft section (6a), which is mounted (8) at a first end in an upper end region of said housing (7), is connected with said driving shaft (3) via a first universal joint (A) and, with a second end, is connected with an upper end of said second shaft section (6b) via angular gear (B), a lower end of said second section (6b) being connected with said screw shaft (4), at an angle (V), via a transmission means (C) of torsional moment, characterized in that a reversing means (D), provided with first and second driving gears (11a, 12a) on the reversing means (D) adapted to be, alternatively, connected with the first section (6a), via a respective fluid actuated clutch (13, 14) which is controlled by a manoeuvring central (15), is provided on said first shaft section (6a), this reversing means (D) through said gear (B) providing for reversal of the direction of rotation of said second section (6b) and thereby of said screw (5), via an operative position of said reversing means (D) in which said first shaft section (6a) is disengaged from said second section (6b).

2. An arrangement according to claim 1, characterized in that said clutches (13, 14) are actuated by a pressuirezed fluid, the pressurized fluid being supplied, via conduits (16, 17) in the housing (7), to annular

chambers (18, 19) on said first section (6a), and furthermore, via bores (20, 21) in that section (6a), to a pressure motor in each clutch (13, 14).

3. An arrangement according to claim 2, characterized in that said annular chambers (18, 19) are provided between the driving gears (11a, 12a).

4. An arrangement according to claim 2 or 3, characterized in that a gear pump (22) is provided on said first section (a), suitably at its second end, and is, via piping (23, 24) connected with a lower portion of said housing (7) comprising an oil sump (25), with said screw shaft (4), and a bearing (4a), and a manoeuvring central (15), and furthermore via the conduits (16, 17), with said annular chambers (18, 19) and said clutches (13, 14).

5. An arrangement according to claim 1, characterized in that the angular gear (B) comprises two sets (B1, B2) of conical gears (11a, 11b and 12a, 12b), the driving gears (11a, 12a) of which are mounted to be engageable and disengageable on said first section (6a) of said transmission shaft (6) and are engaged with said driven gears (11b, 12b), which are provided in a mutually nonrotatable engagement with said second section (6b), a conical intermediate gear (12c) being provided between one (12a) of said driving gears (11a, 12a) and one (12b) of said driven gears (11b, 12b) for providing an opposite direction of rotation of said section (6b) when one or the other of said driving gears (11a, 12a) is engaged on said first section (6a).

6. An arrangement according to claim 5, characerized in that said driven gears (11b, 12b) are mutually connected and are connected with said second section (6b) via splines (6c).

**Patentansprüche**

1. Eine Anordnung in einem schwenkbaren und hochklappbaren Innenbord/Außenbord-Heckaggregat (1) für ein Schiff mit einem Innenbord-Motor und einer eine Schraube (5) umfassenden Außenbord-Antriebseinheit (2), wobei eine Innenbord-Antriebswelle (3) des Heckaggregats (1) zur Verbindung mit dem Motor mit einer Schraubenwelle (4) verbunden ist, die in Betriebsstellung etwa horizontal verläuft und in einem unteren Endbereich eines Gehäuses (7) montiert ist, und zwar über eine nach aufwärts gerichtete Transmissionswelle (6), die in erste und zweite Abschnitte (6a, 6b) unterteilt und vom Gehäuse (7) umschlossen ist, wobei der erste Wellenabschnitt (6a), der in einem oberen Endbereich des Gehäuses (7) an einem ersten Ende (8) montiert ist, mit der Antriebswelle (3) über ein erstes Universalgelenk (A) und an einem zweiten Ende mit einem oberen Ende des zweiten Wellenabschnitts (6b) über ein Winkelgetriebe (B) verbunden ist, wobei ein unteres Ende des zweiten Abschnitts (6b) in einem Winkel (V) über ein Drehmoment-Transmissionsmittel (C) mit der Schraubenwelle (4) verbunden ist,
**dadurch gekennzeichnet,**
daß am ersten Wellenabschnitt (6a) ein mit ersten und zweiten Getrieberädern (11a, 12a) versehenes Umkehrmittel (D) vorgesehen ist, das über eine jeweilige mediumbetätigte Kupplung (13, 14) wahlweise mit dem ersten Wellenabschnitt (60) verbindbar ist, wobei die Kupplungen (13, 14) durch eine Manövrierzentrale (15) gesteuert sind und das Umkehrmittel (D) durch das Getriebe (B) eine Umkehr der Drehrichtung des zweiten Abschnitts (6b) und hierdurch der Schraube (5) vermittelt, und zwar über eine Betriebsstellung des Umkehrmittels (D), in welcher der erste Wellenabschnitt (6a) vom zweiten Abschnitt (6b) abgelöst ist.

2. Eine Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die Kupplungen (13, 14) durch ein unter Druck stehendes Medium betätigt sind, wobei das unter Druck stehende Medium über Leitungen (16, 17) im Gehäuse (7) ringförmigen Kammern (18, 19) an dem ersten Abschnitt (6a) zugeführt wird, und weiterhin über Bohrungen (20, 21) in diesem Abschnitt (6a) zu einem Druckmotor in jeder Kupplung (13, 14).

3. Eine Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß die ringförmigen Kammern (18, 19) zwischen den Getrieberädern (11a, 12a) vorgesehen sind.

4. Eine Anordnung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß eine Getriebepumpe (22) am ersten Abschnitt (6a), in geeigneter Weise an dessen zweitem Ende, vorgesehen und über Leitungen (23, 24) mit einem unteren, einen Ölsumpf (25) umfassenden Teil des Gehäuses (7), mit der Schraubenwelle (4), und einem Lager (4a) und einer Manövrierzentrale (15) verbunden ist, und weiterhin über die Leitungen (16, 17) mit den ringförmigen Kammern (18, 19) und den Kupplungen (13, 14).

5. Eine Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß das Winkelgetriebe (B) zwei Sätze (Bl, B2) konischer Getrieberäder (11a, 11b und 12a, 12b) umfaßt, wobei die Antriebsgetrieberäder (11a, 12a)des Getriebes so montiert sind, daß sie an den ersten Abschnitt (6a) der Transmissionswelle (6) ankuppelbar und von diesem Abschnitt wieder abkuppelbar sind, und in die angetriebenen Getrieberäder (llb, 12b) eingreifen, die in einem gegenseitigen nicht drehbaren Eingriff mit dem zwei-

ten Abschnitt (6b) vorgesehen sind, wobei ein konisches Zwischengetrieberad (12c) zwischen einem (12a) der treibenden Getrieberäder (11a, 12a) und einem (12b) der angetriebenen Getrieberäder (11b, 12b) vorgesehen ist, um eine entgegengesetzte Drehrichtung des Abschnittes (6b) zu vermitteln, wenn das eine oder andere der antreibenden Getrieberäder (lla, 12b) an den ersten Abschnitt (6a) angekuppelt ist.

**6.** Eine Anordnung nach Anspruch 5, dadurch gekennzeichnet, daß die angetriebenen Getrieberäder (llb, 12b) ũber Keilnuten (6c) gegenseitig und mit dem zweiten Abschnitt (6b) verbunden sind.

**Revendications**

**1.** Agencement dans un ensemble (1) de poupe intérieur/hors-bord relevable pivotant pour un navire avec un moteur in-bord et une unité d'entraînement hors-bord (2) comprenant une hélice (5), dans lequel un arbre d'entraînement intérieur (3) dudit ensemble de poupe (1) pour le raccordement avec le moteur est raccordé à un arbre d'hélice (4) qui est approximativement horizontal dans une position d'utilisation, et est monté dans une région d'extrémité inférieure d'un carter (7), par l'intermédiaire d'un arbre de transmission dirigé vers le haut (6) divisé en première et deuxième sections (6a, 6b), et entouré par le carter (7), ladite première section d'arbre (6a), qui est montée (8) en une première extrémité d'une région d'extrémité supérieure dudit carter (7), est raccordée audit arbre d'entraînement (3) par l'intermédiaire d'un premier joint universel (A), et, par une deuxième extrémité, est raccordée à une extrémité supérieure de ladite deuxième section d'arbre (6b) par l'intermédiaire d'un engrenage angulaire (B), une extrémité inférieure de ladite deuxième section (6b) étant raccordée audit arbre d'hélice (4), selon un angle (V), par l'intermédiaire de moyens de transmission (C) de moment de torsion, caractérisé en ce que des moyens d'inversion (D) comportant des premier et deuxième engrenages d'entraînement (11a, 12a) sur les moyens d'inversion (D) adaptés pour être alternativement raccordés à la première section (6a) par l'intermédiaire d'un embrayage actionné par un fluide respectif (13, 14) qui est commandé par une centrale de manoeuvre (15) sont présents sur ladite première section d'arbre (6a), ces moyens d'inversion (D) assurant par l'intermédiaire dudit engrenage (B) l'inversion de la direction de rotation de ladite deuxième section (6b), et, par conséquent, de ladite hélice (5), par l'intermédiaire d'une position d'actionnement desdits moyens d'inversion (D) dans laquelle ladite première section d'arbre (6a) est dégagée de ladite deuxième section (6b).

**2.** Agencement selon la revendication 1, caractérisé en ce que lesdits embrayages (13, 14) sont actionnés par un fluide sous pression, le fluide sous pression étant délivré, par l'intermédiaire de conduits (16, 17) dans le carter (7), à des chambres annulaires (18, 19) sur ladite première section (6a), et, de plus, par l'intermédiaire de perçages (20, 21) dans cette section (6a), à un moteur à pression dans chaque embrayage (13, 14).

**3.** Agencement selon la revendication 2, caractérisé en ce que lesdites chambres annulaires (18, 19) sont disposées entre les engrenages d'entraînement (11a, 12a).

**4.** Agencement selon la revendication 2 ou la revendication 3, caractérisé en ce qu'une pompe à engrenages (22) est présente sur ladite première section (a), de façon appropriée au niveau de sa deuxième extrémité, et est, par l'intermédiaire de tubulures (23, 24) raccordée à une partie inférieure dudit carter (7) comprenant une cuvette de carter d'huile (25), audit arbre d'hélice (4), et à un palier (4a) et à une centrale de manoeuvre (15), et, de plus, par l'intermédiaire des conduits (16, 17), auxdites chambres annulaires (18, 19) et auxdits embrayages (13, 14).

**5.** Agencement selon la revendication 1, caractérisé en ce que l'engrenage angulaire (B) comprend deux jeux (B1, B2) d'engrenages coniques (11a, 11b et 12a, 12b), dont les engrenages d'entraînement (11a, 12a) sont montés de façon à pouvoir être mis en prise sur ladite première section (6a) dudit arbre de transmission (6) et à ce que cette prise puisse être relâchée, et sont mis en prise avec lesdits engrenages entraînés (11b, 12b), qui sont disposés en prise mutuellement non rotative avec ladite deuxième section (6b), un engrenage intermédiaire conique (12c) étant présent entre l'un (12a) desdits engrenages d'entraînement (11a, 12a), et l'un (12b) desdits engrenages entraînés (11b, 12b) pour permettre une direction de rotation opposée de ladite section (6b) lorsque l'un ou l'autre desdits engrenages d'entraînement (11a, 12a) est en prise sur ladite première section (6a).

**6.** Agencement selon la revendication 5, caractérisé en ce que lesdits engrenages entraînés (11b, 12b) sont mutuellement raccordés et sont raccordés à ladite deuxième section (6b) par l'intermédiaire de cannelures (6c).

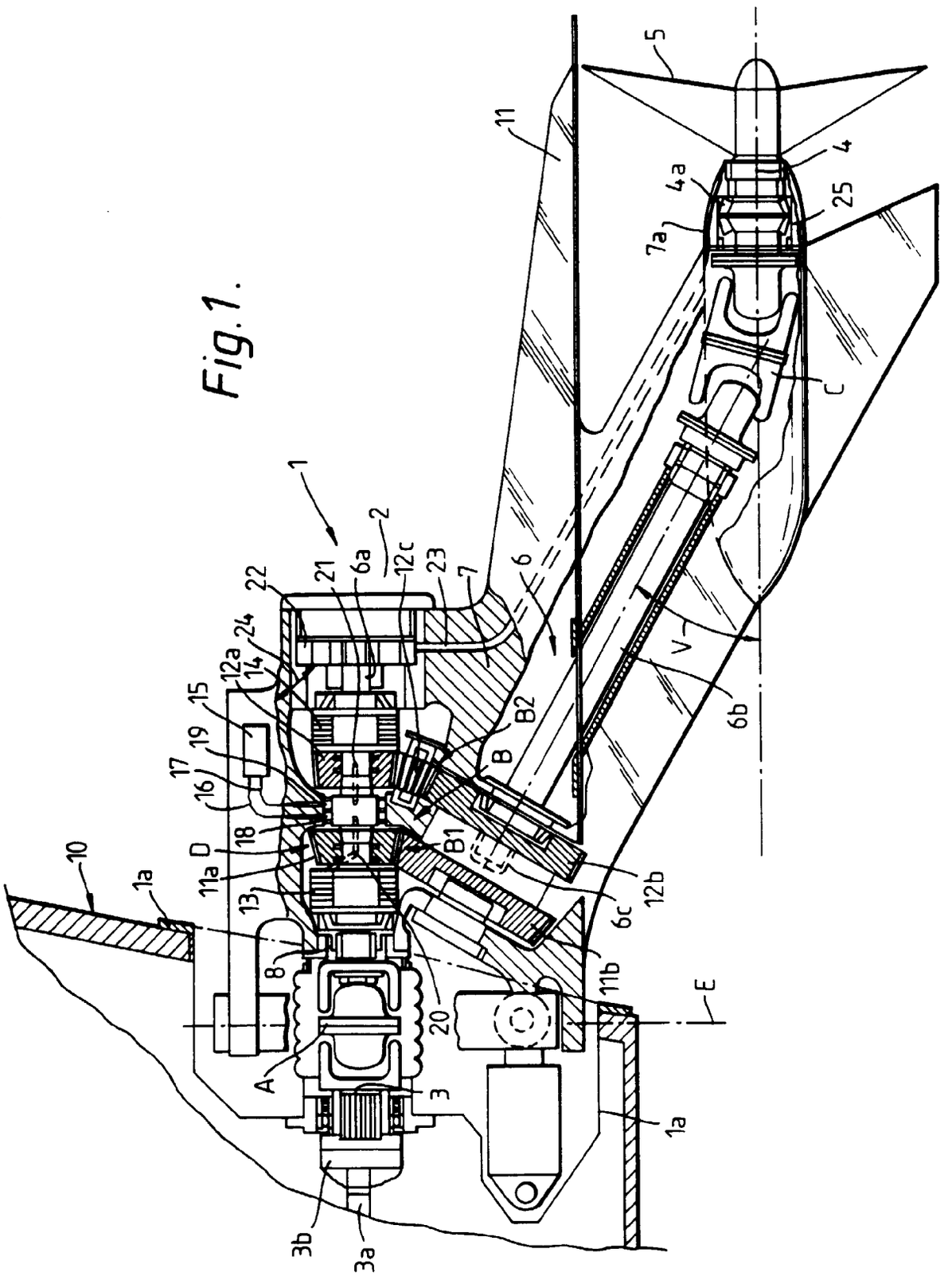

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Fig.1.

Fig. 2.

