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

(11) Publication number: **0 162 172**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **84400844.1**

(22) Date of filing: **25.04.84**

(51) Int. Cl.⁴: **B 63 H 3/04**

(30) Priority: **25.04.83 ES 521818**

(43) Date of publication of application:
27.11.85 Bulletin 85/48

(84) Designated Contracting States:
BE CH DE FR GB IT LI NL SE

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(54) **Piston system applicable to propellers with reversible blades.**

(57) The present invention relates to propelling systems for vehicles and like transportation means. It provides a piston system applicable to propellers with reversible blades, characterized by a driving-reverse system, allowing a new procedure of reversibility of the propellers, which change the rectilinear movement of the spindle-shaft into circular movements of the blades by means of eccentrics.

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PISTON SYSTEM APPLICABLE TO PROPELLERS WITH REVERSIBLE BLADES

The present invention relates to propelling systems for vehicles and like transportation means.

The piston system of the present invention modifies the existing ones because its rectilinear-circular movement in all cases eliminates the use of the electricity. Its mechanism is reduced to the use of a manually operated piston. It has the advantage thatit can be fabricated in two, three, four or any reasonable number of blades adaptable according to the power desired.

Another of the advantages of the piston system of the invention is that it eliminates all kinds of complicated mechanisms: gears, springs, pumps, etc, and its simple operation makes it efficient and safe.

The rapidity of its manoeuvring, which can go from "all forward" to "all backward", imparts to the piston system, due to the simplicity of its elements, a further great advantage, as also the fact that it requires no maintenance. The only precaution to be taken is to open two valves and close them prior to starting the engine again.

Another advantage of the piston system of the invention as applied to a ship propeller, is that the whole direction system as well as the whole transmission system are standard for a large number of models. The same is true of the driving-reversing system, all the elements of which are interchangeable, with the peculiarity of having a motor, in ships, that rotates only to the right, with only inlet edges on the blades and oil lines in the entrance to the transmission system.

The piston system of the invention is made up of three separate assemblies: the direction system, the transmission system and the driving-reversing system. In each of them, the main element is the driving piston, two of them being hydraulic, one manually operated, and the third one not hydraulic, for the reversibility, which is the most important feature of the present invention.

In a propeller rotating in any direction, right or left, if its water supply edges (water cutting edges) are perpendicular to the rotating shaft, it does not have any effect. That is to say, if the propeller is installed on a ship, the latter does not move.

An observer located close to the engine on a ship or boat in such a way that the propeller is located behind him can say that the engine rotates from right to left or left to right. The most normal in ships is from left to right. Under such conditions, as also for more easy understanding of the invention, reference will be made in the following to a single blade, even if two, three or four blades are synchronized in a same movement, all of them turning by a same angle.

Considering an engine rotating only from left to right, will transmit the rotation to the shaft or transmission shafts, the propeller shaft and the propeller. The inlet water edge should be located at the right, as the rotor shaft, and in a position perpendicular (at right angles) to the shaft. From the moment the engine turns, the propeller will also turn at the same speed, without affecting the blades and of course the boat.

As mentioned above, located perpendicular to the edge is the rotary shaft at 90°. For best explanation and more clarity, the description will refer to these 90° of the perpendicular shaft to 0° on the same shaft.

To permit the correct operation of the blade when rotation will be offered resistance, the edge will be moved away from 0° in one direction or the other. When the edge is moved away from 0° in the direction of -90°, the effect produced on the propeller blade is forward, whereas, when the edge is moved away from 0° in the direction +90°, the effect is backward, transmitting it in both cases to the boat. Logically, the most favorable angle is the one that is offered more resistance and transmits it in forward or backward. In the piston system of the invention, the angle used for this purpose is 58° corresponding to 32° with respect to 0° of the perpendicular shaft for forward and 28° for backward. There have been established three positions between such arc of 0° and 32°, which correspond to three speeds (low, medium and full). For this purpose, the blade in its lower part has a fixed eccentric which ends or limits the arcs taken, and in the interior is a slide guide that makes it rotate and take different positions and with them each corresponding speed forward and backward.

The invention will be better understood and further features details and advantages thereof will appear more clearly as the following explanatory description proceeds with reference to the appended drawings, namely Figures 1,2,3,4,5,6,7,8,9,10,10a,11,12,13,14,15, 16,16a,17,17a,18,19,20,21,22,23,24,25,26,27,28,29,30, 31,32,33,34,35,36,37,38,39,40,41, which form an integral part of the invention.

With reference to Figure 1 and beginning with the position STOP, the manoeuvering lever is in the horizontal position, STOP. The piston M of the cylinder in the direction system is in the middle position. The piston T in the transmission system is in its middle position and the rod-shaft transmitter in the center of its travel. The piston of the driving-reversing system (Figure 11) is at the middle of its travel.

The driving-reversing piston over its generatrix stands out as many guides as there are blades in the propeller, distributing each generatrix as the number of blades. Each guide slides on its corresponding channel of the bushing-track (rectilinear movement) which prevents any movement other than the one transmitted by the driving piston. Over each one of the two, three or four plain edges (as installed in the propeller), rest the bushing-track, the base and the corresponding blades. Such plain blades, by their design, prevent any movement, less the base turn and with it the blade (Figure 15).

The fixed guide in the driving-reversing piston, free in the channel track and in the center of both, as also, in the center of the blade base, in the center of the eccentric, free to rotate (circular movement) when the guide is displaced.

Changing the operation lever from the horizontal position, STOP, to up, FORWARD, from the moment the movement is initiated, the connecting rod is moved, and with it the spindle and the piston M of the direction system. The piston M will transfer the oil

of the upper face through the conduit C and C'. The flow through C' will compensate and maintain the valve secured. The flow from C will enter the cylinder of the transmission system by the right face, will actuate the piston T with pressure F.s., and will displace to the left an equivalent quantity and the rod-shaft will be displaced and assembled with its driving piston the same quantity. Each guide will be displaced (rectilinear movement) to the end of its channel of the bushing-track and will force the eccentric to turn accordingly to advance and arrive at its end. When the operating lever reaches the maximum end, all forward, the driving-reversing piston at its maximum left end, the guide has forced the base to turn in the meantime and to reach the end, maximum turn 32° and maximum forward transmitted by the propeller to the boat. Two intermediate positions will correspond to two speeds; low or medium.

Moving the operating lever to the position STOP, the guide will return to the eccentric, center of the distance in the track, center of the travel in the piston-driving, the edges of the blades again perpendicular, do not make any effect and the boat will stop, ignoring the inertia.

Moving the operating lever down, the connecting rod will move down, pulling the spindle and the piston M. The oil flows through the conduits B and B'. The flow through B' will compensate and maintain the valve secured. The flow through B will enter the cylinder of the transmission system by the left face, will actuate the piston T and will move it to the right. In this operation as in the previous one, the oil of the

opposite faces flows through the conduits C' and B' to take the out placed spaces and vacuum by the piston M through the corresponding check valves C' and B'. The spindle will be moved to the right as the driving piston and the guide. In this movement, the guide will force the eccentric to turn in the opposite direction and also its base. When the operating lever is at the end ALL BACKWARD the driving piston to its extreme maximum right, the guide will have forced the base to turn and the blade to meantime reach the end, maximum turn 28° and the maximum BACKWARD to be transmitted to the boat propeller. Two positions will correspond to two intermediate speeds: low and medium. It has been observed that both operations are inverted, and it can be deduced that there has been obtained the reversibility of the blade and of course of the speed.

The direction system is composed of the switchgear, direction cylinder or oil distributor and piping.

The control (Figure 2) adaptable to any place of the boat, consists of a manoeuvering plate with a sliding channel for the lever, and, as can be seen, has a safety hold corresponding to each speed. The operating lever rests on one end and the knob of the safety button. In it is inserted one of the ends of the connecting rod, rotating by means of a piston. In the lever is adapted the safety-lock (Figure 3) necessary for speeding and easier change. That keeps free to operate the knob button and stable to loose it in the position desired.

The other end of the connecting rod is fixed to the spindle of the oil direction cylinder, rotary by means

of another bolt.

In the oil direction cylinder (Figure 4) adapted to the same control panel, the piston M is moved by the movements of the lever through the connecting rod and spindle. From each side the oil leaves as per the speed and is received by the opposite side conduit. Depending on the movement of the operating lever in either position, the oil will flow by the conduits B or C and will return by the opposite side. Both conduits B-B' and C-C' have ball check valves that work in only one way, that is to say, only passing in one way.

The valves B and C are inlet valves and B' and C' are return valves.

In the conduits B and C there are oil bypass valves A (Figure 1) from a tank to compensate for the possible leaks and to refuel the circuit each time of operation. These valves A are only maintained open in inactivity of the engine, keeping the circuit completely charged (full) and no air exists. Precaution will be observed to close the valves before the engine is started again.

As previously indicated, the control operating board can be installed in any place and for important boats there can be two of them installed in different places, keeping one of them isolated at all times.

The operating lever is in its horizontal position STOP, the piston M in the center and the piston T in the middle of its track.

Then the cylinder of the oil direction as the transmission cylinder have on them two drain holes that correspond in position, in each face of the piston in its middle position; the four drains will be opened. The two by-pass oil valves A to the tank are opened. In this position, the circuit is filled up and the air eliminated. The two drains will be closed when the oil shows up and then the valves A.

Any movement of the operating lever will move the piston M and with them the oil transfer.

Assuming that the position STOP is moved up, FORWARD, to raise up the lever will carry out the connecting rod, spindle and piston to up position, the oil of this face will enter conduits C and C'. The flow through C' will result in a same pressure on both faces of its valve and the spring tension will remain closed. The flow through C will enter the transmission cylinder with pressure F.s pushing the piston T, moving it and at the same time compressing the oil on left face, causing valve B' to open to return the oil distributor cylinder to the moved space and vacuum by the piston M. The valve B will remain secured by the reason that the C'. Changing the M will drop, the oil of the lower face will enter the conduits B and B'. By the conduit B' no oil can flow because the valve is closed, it will take place through B to push piston T to the right. The oil will be compressed on this face and will flow through C' to occupy the empty space of the higher part of the direction cylinder of oil. The valve C will remain secured.

To obtain any desired speed, it is only necessary to

seize the knob, push the button and place the lever in the desired position. When it is left, it will remain in its place and fixed. It must be moved to piston T an equivalent amount and the spindle shaft and the guide in the eccentric the arc fraction corresponding to the desired speed.

The equality of volume is obtained by supplying the piston by the opposite face of the spindle.

The oil volumes of the cylinder on each face of the piston are larger than those corresponding to its track for the purpose of being used as a brake and the difference by cushion.

The transmission system consists of a cylinder, inwardly rectified with flanges on the ends that are assembled to the engine shaft and with propeller turn. At both ends of the cylinder, as can be observed (Figures 7 and 8), the flanges are adapted by means of a shank (cone flange and wedge with four or five holes) which is easy to remove if needed.

The transmission cylinder or transmission shaft has on its periphery on two generatrices equidistant inlet-outlet holes of 4 mm for oil. These holes on each generatrix are isolated by a collar-clamp (Figure 6) that have inserted two plugs each one and the two ball valves, of one way, remaining fixed while the shaft turns by means of simple tie rod adaptable to any frame of a boat. Also as previously explained, on this periphery the air drain cocks are located. The valves B and C are oil inlets and the B' and C' are return valves to the oil distribution cylinder or oil

direction cylinder.

Inside the transmission cylinder, at its part corresponding to the spindle-shaft, there is a threaded flange, fixed and watertight (Figure 7) with a press to avoid the possibility of oil leakage in the spindle. On the other side, there is a blind plug with a gasket.

The spindle-shaft, by means of the bushing-regulator, is assembled to the one which transmits the movements to driving-reversing piston (Figures 9 and 10).

The corresponding flange to the spindle-shaft is maintained buttonhooked with the flange or shaft holder-propeller. The other flange keeps assembled to the engine.

Under such conditions, when turning the engine, the transmitter cylinder, shaft-holder-propeller and the propeller will also rotate. The transmission cylinder can be installed in any place of the transmission, but is more conveniently closer to the shaft-propeller holder and, in some cases, as per convenience.

Each collar-clamp is fabricated in two halves (Figure 6) opposite to the valve sockets and assembled by means of two bolts. These sockets also are used to adapt the tie rods and fix them to the location selected.

The cylinder without flanges (Figure 7) the piston-driving assembled with the spindle-shaft in the corresponding direction. Follow interior flange press holder, gasket and packing.

Install the four plugs, larger diameter inside, keeping the holes free and then close the collar-clamp.

Next, a blind plug with gasket, having it ready to install the flanges. The first one to be closed is the one that is tight to engine, keeping the other free to make the regulation.

The spindle-shaft regulating will be done as follows :

The spindle-shaft in all its length has an exact measure. It needs to remain or correspond as center of piston transmission and center of piston-driving-reverse.

With the boat on ground or land: The spindle-shaft from the piston-driving-reverse has a bushing in an exact measure by means of a cotter-pin. The bushing, on its periphery on one of the two parallel faces used to fix the key, has a mark and one quantity in mm (Figure 9).

Loosen the press of the shaft-propeller holder, the shaft is moved as per convenience, maintaining the sign upwards. The spindle-shaft will be threaded of the transmission cylinder until the marks coincide with the amount indicated in the bevel. When installed at the exact measure, it is secured with a nut and with a lock-nut to secure the flanges.

With the operating lever in STOP, manually operated, the propellers will be moved perpendicular to rotate the shaft, and maintained while the circuit is filled up: the two air plugs and the oil supply valve should

be opened. When this operation is completed, close the plugs and the A valves and now the circuit is ready for operation.

The flanges of the transmission cylinder are assembled to all transmission. The bushing regulates the total distance and the two spindles are fixed. With the flanges closed and attached to the distance the two spindle-shafts with engine turning, the transmitter cylinder will turn also at the same rpm transmitting to the shaft-holder propeller and the propeller. The two collar-clamps remain fixed and inside the transmitter cylinder will rotate as the other shaft is transmitting the rotation, and the spindle-shaft will rotate as a rotating compass transmitting only rectilinear movement when displaced. When displaced, the piston I in one direction or the other as a result of lever operation, will carry the spindle-shaft the quantity and corresponding direction and with them the piston of the driving-reversing system. Accordingly, the guide will follow the said piston, producing a rotation of the lever by 90° or +90° upward with respect to the perpendicular shaft to the turn. The equality of oil volumes is obtained by supplying the piston from the opposite side to that where the spindle is located.

The oil volumes of the cylinder on each side of the piston are larger than that corresponding to its run for the purpose of using the difference as brake and cushion.

All Figures corresponding to this transmission system are in natural size, although for clarification some

measures are provided.

The piston of the invention consists of a core of steel or bronze in one piece, where two, three or four rotating blades are inserted. Depending on the angle selected, in one direction or the other, with respect to the transverse shaft, it will effect one or another movement, and, depending on the number of degrees in one of such positions, will move to low, medium or full speed position.

The core (Figures 11 and 16) is assembled by means of a groove flange to the shaft-propeller holder and to the transmission externally. By means of a bushing tie up the spindle shafts, one end is fixed to the piston of the transmission cylinder and the other end to the driving-reverse piston, keeping both systems assembled internally. The core has internally a spindle-shaft, driving-reverse piston, bushing-racks, guides and bases of the blades, externally can carry from two to five blades, although the normal number is from three to four. In the opposite side to the flange is located the propeller cap which fixes the bushing-rack, keeping it secured by means of a stud bolt, where all pieces of the assembly enter. The spindle-shaft in this end is fixed to the driving-reverse piston by means of a nut and cotter pin (Figure 11).

The driving-reverse piston is a piston whose only function is to move the guides as per a movement that forces the spindle-shaft moving it by the interior of the bushing-rack.

At its periphery (Figure 12), it is symmetrically

provided with holes that as guides and blades on the propellers, in such a way that, when mounted, each one coincides with each channel parallel with the bushing rack. In these holes, as indicated, the guides are inserted and by a circular form on the base, flat and parallel in the part corresponding to the racks, prevent any movement other than the movement by the channel of the guides, when forced by the driving-reverse piston. In the longitudinal direction, it has two or three holes that communicate with the two sides for the purpose of permitting passage from one side to the other of a special grease to compensate for the speeding, serving as a cushion, or to permit the water to come through if any. The bushing-rack (Figures 13 and 15) is used as a seat for each of the blades, transforming the rectilinear movement into circles by means of the guides and the eccentric. Resting inside the core in both circular ends and their plain sides, as much as blades in the propeller, resting the bases that make it fixed by the form. Inside, the driving-reverse piston holding the guides slip away, passing through the channels to enter the eccentrics of the bases and force it to turn in the displacement, also keeping it secured by means of the propeller cap.

The base of the propeller has the double function of securing the blade by means of bolts and making it rotate by means of the eccentric. In it, a guide is inserted having a special form to prevent the blade from turning around when located in the center. The channel corresponds to two sections of different angles: 32° for FORWARD and 28° for BACKWARD where the guides are moved and forced to turn according to the speed desired.

The blade fits and adjusts in the core box, free to turn in any direction and limited by means of the eccentric and the guide. It is fixed to the core by means of the base. The length of the guides has three different forms (Figure 12). In the round base, that is inserted and adjusted in the driving-reverse piston keep fixed and secured by the spindle-shaft. In the parts corresponding to the channels on the rack, is of the sides well fitted and parallel, with less measure to prevent it from rotating. The slide part of the eccentric has one face, the active one, adapted to the wall, and the other, only some contact points to facilitate the movement. Also, this side is longer than wide to prevent the blade from rotating when it is located at the middle of the eccentric.

Each blade is fixed to its base. The blade, externally, and the base, by the inside of the core in its suitable and marked position. The bushing-rack is introduced, each plain face with the corresponding base, indicated and marked.

The driving-reverse piston inside the core and inside the bushing-rack with the corresponding guides, with active faces, in the same directions. The spindle-shaft is introduced in the opposite side, placing washer, nut and pin. After placing the shaft holding propeller and fastening the flange, the system is ready to be installed on the boat, and the flange is placed inside.

When the driving-reverse piston moves, all the guides move too. All the guides move together by the corresponding channels of the bushing-rack. All are actuated at the same time in the base sector of the

blade, which makes it rotate when moving forward in the rack. For any position of the lever, the direction-transmission and driving-reverse piston will be maintained fixed in the desired speed positions. The guides will remain fixed in the eccentric in the corresponding arc fraction, giving to the blade and the boat the indicated speed and remaining in this position while the operating lever is changed. With the lever in the STOP position, the direction-transmission and driving-reverse piston will be located in the center, as the guide in the eccentric, and consequently the boat will stop.

With the exception of the guide, all Figures (drawings) corresponding to this driving-reverse system are in natural size, although to clarify concepts some measures are indicated.

Claims

1. Piston system applicable to propellers with reversible blades, characterized by a driving-reverse system, new procedure of reversibility of the propellers, which change the rectilinear movement of a spindle-shaft into circular movements of the blades by means of eccentrics, the assembly of the driving-reverse system being assembled by the core; externally the blades are fixed and internally spindle-shaft, driving-reverse core, bushing-rack, guides and base of the blades;
the said core or nucleus on the generatrix symmetrically distributed carry the boxes for the propeller setting by means of the base-eccentric, with studs, make it jointly and free to rotate in any direction; on its front part the union to the flange of the shaft-propeller holder is made by means of other box with studs to make firm; on the rear side, the threaded cap with gasket and safety bolts is located; the spindle-shaft is operated by two pistons of the hydraulic system, one of them, manually operated and which moves the driving-reverse piston at the same time, is accompany any guides as blades in the propeller to produce the reversibility of the speed; the spindle-shaft is fixed to the piston-driving by means of nuts with washers and pins; both are moved inside of the bushing-rack that is located fixed and resting at the end of the core; the driving-reverse piston in the periphery has round holes for any guides as blades in the propeller, distributed in such a way that when moved all of them do it on equal amount;
the driving-reverse piston in the longitudinal direction has three holes whose function is to

communicate both sides so that possibility of water entering does not affect the operation; inside the bushing, the driving piston is displaced with the guides by the channels of parallel faces, which causes the same to take this form and prevents all other movement than the translation in all its travel, because of the less parallel section than in the circular base; so,the bushing-rack is fixed against circular movement by the bases of the blades, keeping secured by means of the propeller cap; on its periphery there are as many plane surfaces and parallel channels as there are blades in the propeller, where the bases of the blades rest and the guides slide; these plane surfaces are in length and height equal to the diameter and height of the bases; the bases fulfil the double function of fixing the blades on the box by means of studs and of transmitting the circular movement by means of the eccentric; the eccentric arcs correspond to 32° in one direction, FORWARD, and 28° in BACKWARD direction; nternally the guide is moved causing the blade to rotate in one direction or the other thus giving the inclination for the desired speed;

the guides are the pieces seated in the driving-reverse piston and fitted and adjusted in the eccentric sliding through them to make possible the reversibility of the blade;

in its length it has three measures and form, in its base, that is united to the driving piston it is round, keeping secured with the spindle-rod by one side and by the upper, rack channel that is of little section and paralleled sides, so that it can only slide;

the corresponding part in the eccentric has parallel sides: the active adapted to its wall and the other

with contact points, less with the purpose of facilitating its displacement; also, this part is longer than wide to avoid that the blade turns around when located in the cneter of the eccentric; when the driving-reverse piston is in the center, the guides are also located in the center of the channel-rack that also are in the center of the eccentric, the blades under these circumstances being perpendicular to the turning shaft; when the engine is operating the rotation is transmitted to the propeller, that also without effect make it to the boat;
when the guide is moved in the eccentric caused by any movement, at the same time, of the operating lever, spindle-shaft, and driving-reverse piston in one sense, forcing the blade to take the corresponding angle to such a movement transmitting it to the boat;
when the guide returns to the middle of the eccentric, the blades return to a perpendicular position, not producing any effect, the operating lever is in the STOP position;
when the guide is moved in the sector opposite to the above, the angle will change to the opposite direction transmitting to the boat the opposite speed; the core is in a single piece and to it can be assembled any blades needed.

2. Piston system according to claim 1, characterized in that the first element driving-reverse system is characterized by the transmission system, that communicates by means of one piston of hydraulic system a longitudinal movement to one spindle-shaft, which at the same time, will be transformed in round by means of eccentrics;
the transmission system consists of one hydraulic

cylinder whose piston is actuated by the oil pressure by one side for evacuation by the opposite to the proceeding place and then move the spindle shaft; it is of bronze or iron, shaped and rectified internally, with flanges on the ends to be adapted to the transmisssion and produce, also, the rotation of the shaft propeller holder and of the propeller; in its periphery over two equidistant generatrix, there are two holes inlet-outlet for oil of 4 mm, as also, two drain cocks to fill the circuit; two collar-clamps isolate the oil outlet with plugs and by means of valves the distribution of inlet and outlet; at the ends, by one side ball plug with gasket and by the other one threaded flange, watertight with gasket and press holder for the spindle-shaft; the volume capacity of the oil is bigger than correspond to the piston track by both sides, with the purpose that when reach the end, serving as brake and cushion; each flange is assembled to the transmission cylinder by means of a handle and wedge; one is adapted to the engine and the other to the propeller-holder; each collar-clamp, in two halves carries two plugs and two ball valves in only one direction, the plugs of each collar, the inside are of 2 mm of larger diameter to facilitate the assembly keeping between both the inlet-outlet holes of isolated oil, the check valves on each collar, one is inlet and the other is for return; the piston is of three pieces for intermediate packing and secure the oil isolation between sides; the aim of this system is limited to moving the spindle-shaft in one direction or in the other as per piston is moved; the piston receives oil pressure by one side and is

moved; the oil of the other side evacuated through its valve to the proceeding place, when the piston is moved, it is accompanied by the spindle-shaft in quantity and direction transmitting it to the driving-reverse system;

when the piston receives oil from the other side, the opposite, is moved in such a direction transmitting it to the spindle-shaft and driving-reverse system.

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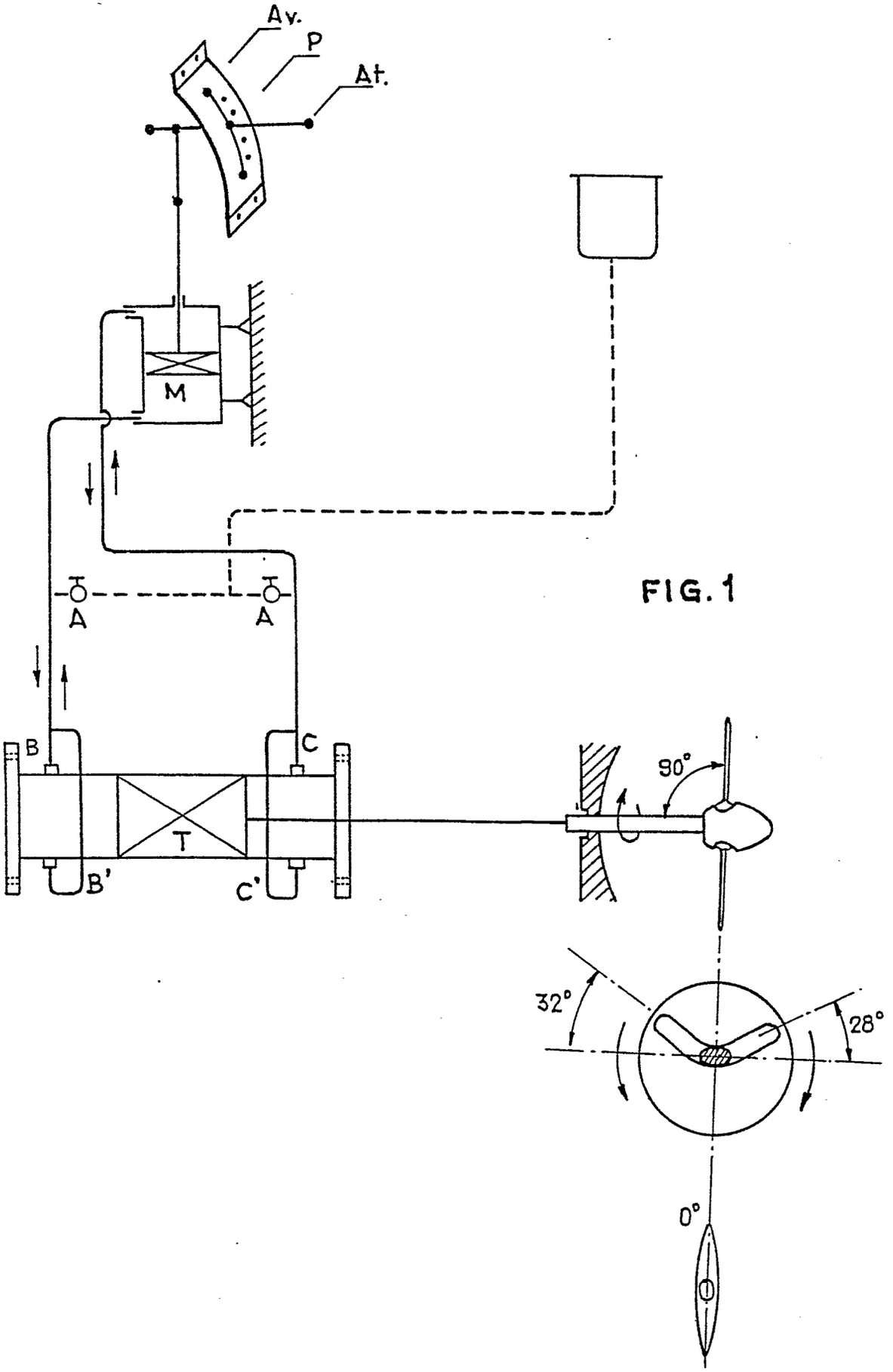


FIG. 1

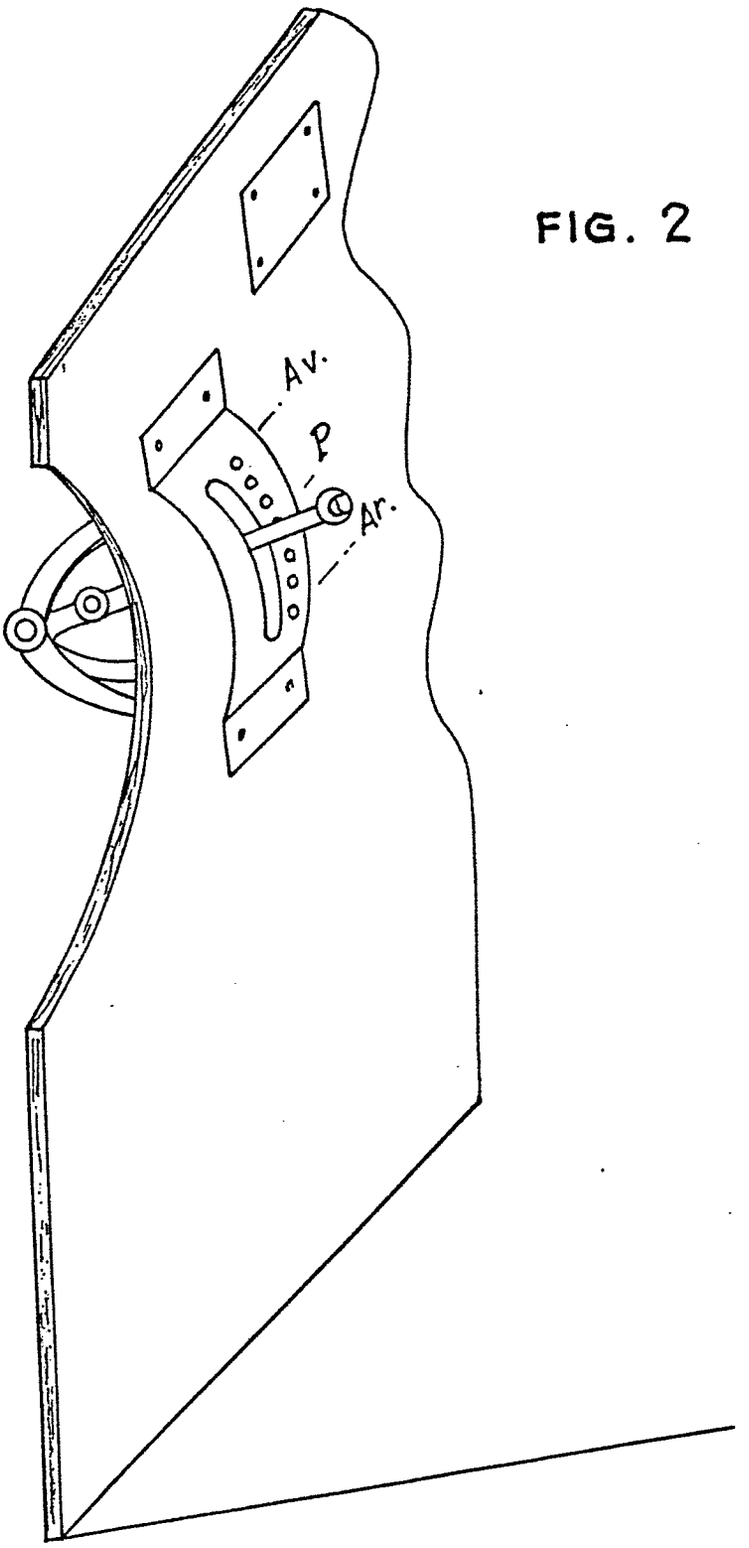


FIG. 2

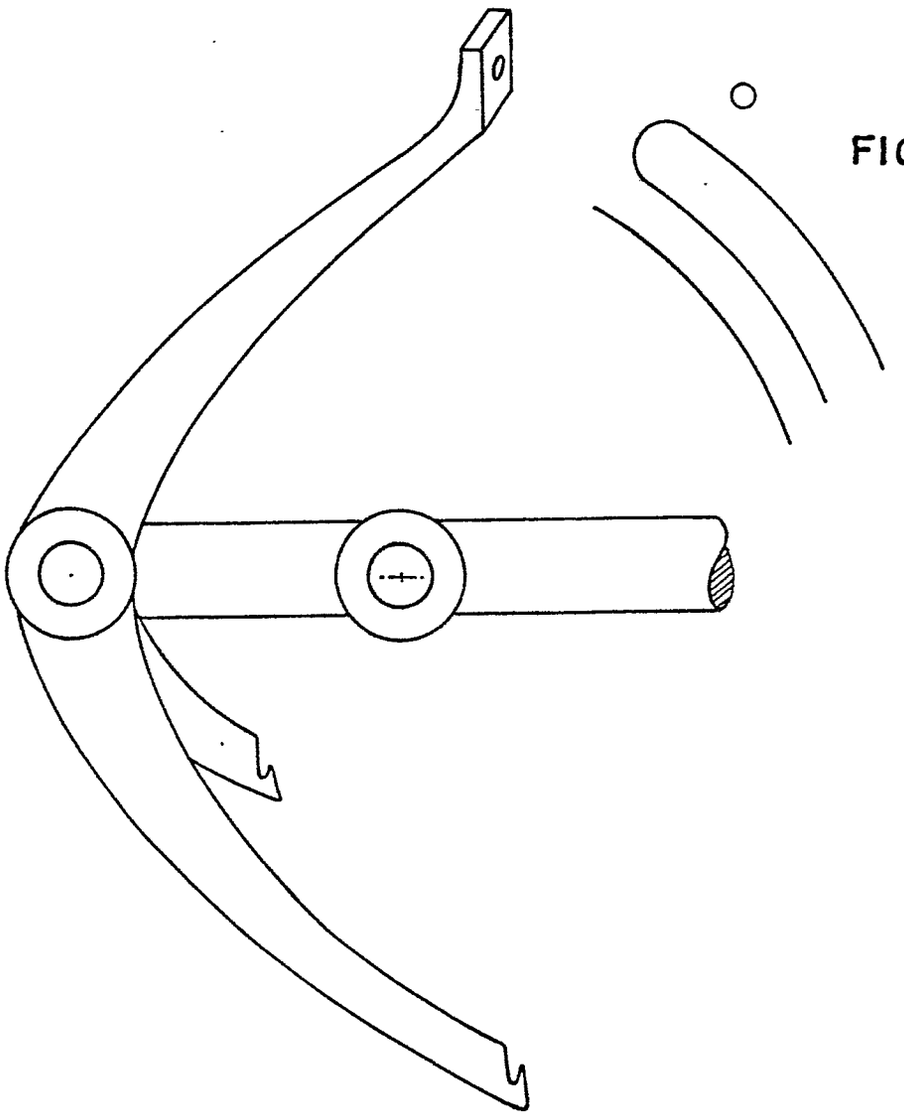
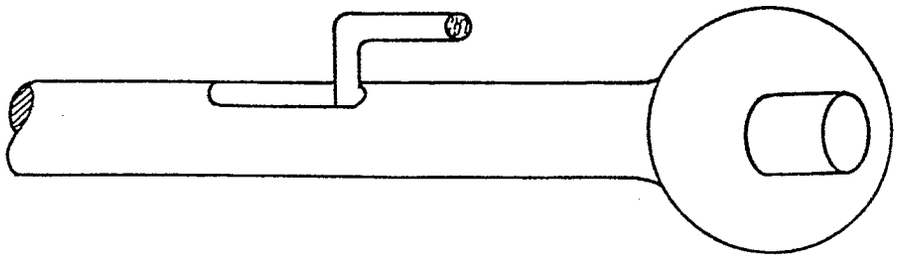


FIG. 3

FIG. 4



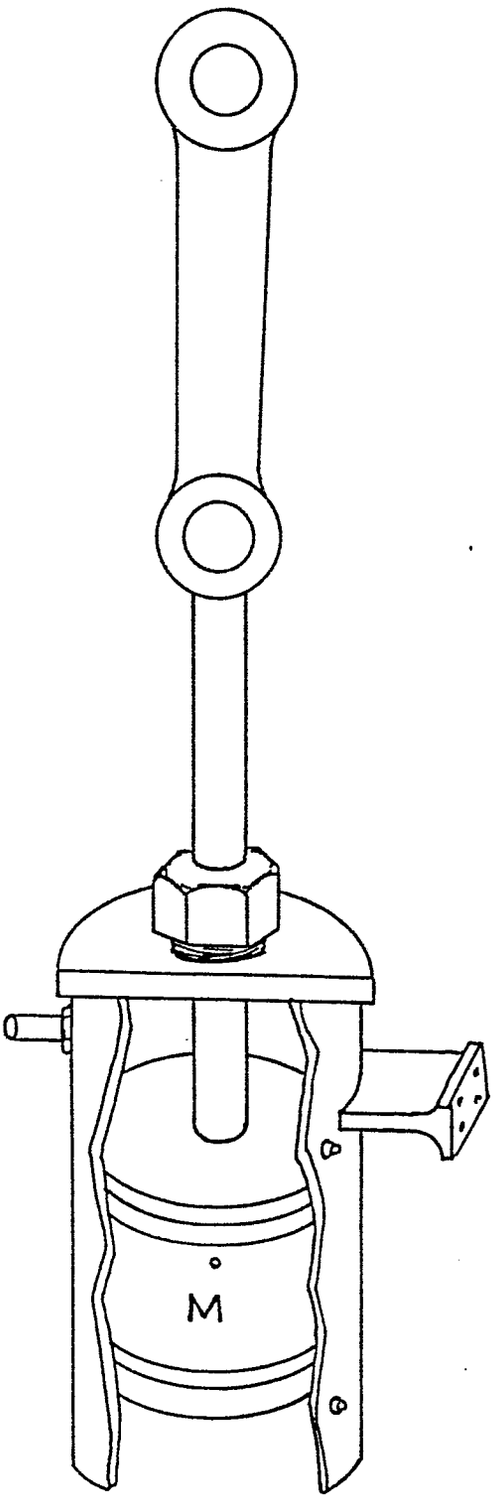


FIG. 5

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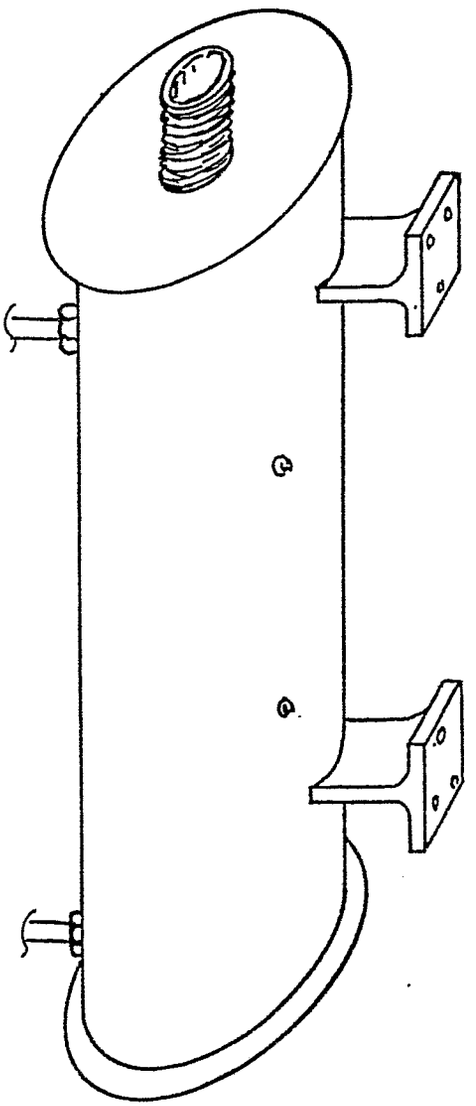

FIG. 6

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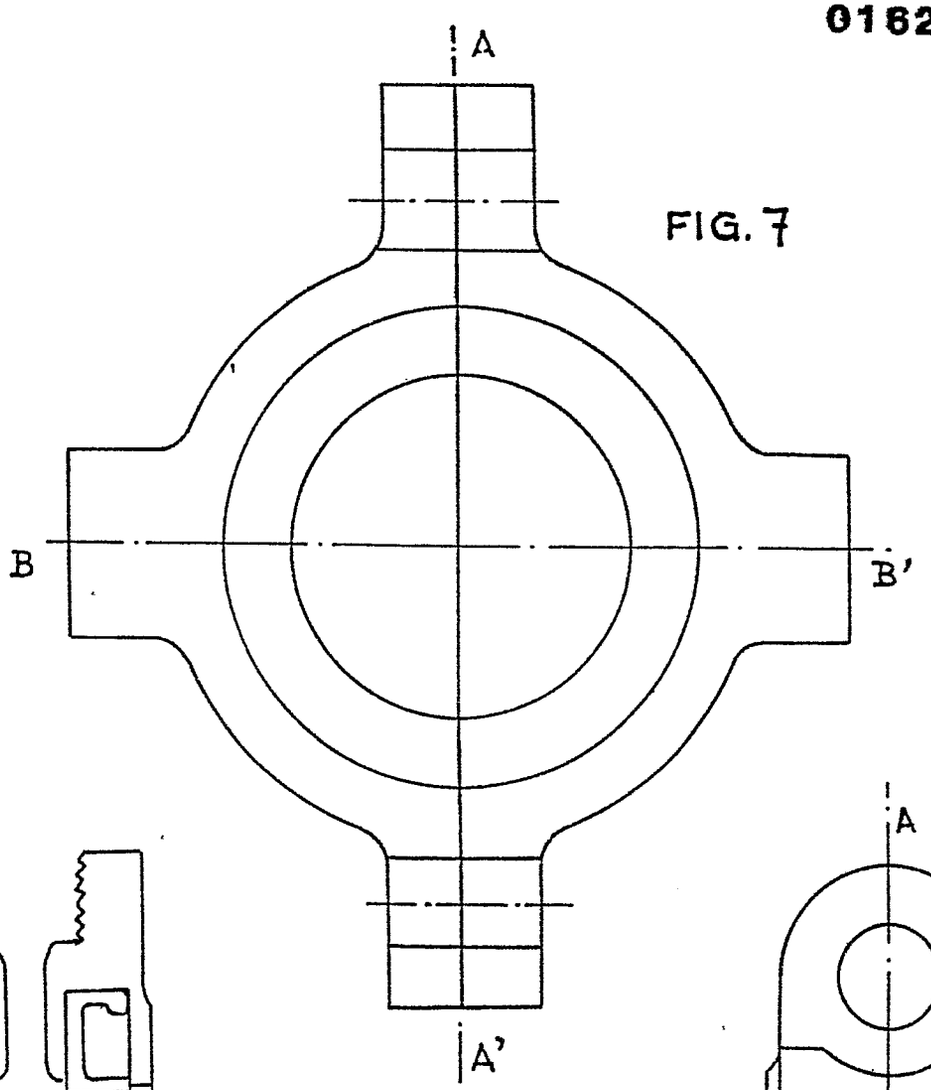

FIG. 7

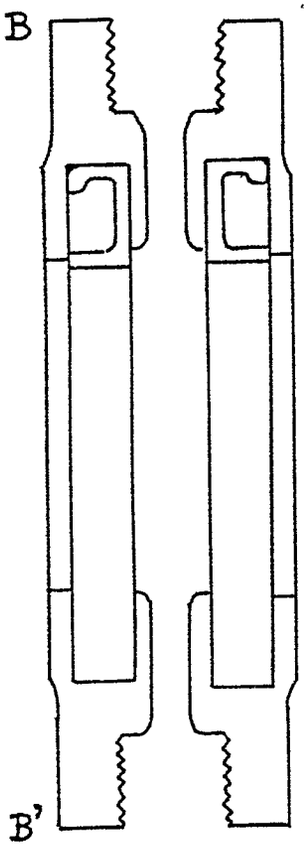

FIG. 9

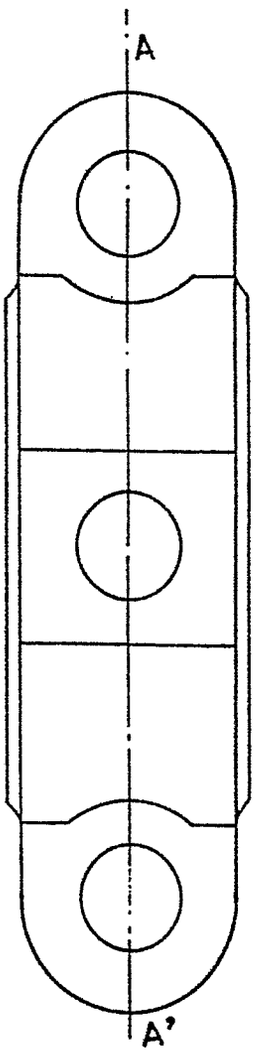

FIG. 8

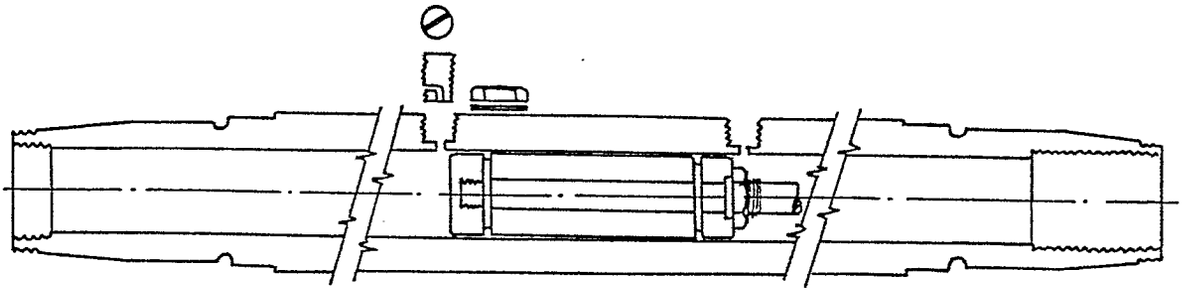

FIG. 10

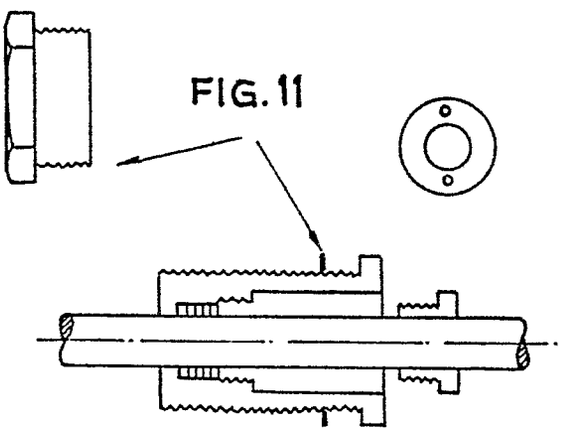

FIG. 11

FIG. 12

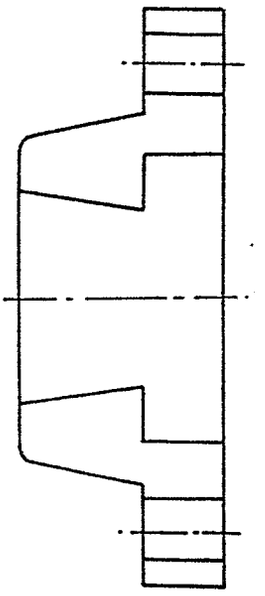

FIG. 13

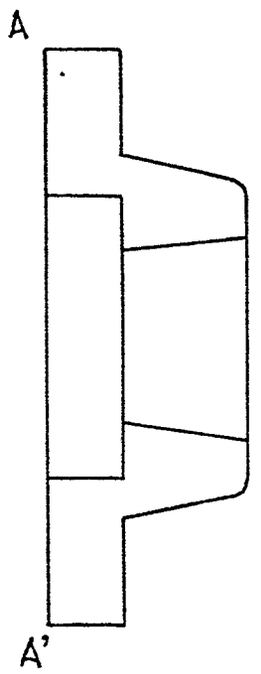

FIG. 14

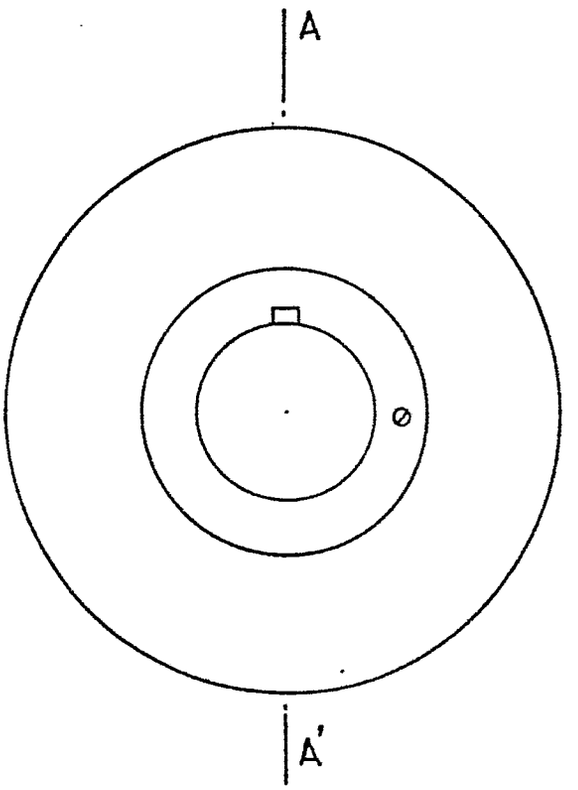

FIG. 15

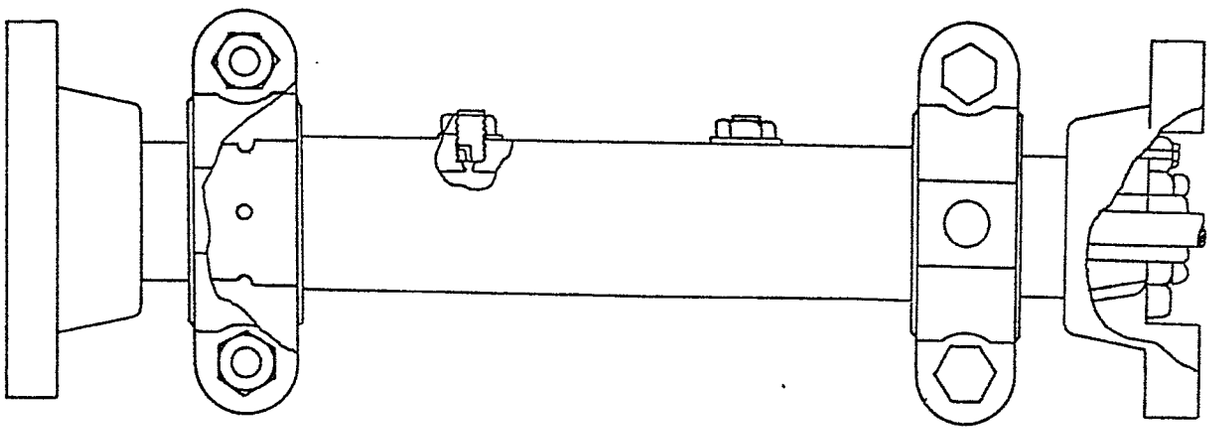

FIG. 16

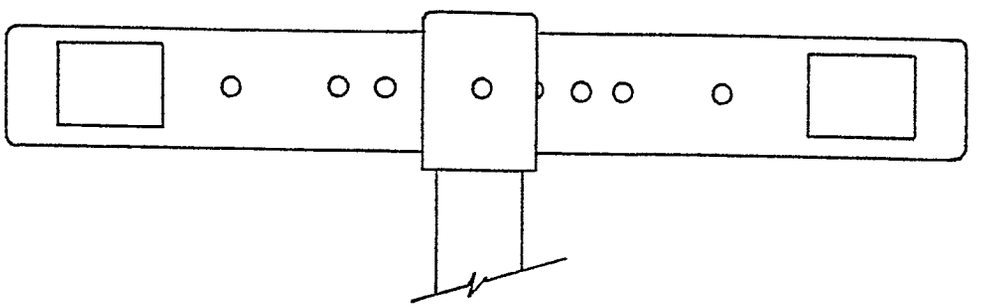

FIG. 17

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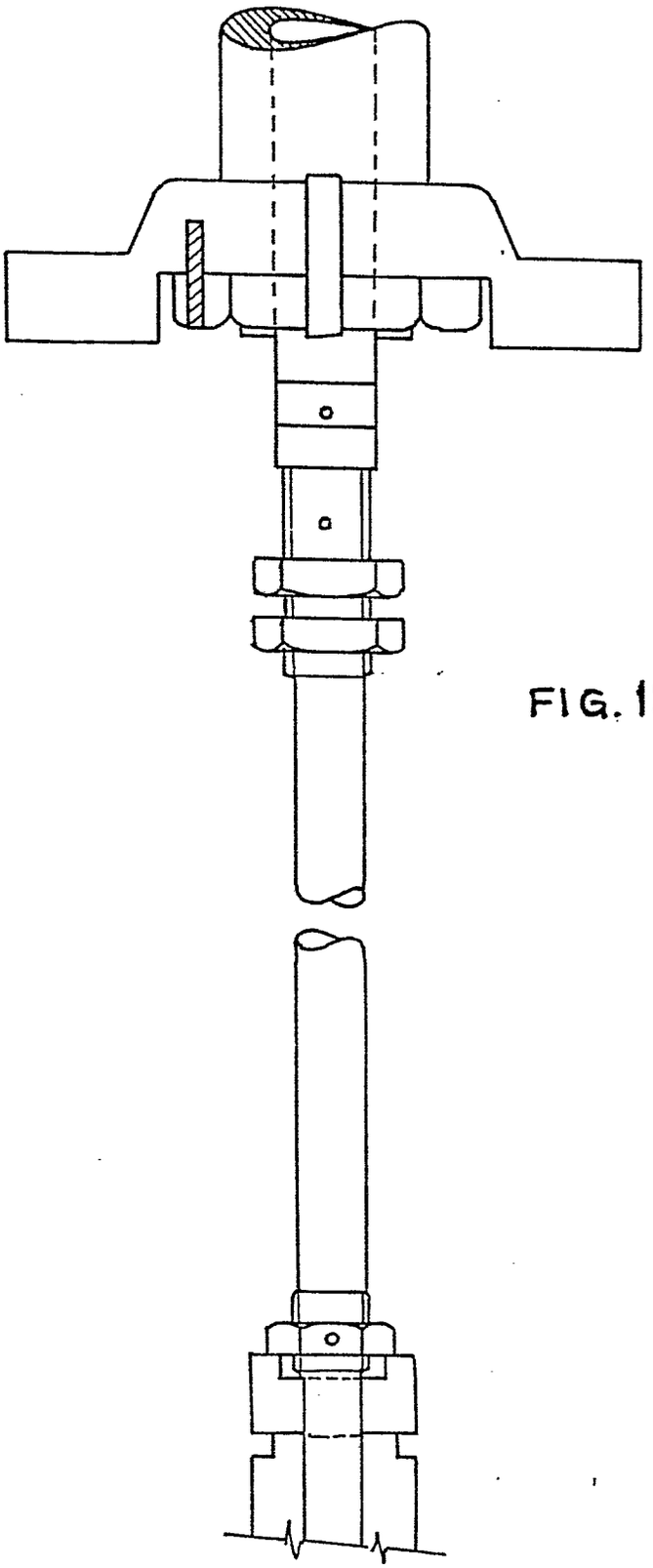

FIG. 18

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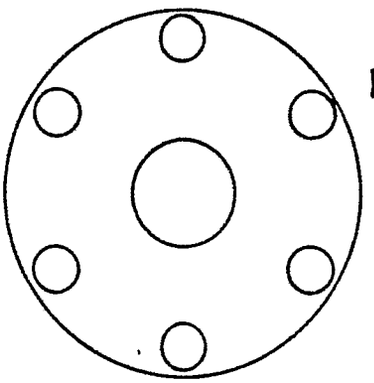


FIG. 20

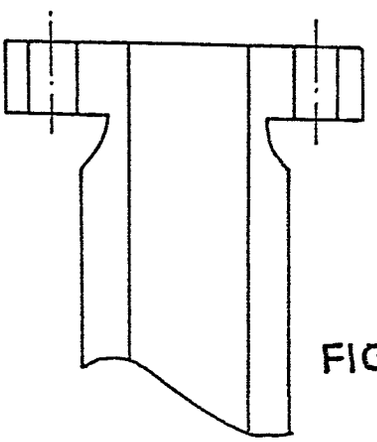
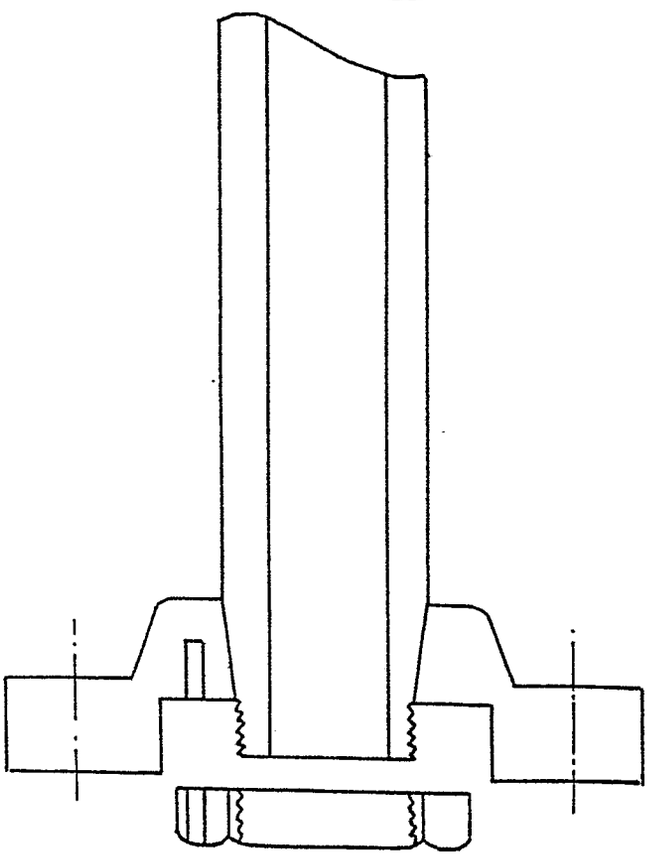
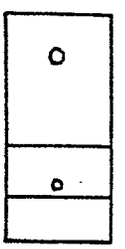


FIG. 19





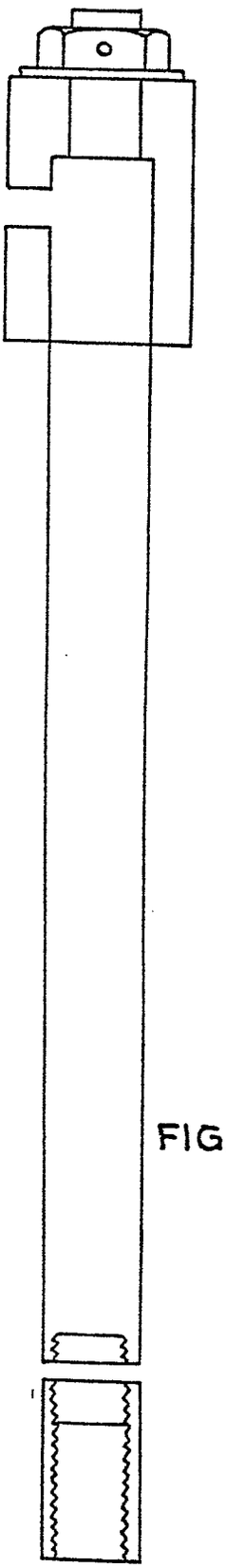


FIG. 21

FIG. 22

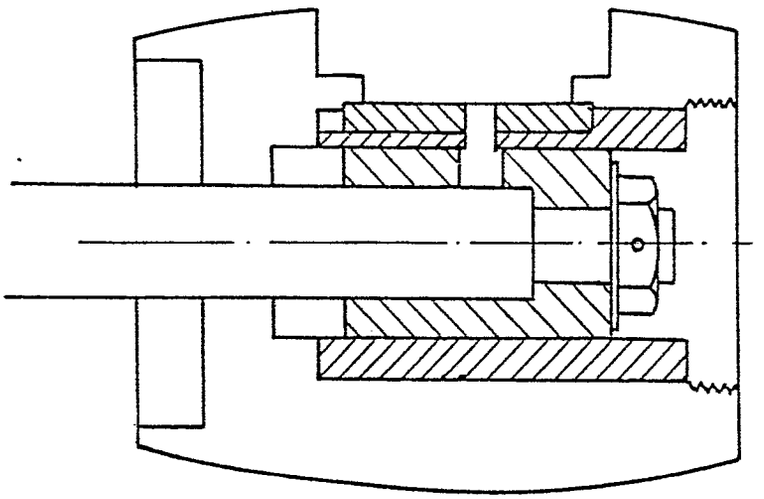


FIG. 23

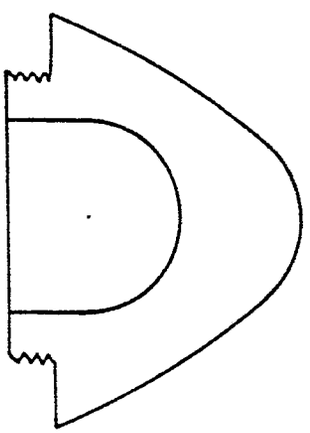


FIG. 24

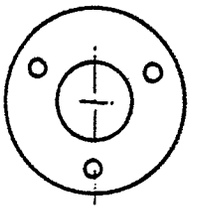


FIG. 25

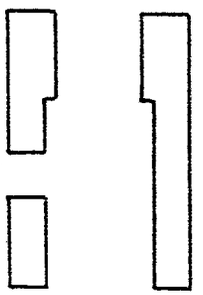
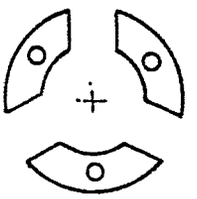


FIG. 26



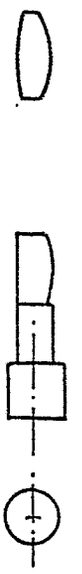
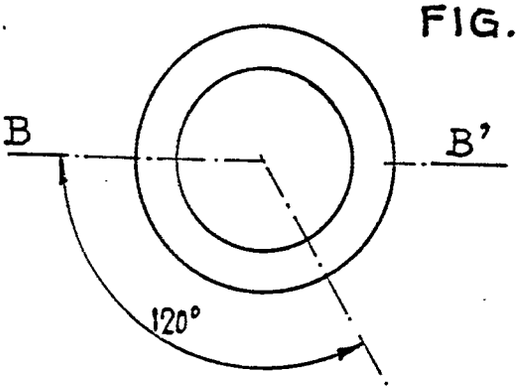


FIG. 27

FIG. 28



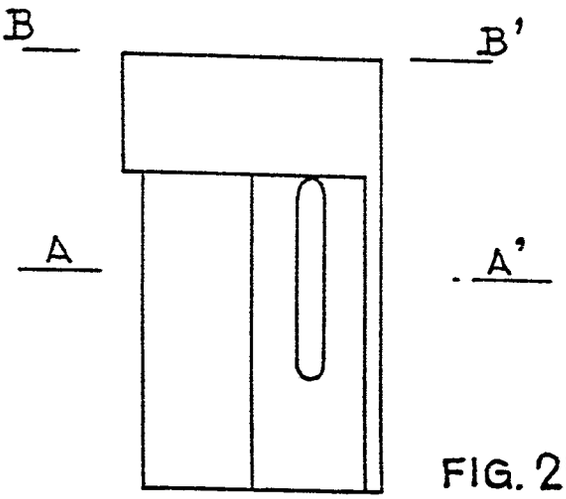


FIG. 29

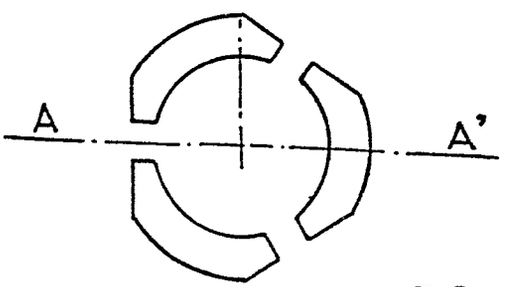


FIG. 30

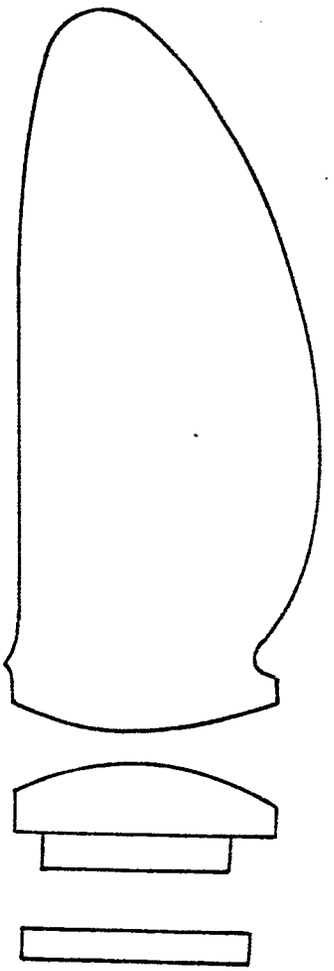


FIG. 31

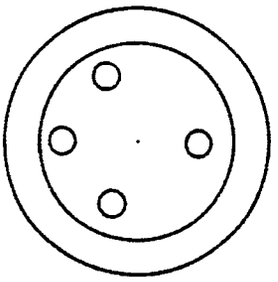


FIG. 32

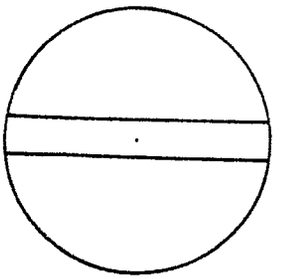


FIG. 33

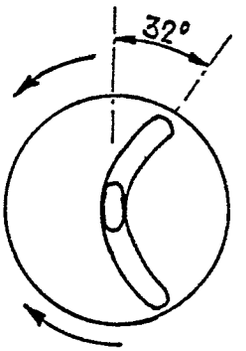


FIG. 34

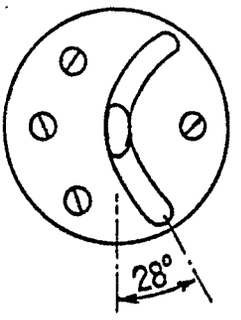


FIG. 35

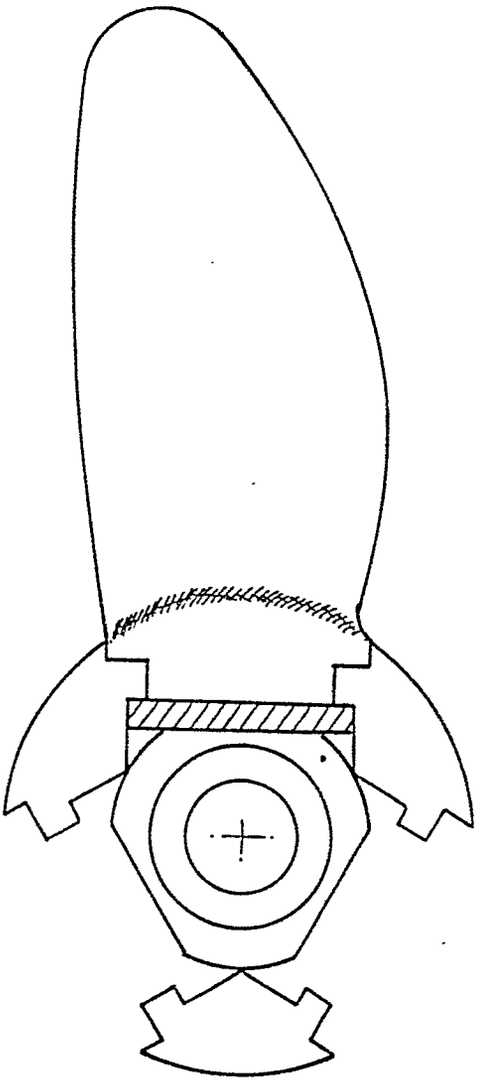


FIG. 36

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FIG. 37

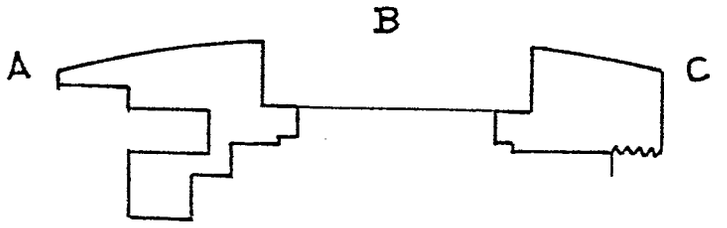
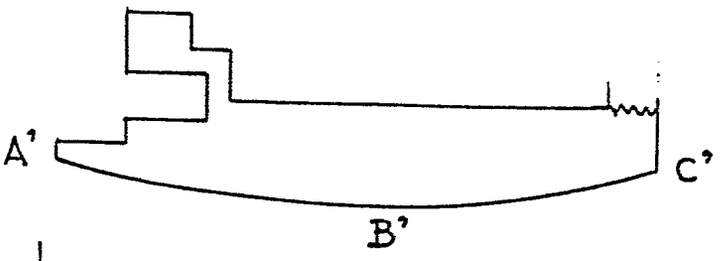


FIG. 38



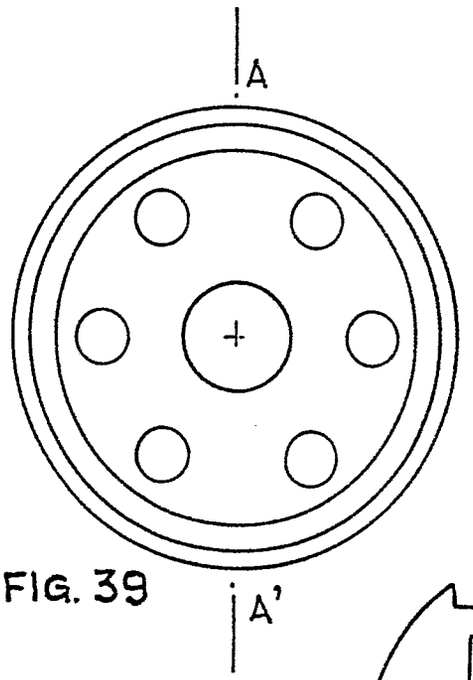
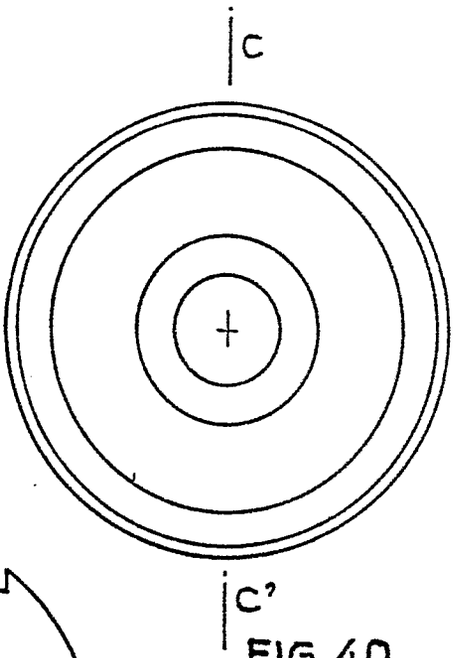


FIG. 39



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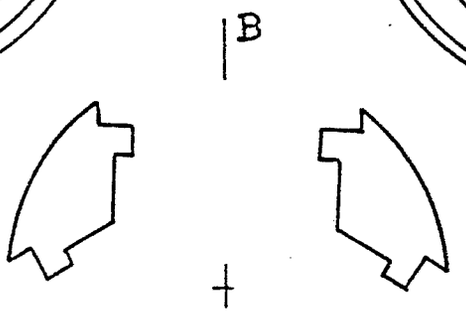
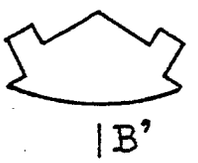


FIG. 41



European Patent Office

PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

0162172
Application number
EP 84 40 0844

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.4)
A	DE - B - 1 070 057 (MADES)		B 63 H 3/04
A	US - A - 3 138 136 (NICHOLS)		
A	GB - A - 2 026 100 (BRANDT et al.)		
A	FR - A - 2 467 141 (REMUSATI)		
A	US - A - 4 347 039 (HOUGHTON)		
A	PATENTS ABSTRACTS OF JAPAN, vol. 7, no. 81 (M-205)(1226) 5th April 1983 & JP - A - 58 8494 (NIIGATA TEKKOSHO K.K.)(18-01-1983)		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 63 H

INCOMPLETE SEARCH

The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims.

Claims searched completely:

Claims searched incompletely: 1,2

Claims not searched:

Reason for the limitation of the search: The description and the claims do not allow a good understanding of the invention and of the details the applicant wants to have protected. Therefore, according to rule 45 EPC, a meaningful search is not possible. Nevertheless documents showing the state of the art for propellers with reversible blades have been quoted.

Place of search	Date of completion of the search	Examiner
The Hague	05-08-1985	BRUMER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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