Nov. 14, 1939. H. V. M. HALL 2,179,626

MOTORBOAT DRIVING MECHANISM

Filed Oct. 24, 1938 2 Sheets-Sheet 1

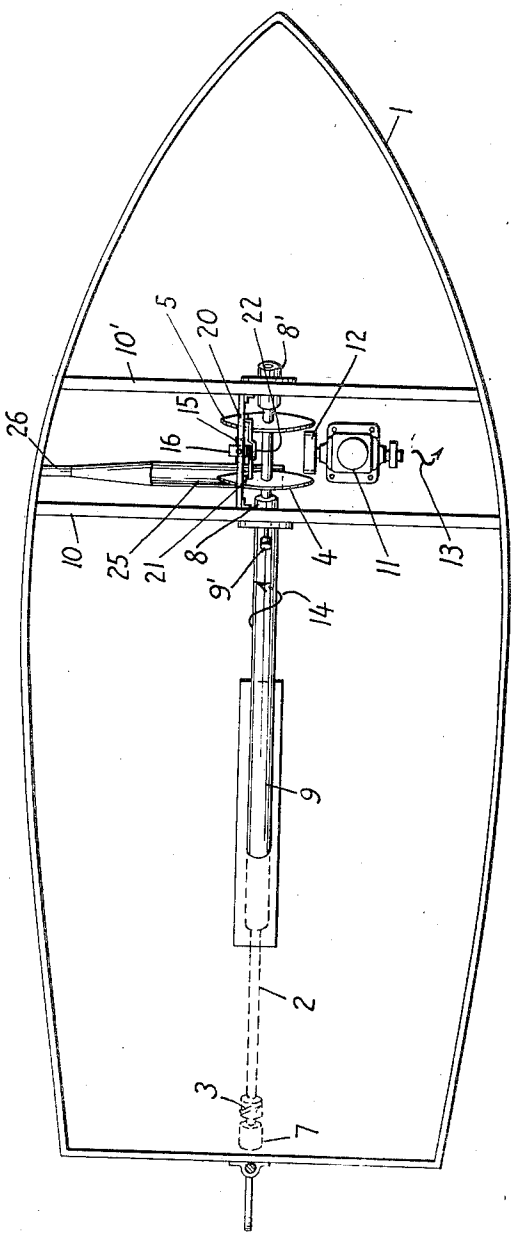


FIG. 1

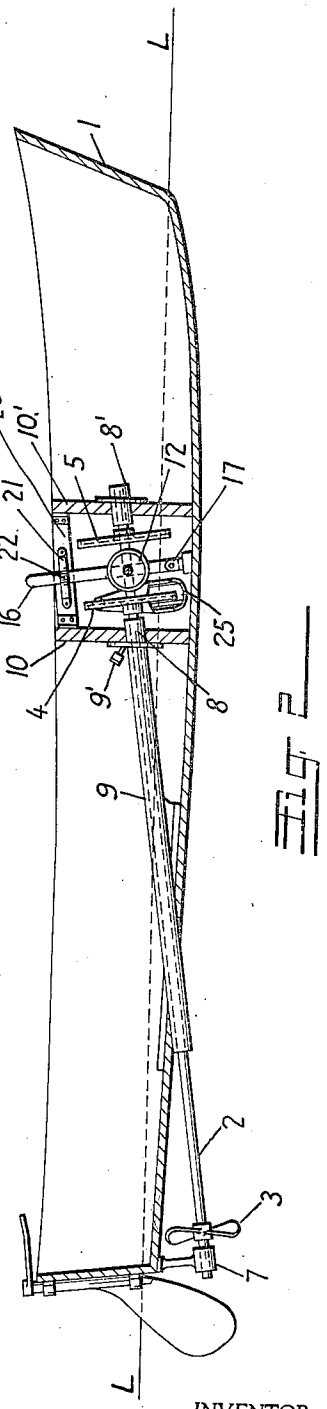


FIG. 2

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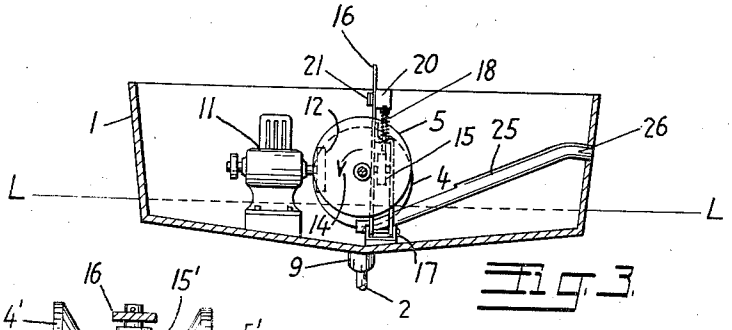


Fig. 3

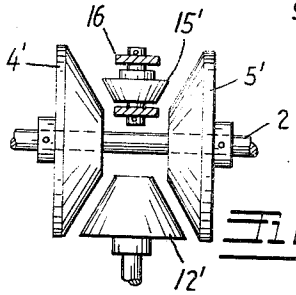


Fig. 6

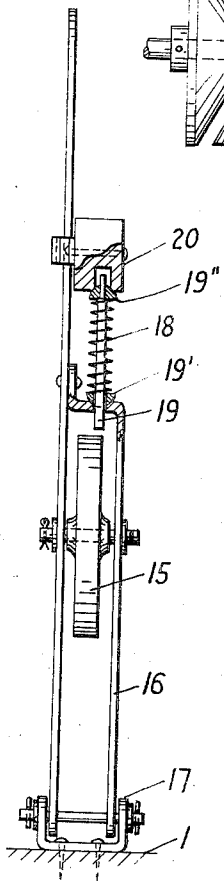


Fig. 5

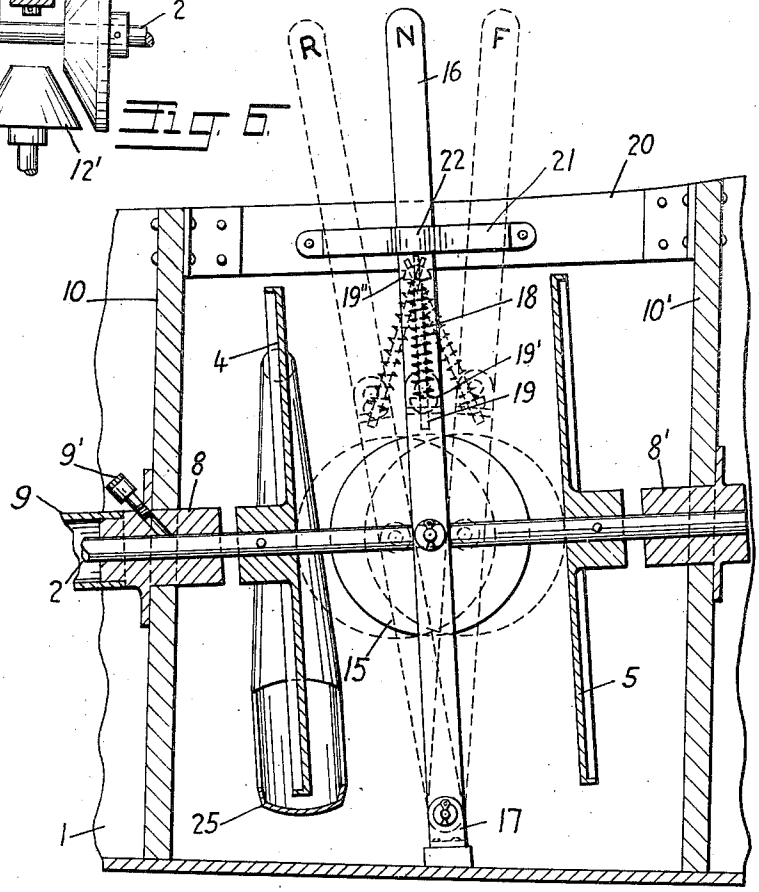


Fig. 4

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Patented Nov. 14, 1939 2,179,626

UNITED STATES PATENT OFFICE

2,179,626

MOTORBOAT DRIVING MECHANISM

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Application October 24, 1938, Serial No. 236,598

11 Claims. (Cl. 115—34)

My invention relates to motorboats and more especially to the driving mechanism for motorboats used mainly by fishermen, as in trolling for fish, or otherwise.

In trolling for fish, for instance, the fisherman sits in a boat and the bait or lure is pulled slowly through the water.

It is necessary to be able to control the speed of the boat so as to move the bait or lure through the water at the speed that is thought to produce the best results at that time and under those conditions.

A small quiet boat is best; it need not have high speed, but it should be able to be put into neutral, forward, or reverse with certainty and speed, for ease in starting the engine, and for ease in approaching a wharf, sunken rocks, sand bars, uneven shore lines, mud banks or anything else likely to be approached by a fisherman.

The object of this invention is to provide for a small fisherman's boat, or any other boat, a drive mechanism which may, at any time, be instantly and easily put into neutral, forward, or reverse, for ease in starting the engine and for perfect and instant control of the movements of the boat.

A further object is to provide such a drive mechanism in which the power is transmitted, in either forward or reverse, through friction.

A further object is to provide such a drive mechanism in which the frictional engagement of the drive is mainly maintained in both forward and reverse, by the thrust or drive of the propeller.

A further object is to provide such a drive mechanism in which the forward end of the propeller shaft tube is above the level of the water, and grease supplied to the propeller shaft tube front bearing will preclude the passage of water through the tube, so that no water-tight packing gland is required for the propeller shaft.

A further object is to provide such a drive mechanism in which the engine and control mechanism may be installed in a water-tight bulkheaded compartment or similar container, which is automatically pumped dry by the drive mechanism, whenever water in any way may enter.

A further object is to provide such a drive mechanism which will remain in either neutral, forward, or reverse position, as set.

A further object is to provide such a drive mechanism having all the above good features and which may be instinctively controlled by the forward position of the control lever to provide forward movement, by the rearward position of the lever to provide rearward movement, and by the intermediate position of the lever to provide the neutral position.

A further object is to provide a drive mechanism having all the above features, and whose operation at all times is practically silent, so that the fish will be disturbed or alarmed as little as possible by the operation of the boat.

A further object is to provide a drive mechanism having all the above good features and which is cheap and simple to manufacture, to install, and to maintain in proper working condition.

A further object is to provide such a drive mechanism in which the engine will, without metallic gearing, be able to revolve about twice for each revolution of the propeller shaft, or some other multiple thereof, whereby, when the engine is throttled down to run slowly, the boat speed will be very low, and whereby even a small engine, when opened up, will be able to run at a high enough speed to deliver sufficient power to drive the boat at a fair speed through the water.

I attain all of the above objects by providing a longitudinally movable propeller shaft and propeller, having two driven friction disks secured to the shaft and spaced apart a distance slightly greater than the diameter of the drive pulley of the engine, which drive pulley is located between the two disks and is covered with leather, rubber, or other proper friction drive material, by providing means to lock the propeller shaft in the forward, rearward, or neutral positions to give forward, reverse, or neutral, by providing water-tight bulkheads or partitions between which the engine and drive mechanism are installed, by providing a propeller shaft tube surrounding the propeller shaft and passing through the bottom of the boat and through the rearward of said bulkheads or partitions, and by providing for at least one of said disks a proper water collecting scoop and a connected discharge tube through which any water in said compartment will be thrown out of the boat by the revolving disk.

All of the above will be more clearly understood by reference to the drawings, in which—

Figure 1 is a plan view in partial section, of a boat provided with my invention.

Figure 2 is a side elevation in partial section of Figure 1 and showing the location of the water line.

Figure 3 is a cross section looking toward the rear of Figure 1 through the engine compartment, showing the location of the engine and in partial section the disk used for water throwing, its

stationary water-collecting scoop and the connected water discharge tube or pipe.

Figure 4 is an enlarged view of the control device and spring lock, located between the two driven disks and the two propeller shaft bearings.

Figure 5 is a transverse sectional view through the control lever showing the spring locking means, the guide for the spring, and the associated parts.

Figure 6 is a view of a modified form of driving mechanism, in which the disks and the engine driving pulley are of the bevel type to provide substantially perfect rolling contact.

In Figures 1 and 2, the boat 1, has the propeller shaft 2, and the propeller 3. To the shaft 2 is securely attached by proper keys, pins, or set screws, or any or all of them, the driven disks 4 and 5, which may be of metal, plastic, or any other proper material.

The propeller shaft 2 is properly mounted in the bearings 7, 8, and 8'. More or other bearings may be employed if desired.

The propeller shaft tube 9 surrounds and has slight clearance with the propeller shaft 2 and passes through the rear bulkhead 10 as a part of the bearing 8, and also passes through the bottom of the boat 1.

A water-tight fit is provided in any proper manner, through both the bulkhead 10 and the boat bottom.

The forward end of the tube 9 where is passes through the bulkhead 10 at the bearing 8, is above the water level L—L, as seen in Figure 2, so that ordinarily no water will get into the boat along the propeller shaft 2.

But the grease cup 9' by supplying grease to the bearing 8 assists in the exclusion of the water due to waves or other causes which might rise in the tube 9 above the water level. To the rear of the bearing 8 the tube 9 has slight clearance with propeller shaft 2, which is not clearly shown in the drawings.

The engine 11 is provided with the pulley 12 whose outer face is covered with leather, rubber, brake lining or other proper friction drive material, or the pulley 12 may if desired be made mainly from such material, and it is located between the disks 4 and 5, and between the bulkheads 10 and 10'.

The engine crankshaft extends transversely of the boat or it may be said to be in an approximately transverse plane, or in a plane substantially at right angles to the propeller shaft 2.

When the shaft 2 and the propeller 3 are in their forward positions, the disk 4 contacts the pulley 12 and the revolution of the engine as shown by the curved arrow 13 revolves the propeller shaft 2 by friction between the pulley 12 and the disk 4, as shown by the curved arrow 14.

This revolution of the propeller shaft 2 causes the propeller 3 to drive the propeller shaft 2 forward and this force causes the disk 4 to be held against the pulley 12, so the drive of the propeller increases the frictional contact between the disk and the engine pulley.

In other words, the entire drive of the propeller against the boat passes through the frictional engagement of the driven disk and the engine pulley.

Thus the pressure between the pulley 12 and the disk 4 is always proportional to the power being exerted by the propeller 3; and consequently the more power being exerted, the greater will be the pressure at this frictional driving contact.

When the propeller shaft 2 and the disks 4 and 5 are in the rearward position, the pulley 12 will contact the disk 5 and the propeller shaft 2 will be revolved in the direction opposite to the arrow 14, and the propeller 3 will pull the shaft 2 rearwardly thus pulling the disk 5 into contact with the pulley 12. This contact and the resulting frictional engagement of the pulley 12 with the disk 5 will be in proportion to the power exerted through the propeller 3, just as when the drive is forward the contact is maintained with the disk 4.

It will be seen from the above that the propeller thrust, whether forward or rearward is transverse with respect to the engine shaft instead of axially along the shaft, as is usual.

The control may employ any proper construction by which the propeller shaft, propeller and driven disks may be moved and set in the forward, reverse, or neutral positions. One of such constructions is shown in Figures 4 and 5. It consists of a roller 15 pivotally mounted on a two legged lever 16, whose two legs are pivotally mounted at their lower ends on a clip or member 17, which is properly attached to the boat 1.

When the upper end of the lever 16 is pushed forward, which is the instinctive thing to do when forward speed is desired, to the position F shown by dotted lines in Figure 4, the roller 15 bears against the forward disk 5, pushing the shaft 2 forward until the disk 4 bears against the driving pulley 12, causing the shaft 2 to revolve so as to drive the boat forward, and this thrust from the propeller 3 to the disk 4 and to the pulley 12 propels the boat and provides the necessary frictional engagement between the disk 4 and the pulley 12.

When in the forward position F the lever 16 is held in that position by the compressed spring 18, which is held in place by the shouldered guide pin 19. The guide pin 19 projects through a free fitting hole in the spherically faced washer 19' and through the loose fitting hole in the lever 16 as shown in Figure 5.

The spherically faced washer 19'' fits over the reduced end of the guide pin 19 and between the shoulder of the pin 19 and the spherical face in the control support member 20. Or the washer 19'' and the pin 19 may be made as one piece if desired.

The spring 18 holds the two spherically faced washers in place against their spherical cups in the lever 16 and the member 20 respectively. Thus movement of the lever 16 is permitted and its movement from either the forward or the reverse positions toward the neutral position is resiliently resisted.

When the lever 16 is moved aft to the position R shown by dotted lines in Figure 4, it is the instinctive movement if reverse is desired. In this position the roller 15 bears against the disk 4, pushing the shaft 2 rearwardly until the disk 5 bears against the engine pulley 12, and this position is maintained by the compressed spring 18.

This causes the shaft 2 to revolve so as to drive the boat 1 rearwardly, and this drive of the propeller 3 forces the disk 5 with more force against the pulley 12, in fact all the force thrusting the boat through the water is applied against the pulley 12.

When in the reverse position R the lever 16 is also held in that position by the compressed spring 18, just as when the lever 16 is in the forward position F.

The control support member 20 may be mount-

ed upon the two bulkheads 10 and 10' as shown in Figure 4, or may be properly mounted upon the boat 1 in any other manner that will properly locate the member 20 so that it may perform its duties even if changed in form somewhat.

A spring guide 21, with a slight depression 22 at its central portion, is properly mounted upon the support member 20, so that the lever 16 is spring-held between the guide 21 and the member 20 when the lever 16 is in either the forward or the reverse position. The depression 22 in the guide 21 serves to prevent the lever 16 from movement out of the neutral position shown by solid lines in the N position in Figure 4. That is, the movement of the lever 16 in either direction from the neutral position can only be accomplished by a slight springing of the guide 21 away from the support member 20.

It will be noted that as the roller 15 operates very close to the axis of the propeller shaft 2, and as the roller 15 is of comparatively large diameter, it will revolve comparatively slowly when in action with practically no drag on the mechanism.

The tension of the spring 18 in either of the off-center positions is enough to cause a light contact between either the disk 4 or the disk 5 and the pulley 12.

When this light contact causes the propeller shaft 2 to revolve the resulting drive or thrust of the propeller 3 provides the necessary driving contact between the pulley 12 and the disk it then contacts.

When the lever 16 is put in the neutral position, it will stay there because it takes a slight pressure to move the lever 16 out of the depression 22 and between the guide 21 and the support member 20, in either direction.

When the lever 16 is in either the forward or the rearward position, it will stay as set (should the engine be shut off) because the spring 18 pushes it to contact the disk 4 or the disk 5 as the case may be, the angle of the spring 18 and the guide pin 19 being accommodated for by the spherically faced washers.

Yet when the lever 16 is in any of the three positions, it can be easily and instantly moved to either of the two other positions since there are no gears that must be engaged, and wherever the lever is moved it will remain.

Moving the lever 16 to the intermediate or neutral position, locks the lever in the depression 22 of the guide 21 and thus holds both disk 4 and disk 5 spaced from the pulley 12.

The above details show one manner in which the control of forward, reverse and neutral may be obtained, but any mechanic will understand that any other proper construction may be employed so long as the same or similar control results are obtained.

Should waves ever cause water to pass up through the tube 9 and into the compartment between the bulkheads 10, and 10', in spite of the end of the tube 9 being above the water level and in spite of the grease in the bearing 8 at the upper end of the tube 9, or if water ever comes over the sides of the boat and into the engine compartment between the two bulkheads, this water will be automatically removed or bailed out, as follows:

The disk 4 revolves with its periphery quite close to the bottom of the boat 1.

The water scoop 25 is properly positioned and attached to the bottom of the boat 1 below the disk 4, and is connected to the pipe 26 which passes through the side of the boat 1 above the water level.

The scoop 25 is wide enough longitudinally of the boat 1 to permit the movements of the disk 4 to take place within the front and rear edges of the scoop.

Any water in the engine compartment will collect at its deepest point which is directly under the center of the disk 4 and within the scoop 25.

As the disk 4 revolves any water its periphery contacts will be thrown along the scoop 25 to the pipe 26 and out of the boat 1.

This will maintain the engine compartment between the bulkheads 10 and 10' in a dry condition at all times when the engine is running.

Since the boat is driven in reverse a very small proportion of the time, no scoop is shown for bailing out the engine compartment when the boat is going in reverse. But, if this is ever required any mechanic will at once see that all that is required is another scoop in line with the present scoop and extending to the other side of the boat, so that when the disk 4 revolves in the opposite direction (reverse) it will throw the water out through this reverse scoop and its connected pipe and out of the boat.

Or, if the engine and propeller are built to run in directions opposite to those indicated by the arrows 13 and 14, when going forward, then the scoop and pipe should be placed on the other side of the boat from that shown in the drawings.

It will thus be seen that all my objects are attained, and that the device is both simple and cheap, and its control is entirely instinctive, since the control lever is merely moved forward for going ahead, rearward for going in reverse, and midway for standing still.

It will be observed that the disks 4 and 5 are about twice the diameter of the pulley 12, so that when the engine 11 is throttled down to run slowly, the propeller 3 will then travel at about half the speed of the engine, and this will provide the slow speed so desired for some fishing conditions. Yet, because of this two to one reduction in the drive, the small engine used may get up to its rated speed where it will produce enough power to revolve the propeller at half engine speed.

And the amount of pressure for a proper friction drive is always automatically provided since the entire thrust of the propeller in pushing the boat through the water maintains the contact between the engine pulley and the disk it then contacts.

The drive is practically silent, so that if a good and proper muffler is employed which discharges directly into the air and not into the water, the boat will not alarm or disturb the fish.

In approaching mud banks, sand bars, sunken rocks or other hazards, the drive provides the most instantaneous control of the boat's movements. And wherever the drive control is set, it will remain.

A modified form of my friction drive is shown in Figure 6.

The friction drive shown in Figures 1, 2, and 3 has true rolling contact between the pulley 12 and the disks 4 and 5 only at the center line of the face of the pulley 12.

Toward the propeller 2 from this center line, the pulley face travels slightly too fast for true rolling contact; and on the other side of this center line of the face of the pulley 12, the pulley face travels slightly too slowly, for true rolling contacts with either the disk 4 or the disk 5.

In other words on either side of this center line there must be some slight slipping between the face of the pulley 12 and the face of either disk 4 or disk 5. It is a well known fact that once slipping starts between two friction drive surfaces, the coefficient of friction at once greatly decreases. This is illustrated clearly in driving an automobile. In either pulling or using the brakes, once the tires begin to slip little can be done.

The construction shown in Figure 6 by providing only true rolling contact with no inherent slipping between the two surfaces, will increase the power that may be transmitted, other things being equal.

The bevel disks 4' and 5' have true rolling contact with the bevel drive pulley 12'. It will be noted that the roller 15' in this construction, also has an angled face to fit the angled faces of disks 4' and 5'.

As shown in Figure 6, the same ratio, two to one, is maintained as shown in Figures 1, 2, and 3.

However, different ratios may be easily obtained, as any mechanic will understand, by variation in the bevel angle and proportion of the parts.

By the use of the bevel construction true rolling contact may be obtained, with probably less slipping and less wear upon the surfaces.

Having now described my invention, what I claim as new and desire to protect by Letters Patent, is as follows:

1. In a motorboat, a front and a rear bulkhead joining the two sides of the boat, a propeller shaft longitudinally movable and carried in proper bearings and provided with a propeller and with two spaced driven disks located between said bulkheads, a tube surrounding said propeller shaft and having water-tight passage through the bottom of the boat and the rearward of the two bulkheads, said tube where it passes through said bulkhead being above the water level, an engine with a crankshaft located in an approximately transverse plane of the boat and provided with a friction drive pulley located between said driven disks, whereby engagement between the drive pulley and one disk will propel the boat forward and engagement between said drive pulley and the other disk will propel the boat rearwardly, and means carried by the boat to move the propeller shaft longitudinally to effect either of said engagements, or to hold said shaft in its intermediate position, selectively.

2. In a motorboat drive mechanism having an engine provided with a friction drive pulley, and a longitudinally movable propeller shaft having two driven disks located on opposite sides of said drive pulley, whereby the forward position of the propeller shaft will engage the rearward disk and the drive pulley and propel the boat forward, and the rearward position of the propeller shaft will engage the forward disk and the drive pulley to propel the boat rearwardly, and in both positions the action of the propeller will increase the frictional engagement of the drive pulley and the disk with which it is in contact, and control means carried by the boat for moving the propeller shaft longitudinally and consisting of a spring-held lever provided with means to put endwise pressure on said propeller shaft in either forward or rearward direction, and a spring lock having a lever-receiving depression for locking the lever resiliently in the neutral position.

3. In a motorboat drive mechanism, a boat having an engine compartment located between bulkheads, a longitudinally extending rotating shaft driven by the engine and having a member of larger diameter secured thereto, and whose outer face is adjacent the bottom of said boat, and scoop means adjacent said member to catch water thrown therefrom and pipe means attached to said scoop means to discharge said water through one side of said boat above the water level.

4. In a motorboat, front and rear bulkheads joining the two sides of the boat, a propeller shaft longitudinally movable and carried in proper bearings and provided with a propeller and with two spaced driven disks located between said bulkheads and at least one of said disks having its rim located adjacent the bottom of said boat whereby to throw water from the bottom of the boat, a tube surrounding said propeller shaft and having water tight passage through the bottom of the boat and the rearward of the two bulkheads, said tube where it passes through said bulkhead being above the water level, water catching-means adjacent said water throwing disk to catch water thrown from said disk and discharge it outside said boat, an engine with a crankshaft located in an approximately transverse plane of the boat and provided with a friction drive pulley located between said driven disks, whereby engagement between the drive pulley and one disk will propel the boat forward and engagement between said drive pulley and the other disk will propel the boat rearwardly, and means carried by the boat to move the propeller shaft longitudinally to effect either of said engagements, or to hold said shaft in its intermediate position, selectively.

5. In a motorboat drive mechanism having an engine provided with a friction drive pulley, and a longitudinally movable propeller shaft having two driven disks, at least one of said disks having its rim rotate adjacent the floor of the boat where it will throw any water that may collect, means adjacent said water throwing disk to catch and discharge outside the boat water thrown from said disk, said two disks located on opposite sides of said drive pulley whereby the forward position of the propeller shaft will engage the rearward disk and the drive pulley and propel the boat forward, and the rearward position of the propeller shaft will engage the forward disk and the drive pulley to propel the boat rearwardly, and in both positions the action of the propeller will increase the frictional engagement of the drive pulley and the disk with which it is in contact, and control means carried by the boat for moving the propeller shaft longitudinally and consisting of a spring-held lever provided with means to put endwise pressure on said propeller shaft in either forward or rearward direction, and a spring lock having a lever-receiving depression for locking the lever resiliently in the neutral position.

6. In a motorboat drive mechanism a circular revolving member adapted to throw water which comes into contact with its rim which is located adjacent the bottom of the boat, in the direction in which the rim is traveling adjacent the bottom of the boat, water receiving means adjacent said member adapted to catch water thrown from the rim of said member and discharge the water thus caught outside the boat.

7. In a motorboat friction drive mechanism, a circular revolving member adjacent the driving friction contact means of said drive mechanism constructed and arranged to throw any water

which may come into contact with its rim in the general direction in which the rim is traveling adjacent the floor of said boat, and water receiving means adjacent said member constructed and arranged to catch water thrown from said member and discharge the water thus caught outside the boat, whereby the said frictional contact means will at all times be prevented from being submerged and will be kept in good working condition.

8. In a motorboat friction drive mechanism, a compartment in the boat, a friction drive mechanism in said compartment, a propeller shaft in a tube having a water tight passage from outside the boat into said compartment, where the tube is located above the water level, and a circular revolving member adjacent the frictional contact drive means of said drive mechanism constructed and arranged to throw water which may come into contact with its rim in the general direction in which the rim is traveling adjacent the bottom of said compartment, and water receiving means adjacent said member constructed and arranged to catch water thrown from said member and discharge the water thus caught outside the boat, whereby the said frictional contact means and said compartment will at all times be kept dry.

9. In a motorboat drive mechanism having an engine mounted upon the inside of the bottom of the boat and provided with a crankshaft having a friction drive member, and a longitudinally movable propeller shaft having two friction driven members located on opposite sides of said friction drive member, whereby the forward position of the propeller shaft will engage the rearward driven member and the drive member and propel the boat forward, and the rearward position of the propeller shaft will engage the forward driven member and the drive member to propel the boat rearwardly, and in both positions the action of the propeller will increase the frictional engagement of the drive member and the driven member with which it is in contact, one of said driven members being constructed and arranged to throw water which may come into contact with its rim in the general direction in which the rim is traveling adjacent the inside bottom of said boat, water receiving means adjacent said water throwing member constructed and arranged to catch water thrown from said member and discharge the water outside the boat, manually operated means having a hand-receiving portion, to move the propeller shaft longitudinally to effect either of said engagements or to locate said shaft in its intermediate position selectively and including a pivotal mounting on the boat on the opposite side of said crankshaft from said hand-receiving portion, whereby the forward and rearward positions of said manually operated means will correspond to the forward and rearward positions of said propeller shaft, resilient means to hold the said shaft as set in either its forward or its rearward position and to increase said frictional engagements, and recessed means to resiliently hold said manually operated means in its intermediate position.

10. In a motorboat drive mechanism having an engine mounted upon the inside of the bottom of the boat and provided with a crankshaft having a friction drive member, and a longitudinally movable propeller shaft having two friction driven members located on opposite sides of said friction drive member, whereby the forward position of the propeller shaft will engage the rearward driven member and the drive member and propel the boat forward, and the rearward position of the propeller shaft will engage the forward driven member and the drive member to propel the boat rearwardly, and in both positions the action of the propeller will increase the frictional engagement of the drive member and the driven member with which it is in contact, a bulkhead extending across said boat to the rear of said engine and friction members, a tube enclosing the propeller shaft and having a water tight passage through the bottom of the boat and through said bulkhead above the water line, manually operated means having a hand-receiving portion, to move the propeller shaft longitudinally to effect either of said engagements or to locate said shaft in its intermediate position selectively and including a pivotal mounting on the boat on the opposite side of said crankshaft from said hand-receiving portion, whereby the forward and rearward positions of said manually operated means will correspond to the forward and rearward positions of said propeller shaft, resilient means to hold the said shaft as set in either its forward or its rearward position and to increase said frictional engagements, and recessed means to resiliently hold said manually operated means in its intermediate position.

11. In a motorboat drive mechanism having an engine mounted upon the inside of the bottom of the boat and provided with a crankshaft having a friction drive member, and a longitudinally movable propeller shaft having two friction driven members located on opposite sides of said friction drive member, whereby the forward position of the propeller shaft will engage the rearward driven member and the drive member and propel the boat forward, and the rearward position of the propeller shaft will engage the forward driven member and the drive member to propel the boat rearwardly, and in both positions the action of the propeller will increase the frictional engagement of the drive member and the driven member with which it is in contact, one of said driven members being constructed and arranged to throw water which may come into contact with its rim in the general direction in which the rim is traveling adjacent the inside bottom of said boat, water receiving means adjacent said water throwing member constructed and arranged to catch water thrown from said member and discharge the water thus caught outside the boat, a bulkhead in said boat to the rear of said engine and friction members, a tube enclosing the propeller shaft and having water tight passage through the bottom of the boat and through said bulkhead above the water level, manually operated means having a hand-receiving portion, to move the propeller shaft longitudinally to effect either of said engagements or to locate said shaft in its intermediate position selectively and including a pivotal mounting on the boat on the opposite side of said crankshaft from said hand-receiving portion, whereby the forward and rearward positions of said manually operated means will correspond to the forward and rearward positions of said propeller shaft, resilient means to hold the said shaft as set in either its forward or its rearward position and to increase said frictional engagements, and recessed means to resiliently hold said manually operated means in its intermediate position.

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