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

(11) Publication number : **0 545 666 A3**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92310941.7**

(51) Int. Cl.[5] : **B63H 1/26,** B63H 3/10

(22) Date of filing : **01.12.92**

(30) Priority : **02.12.91 US 801713**
02.12.91 US 801719

(43) Date of publication of application :
09.06.93 Bulletin 93/23

(84) Designated Contracting States :
DE FR GB IT SE

(88) Date of deferred publication of search report :
04.08.93 Bulletin 93/31

(71) Applicant : **BRUNSWICK CORPORATION**
One Brunswick Plaza
Skokie Illinois 60077 (US)

(72) Inventor : **Karls, Michael A.**
N6018 Lakeshore Drive
Hilbert, Wisconsin 54129 (US)
Inventor : **Koepsel, Roger E.**
1141 North Oakwood Road
Oshkosh, Wisconsin 54904 (US)
Inventor : **Steiner, Ronald M.**
4245 Fond du Lac Road
Oshkosh, 54901 (US)

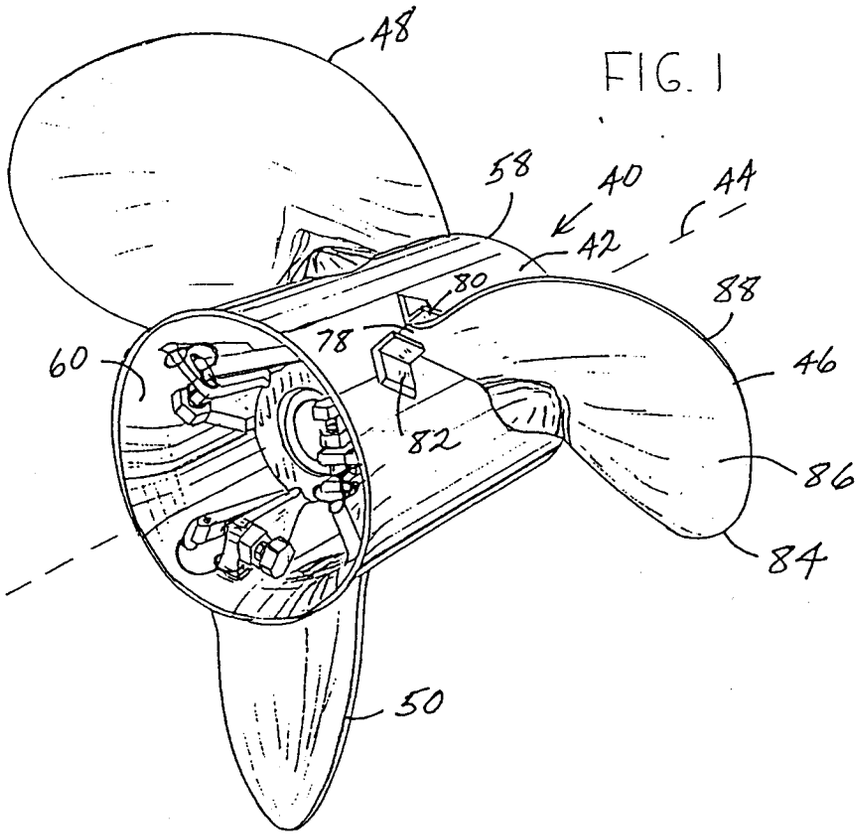
(74) Representative : **Burke, Steven David et al**
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ (GB)

(54) Variable pitch marine propeller with hydrodynamic shifting and shift biasing and synchronizing mechanism.

(57) A marine propeller includes a hub rotatable about a longitudinal axis and having a plurality of blades extending radially outwardly therefrom and pivotable about respective radial pivot axes between a low pitch position and a high pitch position. Each blade has a hydrodynamic force characteristic which shifts the location of the resultant hydrodynamic force on the blade in a direction aiding up-pitching of the blade, and increasing the up-pitching pivot moment with decreasing angles of attack. A counteractive hydrodynamic force generating area is provided on the negative pressure backside surface of the blade and shifts the location of the resultant hydrodynamic force on the frontside surface forwardly with decreasing angle of attack. The blade is pivoted by increased water flow along the counteractive hydrodynamic force generating area with decreasing angles of attack, which increased water flow generates a backside hydrodynamic force on the blade at the counteractive hydrodynamic force generating area spaced from the pivot axis by a moment arm provided by the section of the blade between the pivot axis and the counteractive hydrodynamic force generating area, such that the backside hydrodynamic force acting on the moment arm pivots the blade to an increased pitch position. The counteractive hydrodynamic force generating area on the backside surface at the rearward trailing portion separates water flow along the backside surface at high angles of attack, and re-attaches water flow along the backside surface at low angles of attack to change the backside surface at the rearward trailing portion to a positive pressure area to generate the up-pitching moment. A disc has a plurality of guide slots each receiving and retaining a respective lever arm extending rearwardly within the hub from a respective blade. A biasing spring coaxial with the longitudinal axis of rotation of the hub biases the disc to in turn bias the lever arms and blades to the low pitch position. The disc is a generally flat planar plate-like member extending radially outwardly from the longitudinal axis at the rear of the hub and includes a preload mechanism accessible at the rear of the hub for adjusting the bias. The disc restricts movement of the lever arms along the guide slots such that the lever arms can move only in unison, which prevents blade flutter. Pivoting of the blades is controlled by both a) movement of the lever arms along the guide slots, and b) arcuate movement of the guide slots as the disc rotates about the longitudinal axis, such that pivoting of each blade from its low pitch position to its high pitch position requires both a) movement of the respective lever arm along its respective guide slot, and b) rotation of the disc to arcuately move the guide slot.

EP 0 545 666 A3

FIG. 1



European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 92 31 0941

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	DE-C-410 401 (R.SCHULZE) * the whole document *	1-5,7-9 6,18,19	B63H1/26 B63H3/10
Y,D	US-A-4 929 153 (S.SPEER) * column 4, line 58 - column 5, line 20; figures 4,5 *	6,18,19	
X	ENGINEERING no. 3, March 1988, LONDON page 124 'Boat propeller has self-pitching blades'	1-9	
X	DE-A-3 640 780 (M.BLAUER) * claims; figure 6 *	8	
X Y A	US-A-2 682 926 (L.EVANS) * column 2, line 37 - column 5, line 33 * * figures *	10-12 18,19 13	
X	US-A-2 988 156 (T.COLEMAN) * the whole document *	10-12	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-3 229 772 (D.MILLER) * figures *	10,13,18	B63H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 MAY 1993	STIERMAN E.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

European Patent Office

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

namely claims:

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,
namely:

see sheet -B-

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid,

namely claims:

☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims,

namely claims:

European Patent Office

EP 92 31 0941 -B-

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-9,18 : Controllable pitch propeller with special blade profile

2. Claims 10-17, 19 : Controllable pitch propeller with biasing spring