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**Hydraulic stern drive for boats.**

A hydraulic stern drive for boats essentially comprises a fixed portion and a movable portion, including a propeller driving hydraulic motor and being coupled by a cross journal allowing the movable portion to be driven about a horizontal axis and a vertical axis, the cross journal being adapted to transmit to the boat the forces or stresses generated between the movable and fixed portions.

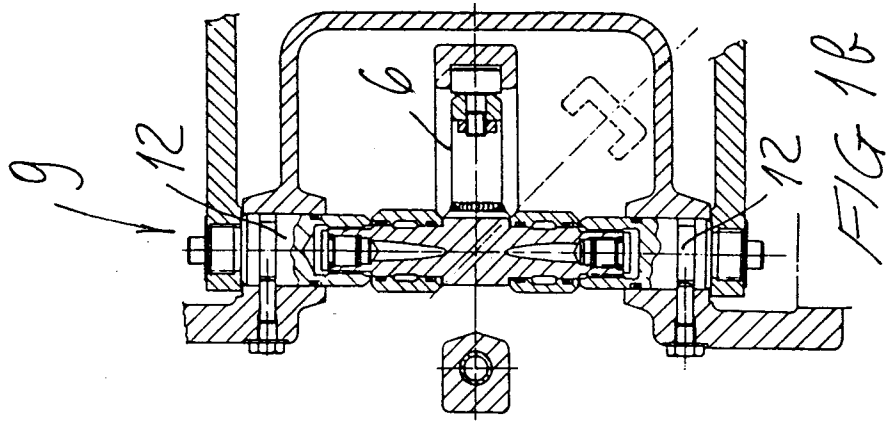
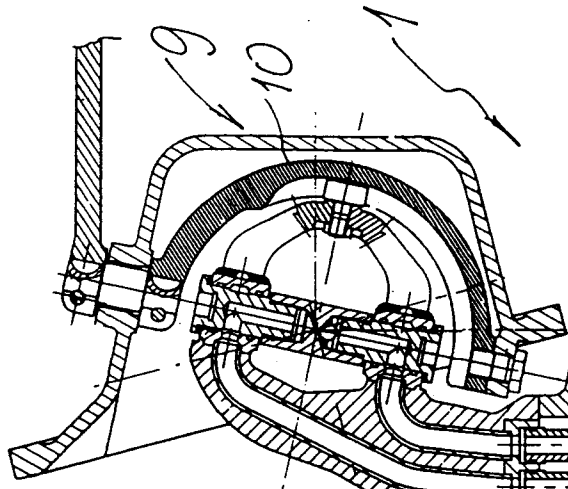
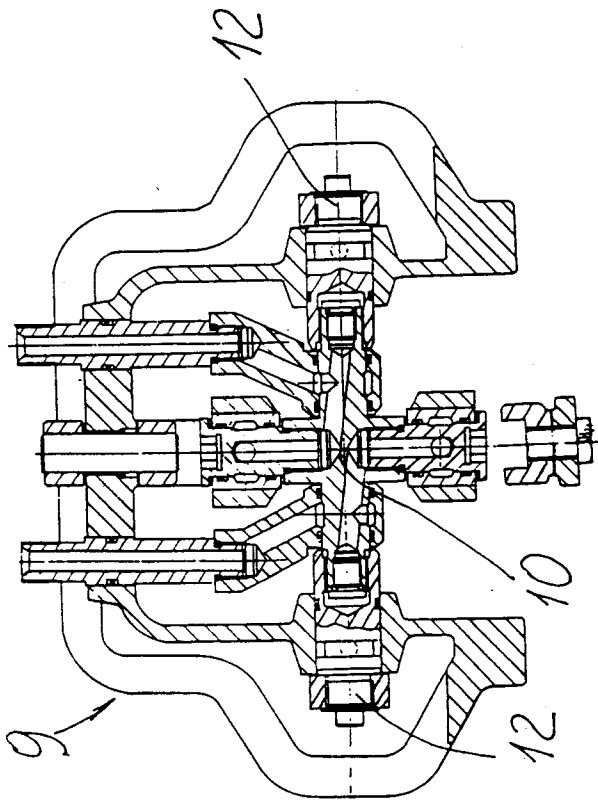
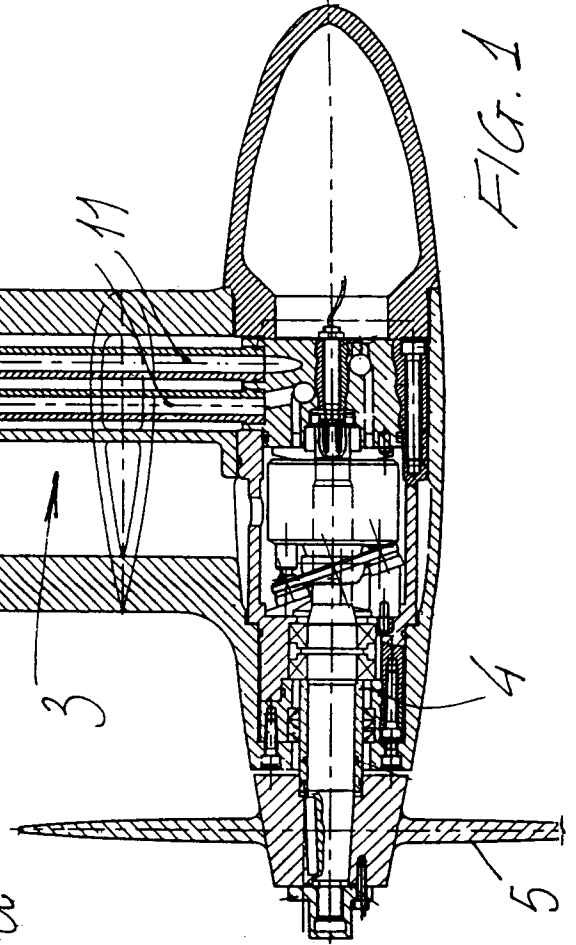


FIG. 10a



## BACKGROUND OF THE INVENTION

The present invention relates to a stern drive for boats,said drive being of a hydraulic operated type.

As is known,conventional stern drives transfer mechanical power from the primary motor or engine to the boat propeller,by exclusively using mechanical elements,such as cardanic joints,shafts,resilient joints or couplings,motion reversing units,gear wheels and the like.

Because of inherent limitations of conventional cardanic joints,however,these drives are not devoid of drawbacks,for example with respect to the movements for raising the drive assembly and for turning the boat.

In fact,the above mentioned prior drives allow a maximum turning angle of about 60-65° related to a horizontal axis and of about  $\pm 35^\circ$  with respect to a vertical axis.

Thus,under great angle turning conditions, the power which can be transmitted to the propeller is severely limited.

## SUMMARY OF THE INVENTION

Accordingly,the main object of the present invention is to overcome the above mentioned drawback, by providing a stern drive for boats which allows a greater turning range of the drive assembly both about a vertical axis and about a horizontal axis.

Another object of the present invention is to provide such a drive which can transmit to the boat propeller a power as great as possible,even under great angle turning conditions.

Yet another object of the present invention is to provide such a stern drive for boat which is very reliable in operation.

According to one aspect of the present invention, the above mentioned objects,as well as get other objects,which will become more apparent hereinafter, are achieved by a stern drive for boats,characterized in that said drive essentially comprises a fixed portion and a movable portion,including a propeller driving hydraulic motor,said fixed and movable portions being coupled by a cross journal allowing the movable portion to turn about a horizontal axis and a vertical axis, and causing said hydraulic motor to be supplied with a pressurized fluid derived from a pump driven by primary motor means,said cross journal being moreover adapted to transmit to the boat stresses generated between said movable and fixed portions.

## BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the present invention will become more apparent from the following detailed description of a Preferred embodiment thereof,which is illustrated,by way of an indica-

tive but not limitative example,in the figures of the accompanying drawings,where:

figure 1 is a schematic view illustrating a stern drive provided with a hydraulic motor according to the present invention;

figs. 1a and 1b are respectively a front view and a top plan view illustrating a cross journal forming a main portion of the stern drive according to the present invention; and

Figs. 2 and 3 illustrate two possible methods for supplying the hydraulic motor.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the figures of the accompanying drawings,the stern drive for boats according to the present invention essentially comprises a fixed portion indicated generally at 1,flange coupled to the stern board or transom 2 of the boat,and a movable portion 3 including a hydraulic motor assembly 4 driving a propeller 5.

The fixed portion is moreover provided with hydraulic fixtures 6,either of the treaded or flanged type,for supplying the hydraulic motor with a pressurized hydraulic fluid delivered from a pump 7 in turn driven by a primary motor or engine 8.

Said movable portion 3 substantially comprises the drive assembly proper and a mechanism 9 for allowing the bottom or foot of the drive assembly to be raised off water,by a movement about a suitable horizontal axis,and the boat to turn,by a movement about a suitable vertical axis.

In this connection it should be apparent to those skilled in the art that both the weight of the movable portion of the drive and the driving force of the boat propeller,as well as the side force generated during a turning movement of the boat,will be 'discharged' onto the boat by means of the above disclosed mechanism,which practically constitutes a suspension system.

This suspension system,in particular, comprises a cross journal 10 which,in addition to allowing the movable portion 3 to be displaced about the mentioned axes,is also adapted to transfer the several forces or stresses from the movable to the fixed portion of the drive and,hence,to the boat hull.

The cross journal,moreover,will transmit from the fixed portion to the movable portion,by means of suitable ducts 11,the hydraulic power fluid required for driving the boat.

To that end it is possible to use both several perforations inside the cross journal (not shown) and bushes 12 applied at the end portions of the cross journal and mounted so as to perform a rotary movement with respect to the end portions.

On the mutual sliding surfaces of the bushes and cross journal,in particular,seals will be applied for pre-

venting any leakage of the pressurized oil circulating in the inside.

Thus,owing to the provision of the cross journal-/bush assembly,from the fixed portion to the movable portion of the drive (and vice versa) it will be possible to transmit both the pressurized oil and the oil returning from the hydraulic motor,which will transform again the hydraulic power into mechanical power for driving the propeller 5.

A main feature of the present invention is that a broad raising and turning angle range is provided thereby.

In fact the provision of the cross journal provides raising and turning angles which are much greater than those provided by conventional prior mechanical driving assemblies.

In particular,as is shown in figure 2,a primary driving or motor 8-pump 7 assembly can be provided cooperating with a like emergency assembly, indicated generally at 13.

The operation of these two assemblies,in order to operate the driving assembly 14,can be either simultaneous or not,depending on requirements, and this can be obtained by switching on and off either one or the other of said assemblies by operating corresponding taps 15 and 16.

As shown in figure 3,it is also possible to supply,by the same primary motor 8 and a pair of pumps 7,two driving assemblies 14,separated from one another,with great advantages from a reliable operation standpoint.

In this connection it should be also apparent that the latter approach,using a single primary motor and a double driving assembly,can be integrated by an auxiliary or emergency assembly supplying either one or both said driving assemblies.

While the invention has been disclosed and illustrated with reference to a preferred embodiment thereof,it should be apparent that the disclosed embodiment is susceptible to several modifications and variations all of which will come within the spirit and scope of the appended claims.

## Claims

**1-** A stern drive for boats,characterized in that said drive comprises a fixed portion and a movable portion,including a propeller driving hydraulic motor, said fixed and movable portions being coupled by a cross journal allowing the movable portion to turn about a horizontal axis and a vertical axis,and causing said hydraulic motor to be supplied with a pressurized hydraulic fluid delivered by a pump driven by primary motor means,said cross journal being moreover adapted to transmit to the boat stresses generated between said movable and fixed portions.

**2-** A stern drive according to claim 1,charac-

terized in that said cross journal transmits from said fixed portion to said movable portion,by duct means,a propelling hydraulic power,said cross journal being provided either with perforations or bushes,said bushes being rotatively supported on end portions of said cross journal.

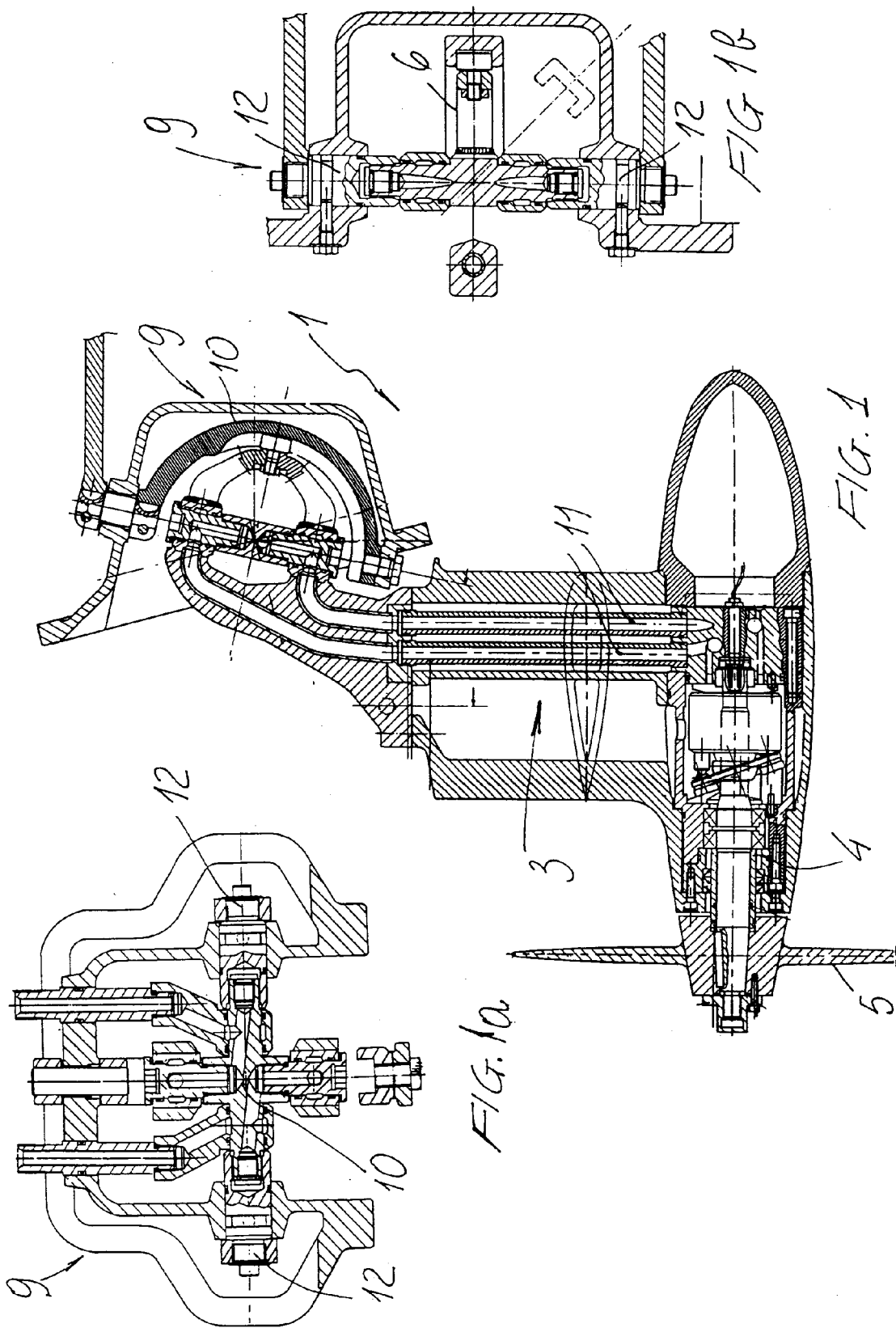
**3-** A stern drive according to claim 1,wherein said cross journal is assembled so as to allow the boat drive assembly to be raised,by displacement about a horizontal axis,by an angle greater than 60°.

**4-** A stern drive according to claim 1,wherein said cross journal is so assembled as to allow the boat drive assembly to be turned about a vertical axis by an angle greater than  $\pm 35^\circ$ .

**5-** A stern drive according to claim 1,wherein pressurized hydraulic fluid is supplied either in parallel or by one or more assemblies including a primary motor and a pump.

**6-** A stern drive according to claim 1,wherein said drive comprises at least two drive assemblies driven by a primary motor operating corresponding pumps.

**7-** A stern drive according to claim 1,wherein said drive comprises a plurality of primary motors,operating as auxiliary or emergency motors,and adapted to be coupled to said drive assemblies through switching tap elements.



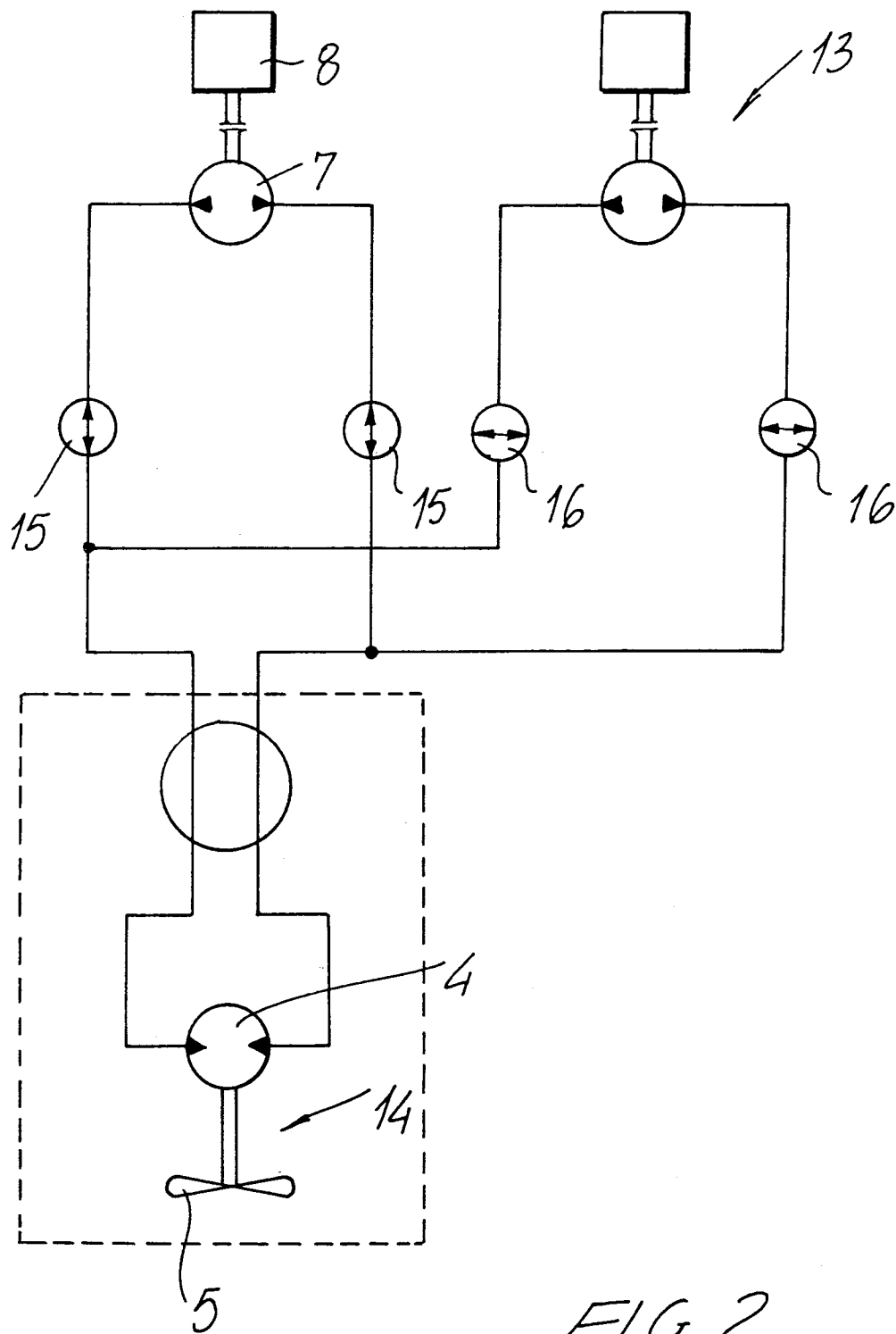


FIG. 2

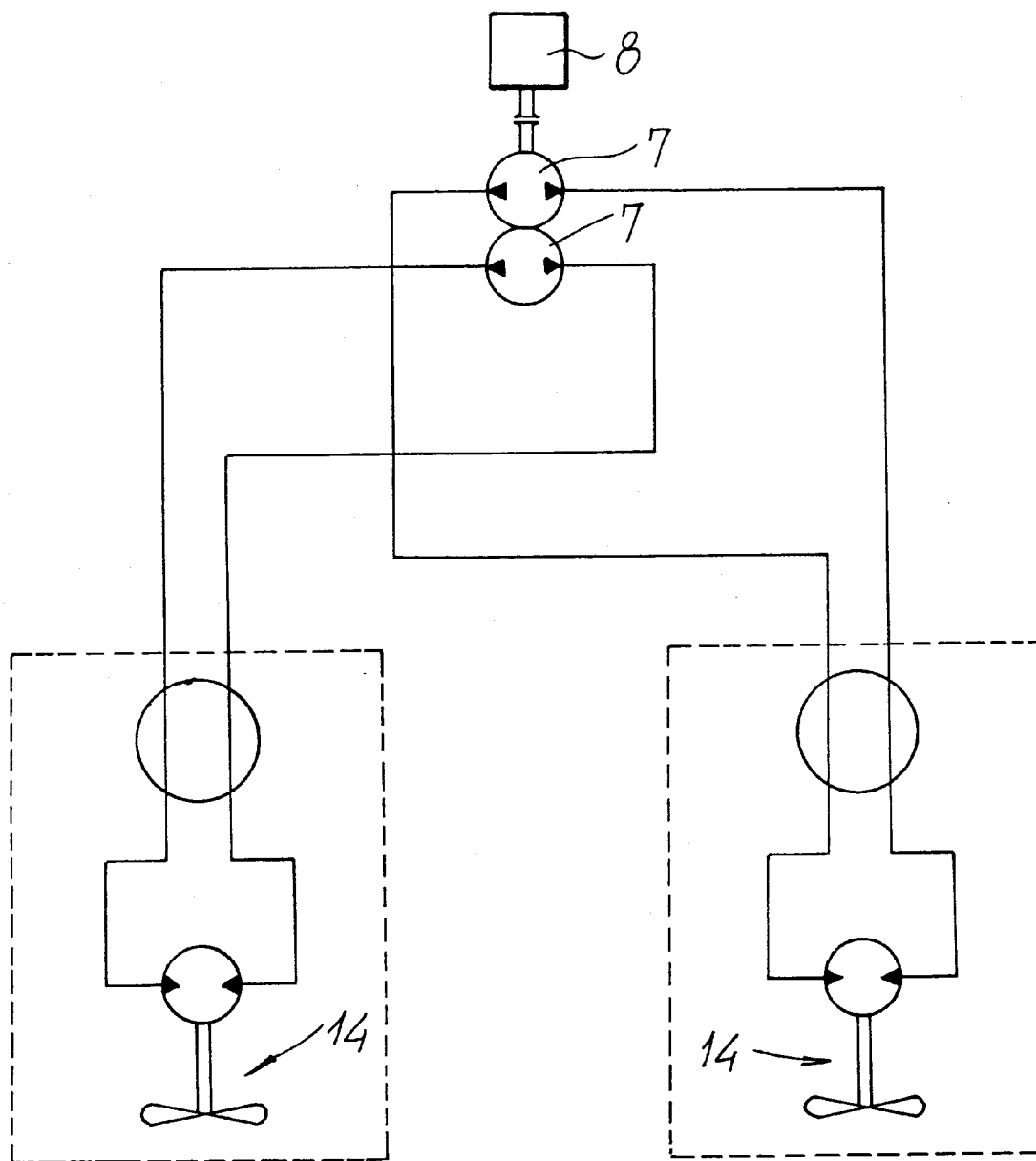


FIG. 3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 91 83 0395

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	US-A-3 847 107 (BUDDRUS) * Column 3, line 42 - column 4, line 33; figures 1-10 *	1-4	B 63 H 23/26
Y	---	5-7	
X	US-A-4 878 864 (VAN BENTEM) * Column 3, line 56 - column 7, line 49; figures 1-6 *	1-4	
A	---	5-7	
Y	EP-A-0 251 995 (NAUTICAL PROPULSION RESEARCH) * Whole document *	5-7	
A	GB-A- 961 740 (STONE MANGANESE MARINE LTD) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 63 H
Place of search THE HAGUE		Date of completion of the search 30-12-1991	Examiner DE SENA Y HERNANDORENA A
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