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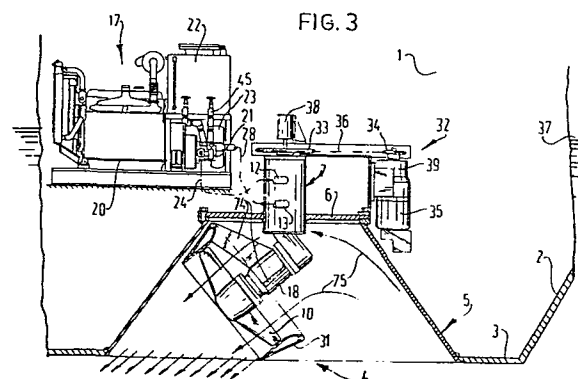
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54 **A device for controlling the bow of a ship.**

57 The device comprises a propeller housing (5), arranged in the bottom (3) in the interior part of the ship, and a propelling screw (10) which is e.g. rotatably driven by a hydromotor (18) connected with a hydropump being joined to a diesel engine. The propeller housing is essentially rotation-symmetrical to a standing axis of symmetry and open and tapering towards the ship's bottom and the main spindle is rotatably journalled in and coaxial with the housing with the aid of main-spindle bearing means (7). The propeller shaft (9) is transversely journalled with the aid of propeller-shaft bearing means (14), so as to be rotatable at an acute angle to the main spindle (8) and the main spindle with the propelling screw is rotatable by rotary means. The propeller screw may be supplied with a jet tube (31) and the bottom of the propeller house with guide blades (92).



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Device for steering a ship's bow

The invention relates to a device for steering a ship's bow, comprising a propeller housing arranged in the bottom in the interior part of the ship, a propeller shaft journaled in propeller-shaft bearing means connected with the propeller housing and rotatably driven by driving means and a propelling screw fastened to said shaft.

In the European Patent Application 79,103111,5 a device of this type is disclosed, which operates particularly satisfactorily. The propeller housing is in this case a tunnel having an inlet port and an outlet port located at a distance from the former, both ports being located in the bottom of the ship. The propelling screw is mounted in the tunnel. The propelling screw supplies a propulsive force by sucking in water through the inlet port and by pressing it out through the outlet port. The direction in which the propulsive force is operating can be varied for steering the ship's bow by means of a guide-blade grating rotatably journaled in

the outlet port of the tunnel, said grating deflecting the water pressed out and providing a horizontal motion component. By turning the guide-blade grating the direction of this horizontal motion component is varied. However, for 5 small ships this construction is excessively bulky and complicated.

The object of the invention is to provide a device of the kind set forth having a simple construction and small dimensions, whereas it provides nevertheless the same satisfactory manoeuvrability of the ship, in which the device is 10 built in, as the known device does. This is achieved in that the propeller housing is essentially rotation-symmetrical to a standing axis of symmetry and open and tapering towards the bottom of the ship, in that a main spindle is rotatably jour- 15 nalled in and coaxial with the housing with the aid of main-spindle bearing means, in that the propeller shaft is transversely journaled with the aid of propeller-shaft bearing means so as to be rotatable at an acute angle to the main spindle and in that the main spindle with the propelling 20 screw is rotatable by rotary means. In this way all movable parts with the exception of the driving means for the propelling screw constitute a compact unit. The functions of supplying propulsive force and of varying the operative direction of said propulsive force are both satisfactorily per- 25 formed by said unit.

When in accordance with the invention the driving means comprise a hydromotor rigidly secured to the main spindle and driving the propeller shaft and a hydropump communicating with said motor through hydraulic conduits and 30 driven by a diesel aggregate, the construction is even considerably simpler. When in accordance with the invention the hydraulic inlet and outlet conduits for the hydromotor extend through the main spindle, there is no need to use vulnerable flexible conduits.

35 In a preferred embodiment the propeller screw is surrounded by a jet tube, as a result of which the efficiency of the propeller screw and the manoeuvrability of the ship are improved.

According to the invention the rotary means may comprise an electric motor remote-controlled from the bridge.

The invention will be described fully hereinafter with reference to an embodiment shown in the accompanying 5 drawings.

Fig. 1 illustrates a ship having in its bow a device in accordance with the invention.

Fig. 2 is an axial sectional view of part of the device shown in Fig. 1.

10 Fig. 3 shows a further developed embodiment of a device in accordance with the invention, in which the construction of Fig. 2 is employed.

Fig. 4 is a partial elevational view corresponding to Fig. 3 of a variant of the embodiment.

15 Fig. 5 is a bottom view of the device shown in Fig. 4.

The ship 1 is equipped in the bottom 3 near the bow 2 with a device 4 according to the invention for steering the bow 2 of the ship 1. By means of such a device 4 the ship 1
---20 can be accurately manoeuvred within a limited space.

The device 4 comprises a substantially rotation-symmetrical propeller housing 5 welded in the bottom 3 and having a standing axis of symmetry 11. The figures show the propeller housing 5 in the form of a truncated cone. At the 25 top the propeller housing 5 has a cover 6. As an alternative, other shapes, for example, part of a sphere are possible. The propeller housing 5 is tapering downwards and open on the bottom side. In the cover 6 of the propeller housing 5 a main spindle 8 is journaled by main-spindle bearing means 7, so 30 as to be rotatable about the axis of symmetry 11 of the propeller housing 5. The main-spindle bearing means 7 comprise a bearing housing 47 welded to the cover 6, in which housing a ball bearing 48 and a sliding bearing 49 are mounted. The ball bearing 48 is fixed axially in the bearing housing 47 35 on the bottom side by a ring 56 supported from a shoulder 55 and on the top side by a top cover 51 fastened by bolts 50 to the bearing housing 47. The sliding bearing 49 is supported

on the bottom side by a lower cover 53 fastened by bolts 52 to the bearing housing 47. The ball bearing 48 is axially fixed to the main spindle 8, since it is locked between a bearing nut 54 and a shoulder 57 of the main spindle 8.

5 A propeller shaft 9 is rotatably journalled with the aid of propeller-shaft bearing means 14 at an acute angle a to the main spindle 8 and connected herewith. In the embodiment shown the angle a is of the order of magnitude of 30 to 60 degrees, particularly 40 degrees. To the propeller
10 shaft 9 a propelling screw 10 is secured by bolts 41. The propeller-shaft bearing means 14 comprise two self-adjusting barrel bearings 15, 16 mounted in a bearing sleeve 40, said bearings absorbing both the radial forces and the axial propulsive force.

15 The propeller shaft 9 and hence the propelling screw 10 are rotatably driven by driving means 17. In the preferred embodiment of figs. 2 and 3 these driving means 17 are hydraulic driving means. A mechanical drive with pinion transmissions is also possible. The driving means 17 shown
20 comprise a hydromotor 18 having a housing 42, a rotor (not shown) of known type journalled in the housing 42, an output shaft 19 and an inlet port 26 and an outlet port 27 for hydraulic fluid. At one end of the output shaft 19 the housing 42 has secured to it the bearing sleeve 40 by means of bolts
25 44. At the other end the housing 42 is rigidly fastened by bolts 43 to the part 79 of the main spindle 8 arranged at the angle a. The output shaft 19 of the hydromotor 18 comprises a portion 46 having external key-toothing, which engages a central hole 83 in the propeller shaft 9 having internal key-way
30 toothing. In this way the shaft 19 is only loaded by torsional forces instead of being loaded by thrust forces, which are transferred via the bearings 15, 16 and the bearing sleeve 40 to the housing 42 of the hydromotor 18. The hydromotor 18 is fed by pressurized oil supplied by a pump 21 driven
35 by a diesel aggregate 20. The oil is passed from a sump 22 through a conduit 45 towards the pump 21, which presses it into a supply conduit 24. The supply conduit 24 includes an overflow valve 25 having an open and a closed position. The

rate of flow to the hydromotor 18 is controlled by controlling the speed of the diesel engine 20. The overflow valve 25 is in closed position during operation and is opened when the diesel engine 20 is working in the idle state and the screw 5 10 has to stand still. The supply conduit 24 communicates with an inlet channel 12 in the main-spindle bearing means 7. The inlet channel 12 communicates with a first annular chamber 58 formed between a sealing sleeve 29 and the bore 30 of the bearing house 47, said chamber communicating through 10 bores 59 in the sealing sleeve 29 with a second annular chamber 60 between the main spindle 8 and the sealing sleeve 29. The main spindle 8 has a central bore 61 closed at the top by a screw plug 62. The central bore 61 has below a portion 63 of larger diameter. This portion 63 is divided by a sleeve 64 15 rigidly fixed in the main spindle 8 into a cylindrical supply channel portion 65 and an annular outlet channel portion 66 coaxial with the former, said portions being completely separated from one another by the sleeve 64. The pressurized oil flows from the second annular chamber 60 through transverse 20 bores 67 in the main spindle 8, the portion 82 of the central bore 61 and the supply channel portion 65 towards the inlet 26 of the hydromotor 18. After having passed through the motor 18 the oil flows out of the outlet 27 into a draining channel portion 68, which communicates with the outlet channel 25 portion 66. From this portion the oil flows through transverse bores 69 in the main spindle 8 into a third annular chamber 70 formed between the bearing housing 47 and the main spindle 8 communicating with the outlet channel 13. From this channel the oil gets into the drain conduit 28. The oil 30 flows through a filter 23 connected with the drain conduit 28 back into the sump 22 or back to the pump 21. The sliding bearing 49 of the main spindle 8 is lubricated by hydraulic oil supplied on the bottom side through the oil channel 71 and on the top side from the third annular chamber 70. The 35 bearings 15 and 16 of the propeller-shaft bearing means are also lubricated by hydraulic oil. For this purpose a seal of the output shaft 19 normally provided in the hydromotor 18 is

removed so that leakage oil is received in the annular bearing space 72. The annular bearing space 72 is sealed at the projecting of the propeller shaft 9 by oil arresters 78 on the propeller shaft 9. The bearing sleeve 40 includes an O-ring 73 to prevent oil from leaking away or water from getting in.

The sump 22 is mounted at such a level in the ship 1 that the oil level in the sump 22 is always above the waterline 37 in the loaded state. Therefore the oil pressure prevailing anywhere in the part of the device 4 located in the water is higher than the water pressure so that water is prevented from penetrating from the outside into the propeller-shaft bearing means 14 and into the sliding bearing 49 of the main-spindle bearing means 7. By providing the oil channels 12, 13 shown in the main spindle 8 and the main-spindle bearing means 7 flexible conduits are not required. In the top cover 51, the sealing sleeve 29, the sliding bearing 49, the sleeve 64 and the main spindle 8 and in the fastening base of the hydromotor 18 sealing means 73, for example, O-rings are provided for sealing the channels and spaces conducting the oil with respect to one another and to the surroundings.

According to the invention the propelling screw 10 may be surrounded by a jet tube 31, which improves the efficiency of the propelling screw 10 and hence the manoeuvrability of the ship 1. The jet tube 31 is connected by means of supports 74 with the main spindle 8. The supports 74 have a low flow resistance in the direction of flow 75 of the water. As stated above, the main spindle 8 is rotatably journaled in the main-spindle bearing means 7. In order to be able to turn the main spindle 8 with the hydromotor 18 and the propelling screw 10 and hence to vary the direction in which the propulsive force produced by the screw 10 is operating, rotary means 32 are provided. In a preferred embodiment of the invention said means comprise an electric motor 35 fastened to the propeller housing 5, a reduction driving gear 39 coupled herewith, a chain sprocket 34 fastened to the

output shaft 76 thereof and a chain sprocket 33 coupled with the former through a chain 36 shown schematically and fastened to the main spindle 8.

The diesel aggregate 20, the overflow valve 25 and the electric motor 35 are preferably connected with control-members 80 shown schematically on the bridge 86 so that the ship 1 can be readily steered from the bridge 86 even in narrow waterways. With the main spindle 8 a position pick-up 38 is connected, which is coupled with a position indicator 81 on the bridge 86 with the aid of which the direction, in which the propulsive force of the device 4 is operating, can be displayed on the bridge 86.

The propeller housing 5 of the embodiment shown in figs. 4 and 5 has the shape of a truncated, octogonal pyramid having eight side faces 90 rather than that of a truncated cone. Below, the housing 5 has an eight-sided grating 91. The grating 91 comprises radially extending carriers 93, between which guide blades 92 are arranged. The guide blades 92 form in the grating 91 a plurality of horizontal sections of eight-sided pyramid faces, said sections being concentrical with one another and with the propeller housing 5. The water stream produced by the propelling screw 10 obtains a stronger, horizontal component by the guide blades 92 of the grating 91.

Fig. 4 shows an exhaust system 94 communicating with the propeller housing 5. This system serves for evacuating air from the propeller housing 5, which air may penetrate into the housing when the waterline of the ship 1, for example, in the no-load state, is lower than the level of the cover 6.

The exhaust system 94 comprises a level switch 99 arranged in a suction housing 95 for switching on and off an exhaust pump 103 (not shown) in dependence upon the water level 98. The suction housing 95 communicates through slot-shaped openings 96, 97 with the interior of the propeller housing 5. The exhaust pump 103 is connected through a suction conduit 102 with the valve housing 101 of a valve 104. The valve housing 101 comprises a floating ball 100, which closes the suction conduit 102 when the water level 98

is sufficiently high.

The use of an exhaust system 94 is not limited to a device having an eight-sided propeller housing 5. The system may as well be employed with a frustoconical propeller housing 5. Moreover, a jet tube may also be used in an eight-sided propeller housing 5.

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C L A I M S

1. A device for steering a ship's bow, comprising a propeller housing arranged in the bottom in the interior part of the ship, a propeller shaft journalled in propeller-shaft bearing means connected with the propeller housing and rotatably driven by driving means and a propelling screw fastened to said shaft, characterized in that the propeller housing is essentially rotation-symmetrical to a standing axis of symmetry and open and tapering towards the ship's bottom, in that a main spindle is rotatably journalled in and coaxial with the housing with the aid of main-spindle bearing means, in that the propeller shaft is transversely journalled with the aid of propeller-shaft bearing means, so as to be rotatable at an acute angle to the main spindle and in that the main spindle with the propelling screw is rotatable by rotary means.

2. A device as claimed in claim 1, characterized in that the driving means comprise a hydromotor rigidly secured to the main spindle and driving the propeller shaft and a hydropump communicating with the former through hydraulic 5 conduits and driven by a diesel aggregate.

3. A device as claimed in claim 1, characterized in that the hydraulic conduits extend partly through the main spindle.

4. A device as claimed in any one of the preceding 10 claims, characterized in that the propeller shaft bearing means and the main-spindle bearing means are lubricated with hydraulic oil from the driving means.

5. A device as claimed in any one of the preceding claims, characterized in that the propeller is surrounded by 15 a jet tube.

6. A device as claimed in any one of the preceding claims, characterized in that the rotary means comprise a remote-controllable electric motor.

7. A device as claimed in any one of the preceding 20 claims, characterized in that in the propeller housing, at the level of the ship's bottom, guide blades directed outwardly extend in downward direction.

8. A device as claimed in any one of the preceding claims, characterized in that with the propeller housing an 25 exhaust device sucking air out of said housing is connected, being controlled by control-means responding to the water level in said housing.

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FIG. 1

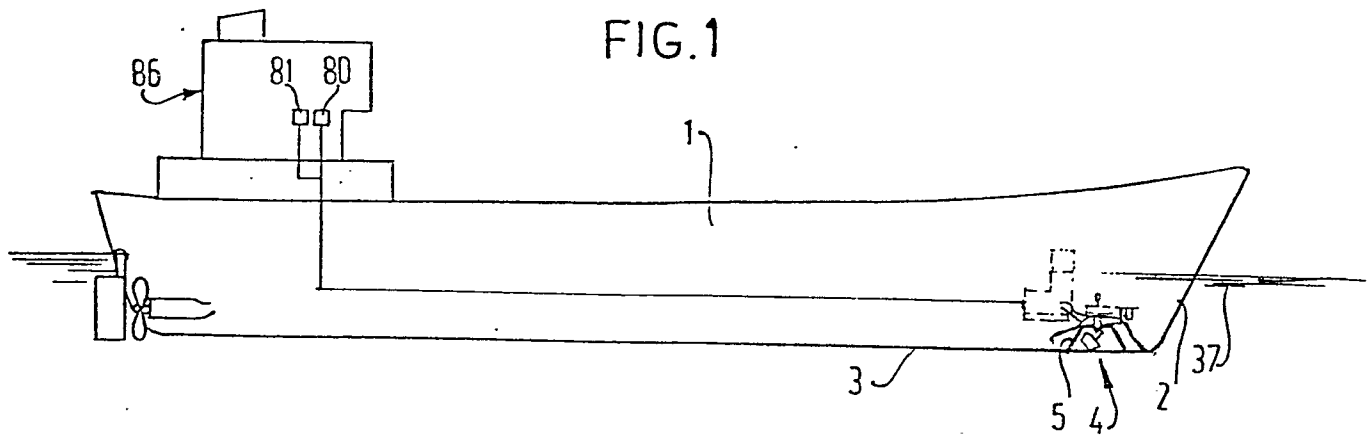


FIG. 3

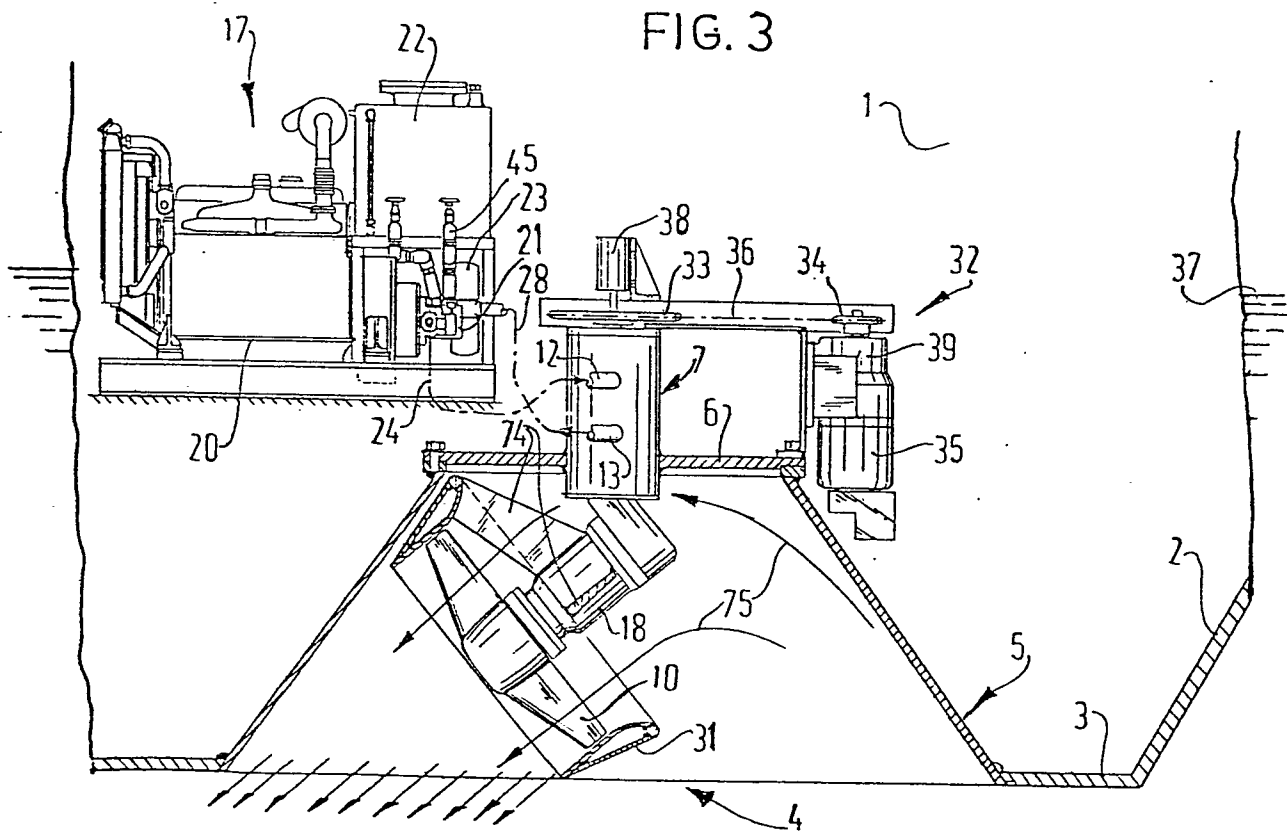
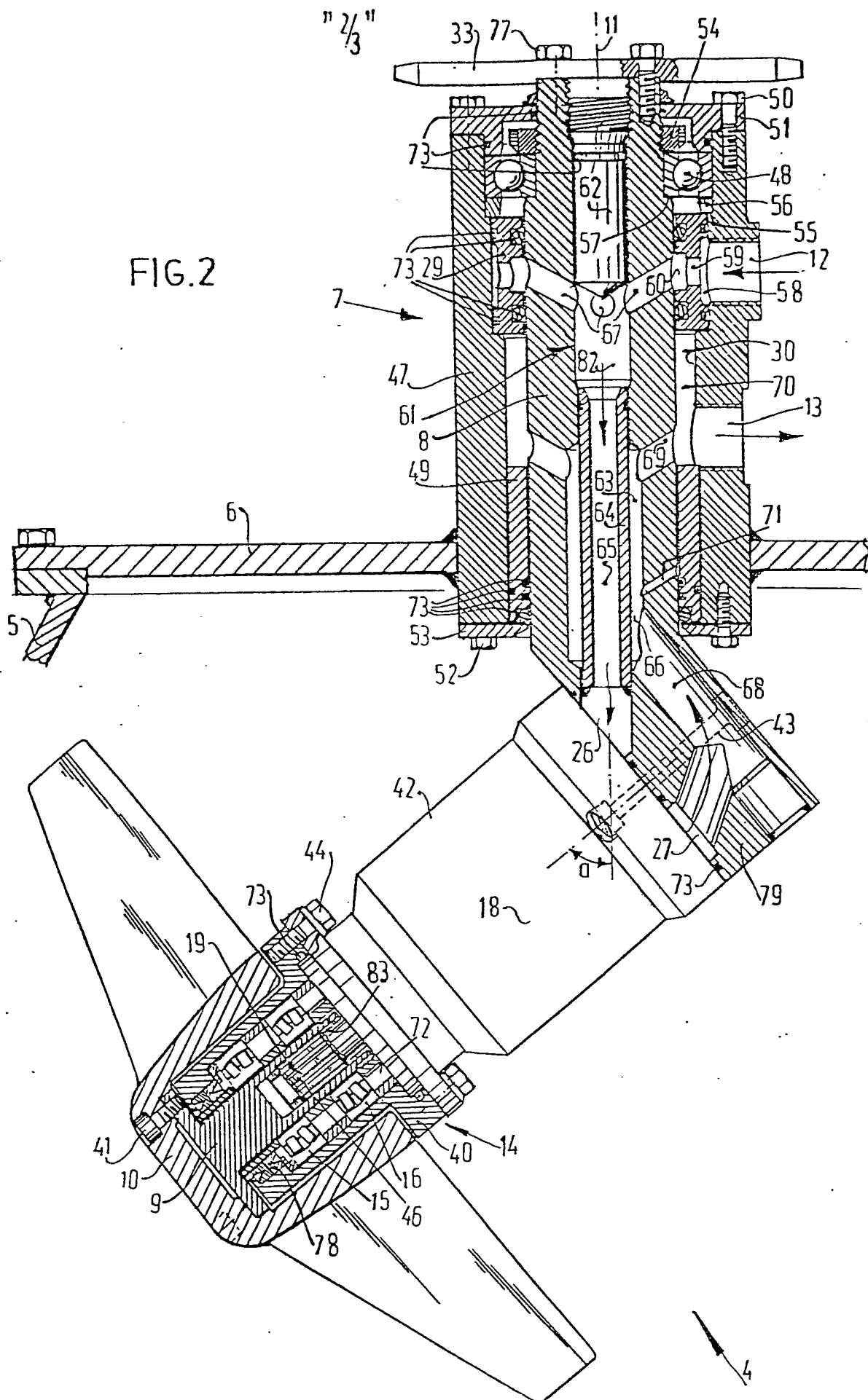


FIG. 2



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FIG. 4

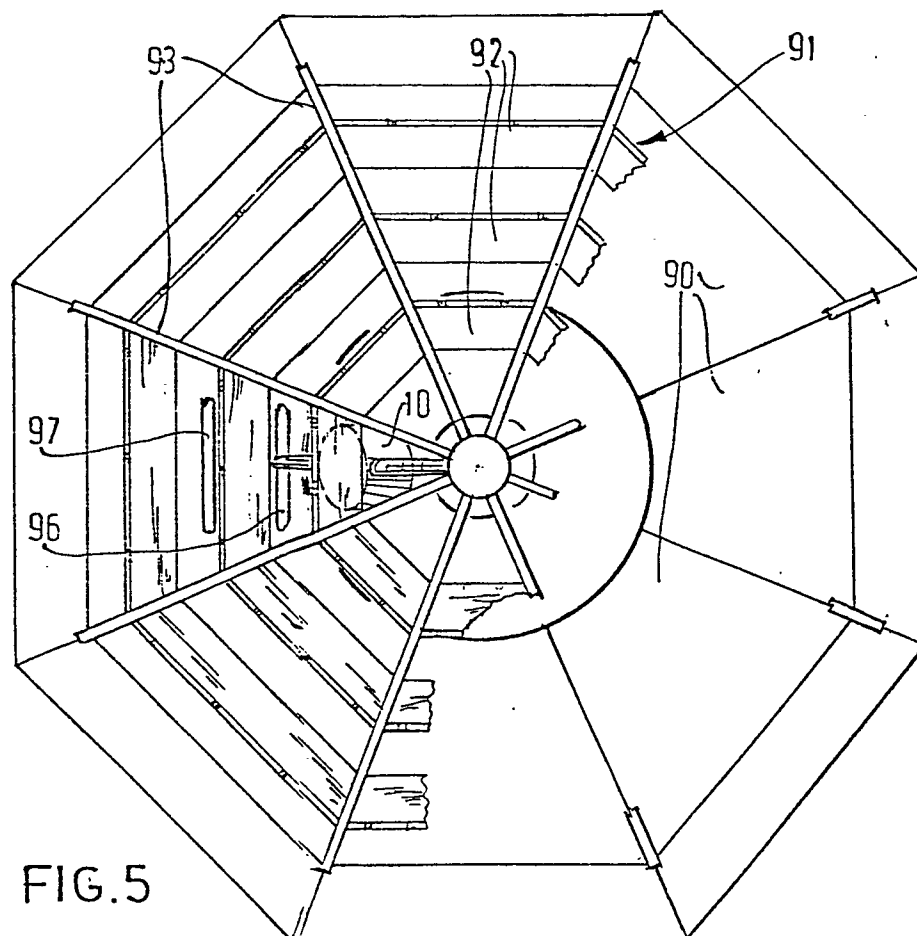
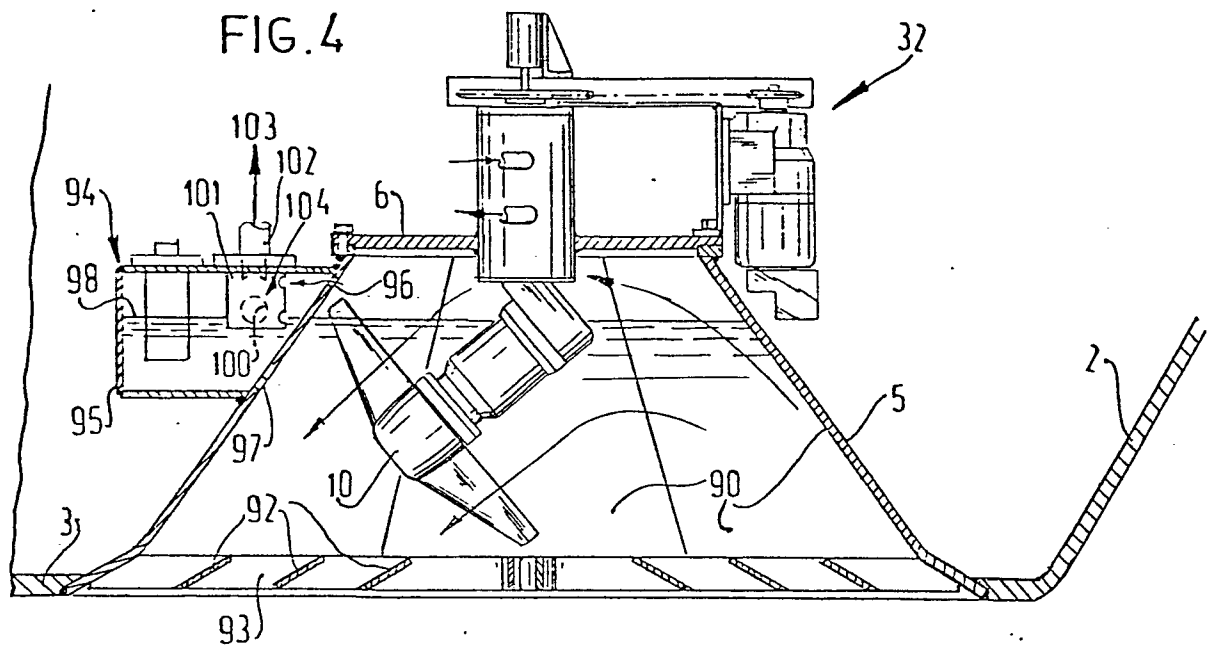


FIG. 5



European Patent
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EUROPEAN SEARCH REPORT

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Application number
EP 80 20 0169

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>GB - A - 2 010 763</u> (SCHOTTEL) * Entire document *	1, 5, 6, 7	B 63 H 25/42
	<u>FR - A - 2 238 634</u> (HIRMAN) * Figure 6; page 10 *	1, 2, 3	
	<u>DE - A - 2 330 829</u> (ORENSTEIN & KOPPEL) * Figures; claim 1 *	8	
	<u>DE - A - 2 145 098</u> (MBB)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³) B 63 H
			CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 27-10-1980	Examiner LUKAS