United States Patent

Mades

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[54] SHIP'S DRIVE AND METHOD OF OPERATING THE SAME

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[51] **Int. Cl.** **B63h 3/10**

[58] **Field of Search**.....115/34, 35, .5

[56] **References Cited**

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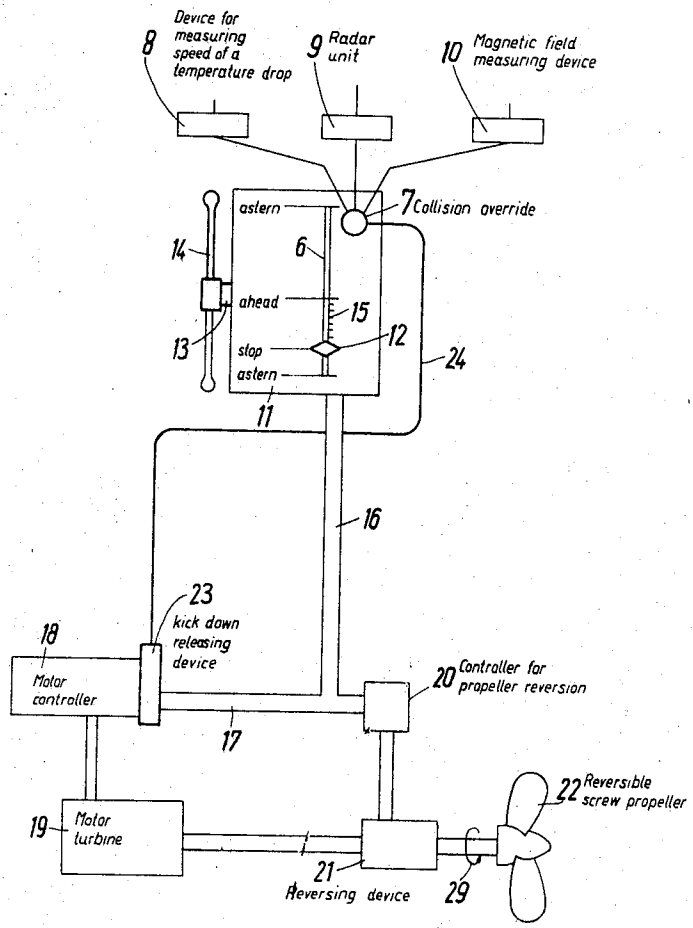
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[57] **ABSTRACT**

A ship's drive and a method of operating it. The drive has a prime mover which can operate at a first power output, at a higher second power output and at a highest third power output. A screw propeller is driven in rotation by the prime mover and includes several blades which are mounted on it angularly adjustable so that they can be displaced either in leeward or, optionally, in luffward direction between a first, a second, and a third position which respectively correspond to full ahead, astern and emergency full astern drive mode. A control unit is provided which couples the propeller with the prime mover in such a manner that the blades can be displaced towards the first position only in leeward direction and only when the prime mover is at its first power output. When the prime mover delivers its second power output the blades can be displaced towards the second position only in luffward direction. In case of an emergency stop, an override arrangement displaces the blades to the third position in luffward direction and irrespective of their previous position while simultaneously initiating the operation of the prime mover at its third and highest power output.

10 Claims, 2 Drawing Figures



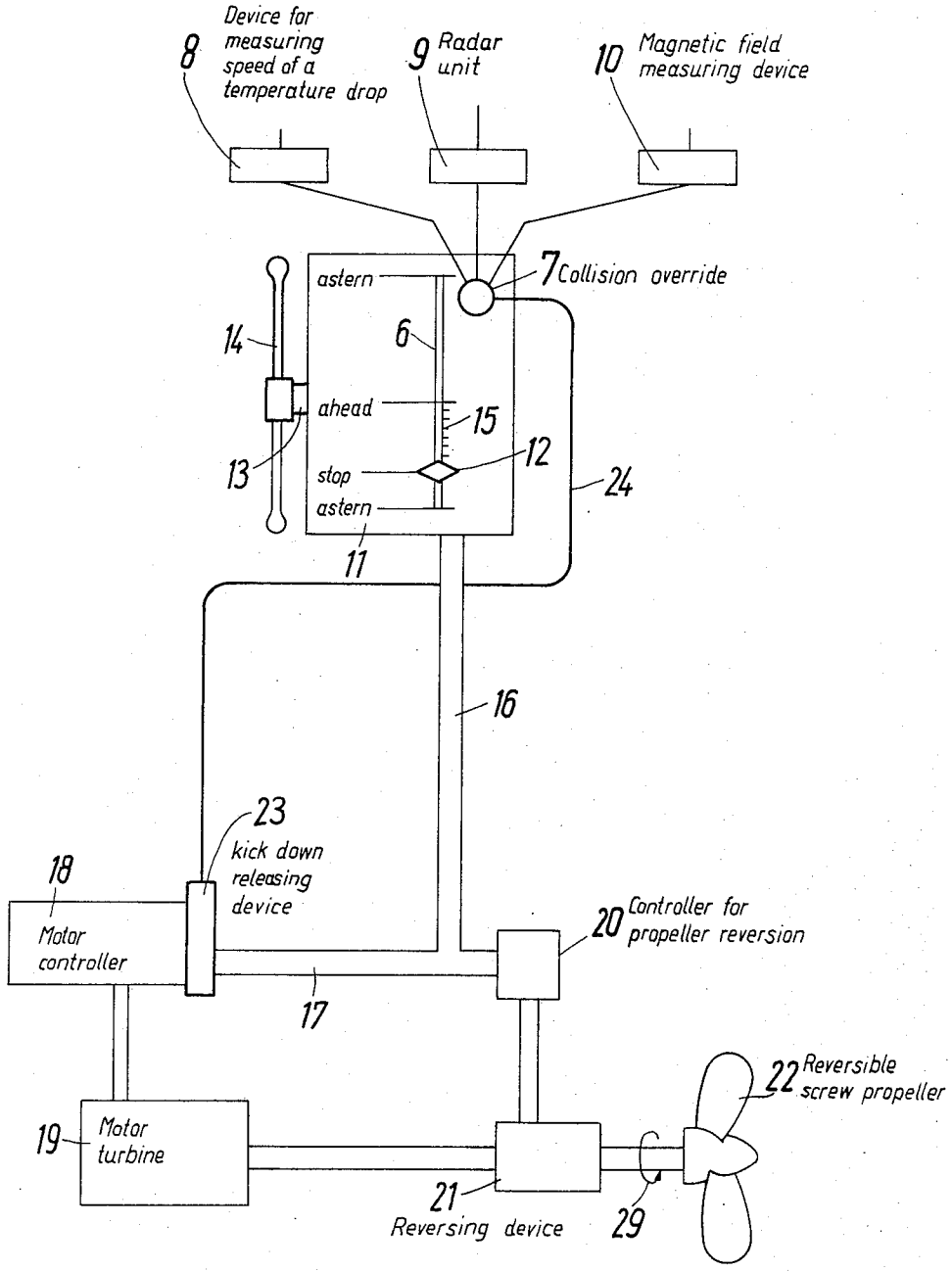


Fig. 1

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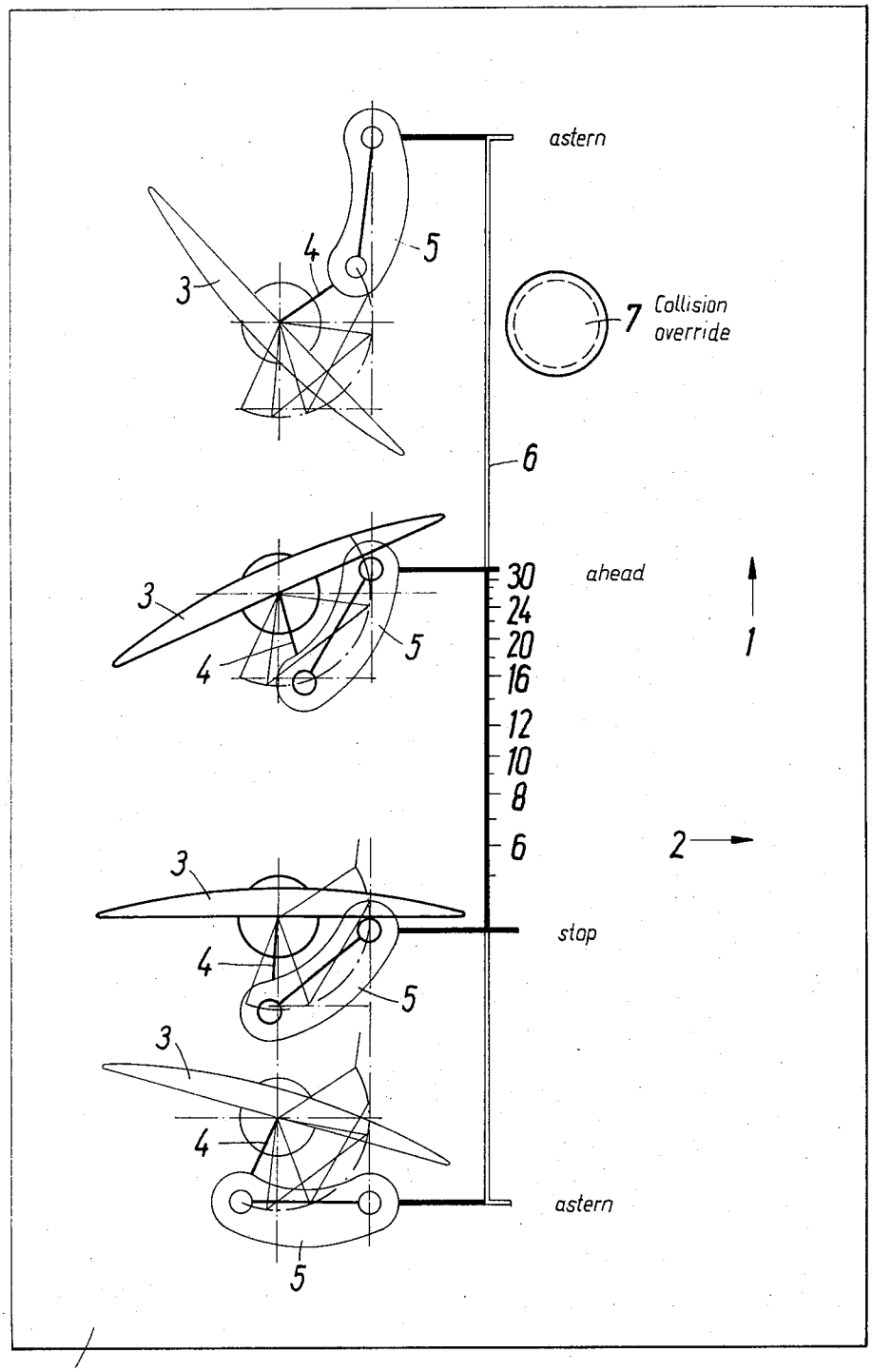


Fig. 2

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SHIP'S DRIVE AND METHOD OF OPERATING THE SAME

BACKGROUND OF THE INVENTION

The present invention is concerned with a ship's drive and with a method of operating the same.

Contrary to popular assumption, forward movement of a ship is not necessarily its most important mode of movement. There are many instances when it is equally important—if not more so—to be able to check forward movement. THis is evidently true where an emergency stop becomes necessary to avoid collision with another ship, an iceberg or a similar construction in the path of the vessel involved. However, there are other instances where stopping maneuvers are of the greatest importance. National and international maritime regulations specify, for example, which ship in certain circumstances has a right of way; when such a situation occurs, the secondary vessel must obviously be capable of properly stopping its progress to avoid a collision. This is true in harbors, waterways and also in the open sea.

Again, it is possible that the signals of one vessel—indicating its intended maneuver—are misunderstood by another vessel and result in a behavior of the other vessel which can lead to collision unless one or both vessels are capable of stopping their forward movement. It is pointed out, for example, that with the state of the art prior to the present invention the commanding officer of a vessel is almost powerless to avoid a collision with another, improperly maneuvering vessel once he has taken the limited stops available to him, namely to order his engines full astern and in order his rudder hard over.

The problems resulting from collisions with an iceberg are even worse than those caused by collision with another vessel. Other vessels are usually recognized early enough to allow at least some evasive action; icebergs, however, are very often detected must too late to take any effective counteraction. This is the result of the almost invariable fog front which develops where an icefield merges with the open sea. By the time an approaching berg is recognized through the fog, the time and distance available for braking the movement of the vessel by reversing its propellers is almost always too little to be of any value in avoiding a collision. This is particularly true in the case of vessels with conventional propulsion plants and non-adjustable screw or screws, because the shortest possible stopping distance is a non-variable function of the propulsion plant and screw parameters.

In vessels where the propulsion plant is in form of a reversible piston drive, such as a steam or diesel engine, the full power of the plant is available for a reverse-drive maneuver. However, a non-variable (or fixed) propeller screw has an effectiveness which is 20 percent lower during reverse operation than during forward operation, owing to the reversing of the suction and pressure sides of the propeller as its direction of rotation is reversed. Thus, fully effective braking or stopping is not available even though the full power of the plant is.

The situation is even less advantageous where the propulsion plant is a turbine, whether it be gas-powered or steam-powered. With such a propulsion plant the braking maneuver can be initiated only by first cutting

the supply of steam or gas to the main (forward) turbine and then starting the secondary (reverse) turbine. However, the reverse turbine can be started only after the main turbine is stopped—for obvious reasons—and has an output amounting to only about 60 percent of that of the main turbine. Moreover, in order to maintain temperature conditions within predetermined limits, the reverse turbine must not immediately be subjected to full load. This means that initially the secondary turbine rotates in the forward direction of the main turbine, being mounted on the same shaft as the latter; as a result, the substantial inertia of the rotor of the main turbine and of the transmission gears—supported by the turbine effect with its negative propulsion flow thrust which drives the propeller as a Kaplan-turbine—oppose the desired reversal in the direction of rotation of the shaft and propeller. It follows that significant time is lost before the screw can finally exert an effective reverse-thrust braking action. This difficulty is aggravated by the fact that in the interim period between shutting-off of the main turbine and the time at which the reverse thrust of the secondary turbine becomes effective, the vessel is left drifting with little or no response to the rudder.

An example of this problem occurred recently when the supertanker "Manhattan" attempted to open a so-called "polar route" to Alaska in order to prove the feasibility of exploiting the Alaskan oilfields by sea. The vessel was intended to act as its own icebreaker and was specially reinforced for the purpose. It utilized a two-propeller turbine drive having an output of 43,000 hp at 70 rpm. However, the vessel's secondary or reverse turbine has an output amounting to only 30 percent of that of the main turbine. Thus, when the "Manhattan" became trapped in an icefield and could become released only be reversing direction and backing out, its reverse propulsion was insufficient to free the vessel which finally had to be released through the efforts of two accompanying icebreakers.

One way of overcoming these problems would be to provide turbine powered vessels with an adjustable screw propeller, so that one and the same screw (or screws if several are provided) could be utilized for the reverse drive by being powered by the main turbine (omitting any necessity for a secondary turbine) and by simply changing the position of the propeller blades depending upon whether the screws are to be set for forward or for reverse movement. However, most the the known adjustable screw propellers have a degree of effectiveness which is approximately 4 percent lower than that of fixed propellers in all operating modes, so that consequently the operation of a turbine powered vessel using adjustable screw propellers would be made substantially less economical than heretofore. These considerations account for the well known fact that adjustable screw propellers are currently in use almost exclusively on diesel-powered ferries which usually have to traverse comparatively short distances but which must almost constantly maneuver. Under such circumstances it is possible from an economic point of view to accept the lesser effectiveness of adjustable screw propellers because of the advantage afforded by them, namely the fact that the full power of the propulsion unit is available for reverse drive also. Of course it will be appreciated that during reverse operation of the ad-

justable screw propeller its effectiveness is even less than during its forward operation because in the conventional adjustable screw propellers the pressure and suction sides of the propeller blades are necessarily exchanged or reversed when the propeller is adjusted for reverse operation. It should be pointed out that conventional adjustable screw propellers have blades which are always adjusted toward lee or in a leeward direction, meaning that they turn through the plane of rotation of the screw. Because of the exchange of the suction and pressure sides of the blades which is involved in this displacement, the adjustable screw propeller which is adjusted for reverse movement has an effectiveness which is lower by 8 percent than even the effectiveness of the fixed propeller during the reverse operation.

The minimum loss of effectiveness of 4 percent in the conventional adjustable screw propellers is caused by the very thick hub necessitated for accommodating the control devices which control the movement of the blades between forward and reverse positions. This reduction is effectiveness must be accepted during the entire operation of a vessel provided with such a propeller, and would thus have highly uneconomical effects on the fuel requirements of the vessel. For this reason adjustable screw propellers have heretofore not been used in vessels which are turbine powered. Added to this is the fact that a direct adjustment of the adjustable blades past their leeward position is not possible as long as the turbine continues to operate, because when the blades reach leeward position—and before they are moved beyond it—their resistance to rotation in the surrounding water drops almost to zero. Under these circumstances the turbine would run almost completely unloaded and its revolutions per minute would increase so rapidly and so drastically that protective devices incorporated in the turbine for this purpose would become triggered and would shut it down. To avoid this difficulty it would be necessary to at least briefly cut the supply of the power to the turbine and of course this also would disadvantageously influence the braking operation.

It is clear, therefore, that improvements in this field are desirable, but it is equally clear that thus far they have not been forthcoming.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to overcome the aforementioned disadvantages of the prior art.

More particularly it is an object of the present invention to provide an improved ship's drive which is capable of so operating that the distance required for stopping the forward movement of the vessel provided with it is drastically reduced from what is known from the prior art.

A concomitant object is to provide such an improved ship's drive in which the amount of propulsion power output available to the propeller of the drive during a stopping maneuver is substantially greater than what is heretofore known.

An additional object of the invention is to provide an improved method of operating such a ship's drive.

In pursuance of the above objects, and others which will become apparent hereinafter, one feature of the invention resides in a ship's drive which, briefly stated, comprises a prime mover operable for providing a first power output, a higher second output, and a highest third power output. At least one screw propeller is mounted for rotation by the prime mover about a main axis and has a plurality of blades angularly displaceable about transverse pivot axis is leeward and optionally in luffward direction between at least a first, a second and a third position which respectively correspond to a full ahead astern and emergency full astern drive mode. There is further provided means which couples the screw propeller with the prime mover for displacement of the blades towards the first position in leeward direction when the prime mover provides the first power output, from the first position towards the second position in luffward direction when the prime mover provides the second power output, and to the third position in luffward direction with concomitant operation of the prime mover at the third power output.

The invention thus provides for a necessary coupling between the controls for the operation of the prime mover and for the operation of the adjustment of the screw propeller blades. This coupling can, however, be terminated in case of a braking emergency, namely when the blades are to be moved to their third position and when simultaneously the prime mover is to be operated at its highest third power output. With this arrangement it is possible, according to a further concept of the invention, to provide a very simple and very clear control unit for controlling the operation of the propulsion unit, which includes both the prime mover and the screw propeller or propellers. Such a control unit involves a control panel provided with a single slot in which a pointer moves between different positions which are indicated by suitable indicia, such as command terminology. The pointer is moved by a single control lever and when the control lever is moved, not only he pointer moves but also the prime mover and the blades of the screw propeller or propellers are adjusted accordingly. When an emergency braking action is required, an override button provided for this purpose is pushed in which case the coupling between the prime mover and the control device for controlling the adjustment of the blades of the screw propeller is terminated, and the prime mover is immediately switched to its highest power output while the blades of the screw propeller are immediately moved in luffward direction to their reverse-propulsion position.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiment when read in connection with the accompany drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a diagram illustrating a drive according to the present invention; and

FIG. 2 is a further diagram illustrating a control unit according o the present invention and also showing in symbolic form, the positioning of the blades of an adjustable screw propeller in the various positions which can be selected with the control unit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Discussing firstly the illustration in FIG. 1 it will be seen that here I have shown in a diagrammatic overview the arrangement of the various components of a drive according to the present invention. Reference numerals 8, 9 and 10 show labelled boxes indicative of detecting devices. Thus, the box labelled 8 is representative of a device capable of measuring the speed of a drop in the ambient temperature. The box labelled 9 is indicative of a radar unit and the box labelled 10 is indicative of a device for measuring the ambient magnetic field. All of these devices are already known in the art and need not be specifically discussed in detail. It will be appreciated precisely what their various functions are. The manner in which they cooperate with the remainder of the drive will be discussed subsequently.

Reference number 11 identifies a control panel provided with an elongated slot 6 in which a pointer 12 is mounted for longitudinal displacement. The pointer 12 is fast with the shaft 13 of an operating lever 14 and thus will move as the latter is moved.

A scale indicating the positions astern, collision override, ahead, stop and astern is provided adjacent the slot 6 on the control panel 11, with the scale being generally identified with reference numeral 15 in FIG. 1 and being shown in an enlarged illustration in FIG. 2. The pointer 12 of course points to the respective command designation which is indicative of the operative mode for which the ship's drive is set at the time.

The operating lever 14 is also connected in a non-illustrated manner with a setting device which is also not shown but which for instance operates on a hydraulic or an electric basis, and which controls via the conductors 16 and 17 the control device 18 for the motor turbine 19, and on the other hand the control device or controller 20 for propeller reversion which operates upon the reversing device 21 and effects the actual reversion of the blades of the reversible screw propeller 22. Thus, in any position of the control unit except operation for utilizing the "collision override" mode, the devices 18 and 20 are operated simultaneously when the handle 14 is operated, meaning that as the power output of the motor turbine 19 is varied via the device 18, the position of the blades of the reversible screw propeller 22 is concomitantly varied via the devices 20 and 21.

If, in the event of a danger of collision the override button 7 is actuated, it acts upon the control switch 23 which may also be considered a kick-down releasing device to thereby disengage the coupling of the devices 18 and 20. As the device 23 effects such disengagement, it at the same time switches the motor turbine 19 via the motor controller 18 to its highest power output and moves the blades of the reversible screw propeller 22 in luffward direction via the devices 20 and 21, to their emergency full astern position.

In FIG. 2 the arrow 1 indicates the normal forward direction of a vessel provided with the novel drive. Arrow 2 indicates the direction of rotation of the non-illustrated and adjustable screw propeller, that is the direction of rotation for forward movement which is indicated by the arrow 2*a* in FIG. 1.

For a better understanding I have illustrated in FIG. 2 the position of one of the adjustable blades of the screw propeller 22, and I have done so in form of a profile. This profile is illustrated in four positions of which the bottom position identified as "astern" is intended for a normal reverse drive during harbor maneuvering at low speed. The stop position is self-evident, and the ahead position is indicative of the full forward movement of the vessel provided with the novel drive, it being kept in mind that the markings 6, 8, 10, 12, 16, 20, 24 and 30 as shown in FIG. 2 are provided to indicate different degrees of forward speed. Finally, at the upper edge of FIG. 2 there is a further "astern" position illustrated, showing the position of the profile of an adjustable blade of the reversible screw propeller 22 when the vessel is to be braked at cruising speed. Of course any other desired position of the profile or profiles can be selected continuously variable intermediate the illustrated positions.

It is clear that the pressure side of the adjustable blade which is turned from the stop position to the lowermost (in FIG. 2) astern position, in leeward direction, is reverse whereas when the profile is moved from ahead position to the uppermost (in FIG. 2) astern position in leeward direction, the pressure side remains unchanged, that is the pressure side which acted during the ahead position also acts during the astern position. This provides for the previously discussed substantial increase in the effectiveness of the novel propeller drive when the adjustment is made in luffward directions, as opposed to where the adjustment is made in leeward direction.

The terms leeward direction and luffward direction will be understood by those versed in the art, but for purposes of greater clarity it is pointed out that when the blade is adjusted in leeward direction it is pivoted through the plane of rotation of the screw propeller, whereas when it is adjusted in luffward direction it is turned to astern position through a position which is normal to the plane of rotation of the screw propeller.

FIG. 2 also shows diagrammatically the crank 4 for effecting displacement of the blade or profile 3, and the control arm 5 for the crank 4.

In the event of an emergency requiring emergency braking, the pushbutton 7 is depressed with the results and for the purposes discussed earlier. When this is done the blades or profiles 3 move at high speed into their maximum reverse position and at the same time the motor turbine 19 is switched to its maximum power output. The pushbutton may be actuated manually, but it can also be coupled with any or all of the devices 8, 9 and 10 so that any danger detected by one of these devices can activate the pushbutton override 7 and automatically initiate the emergency braking procedure.

It is not believed to be necessary to discuss in detail the particular construction for reversible screw propellers of the type suitable for use in the construction according to the present invention. The construction of such a propeller, and of the means for adjusting its various blades, it clearly disclosed in my prior U.S. Pat. Nos. 2,916,095 and 3,122,207, as well as in German Offenlegungs schrift 1 581 129 (especially in FIG. 3) to all of which reference may be had for details. Similarly, device such as the motor controller 18, the propeller reversion controller 20, the reversing device 21 and the kick-down releasing device 23 are well-known to those skilled in the art and their particular construction does not in itself form a part of the present invention.

The reversible screw propeller disclosed in may U.S. Pat. No. 3,122,207 can be used with particular advantage inasmuch as its effectiveness is greater by 4 percent than that of a fixed propeller. When this propeller is used in the construction according to the present invention the total gain of effectiveness over conventional adjustable propellers where the blades are adjusted in leeward directions, amounts to 12 percent inasmuch as in the conventional adjustable propellers the effectiveness is lower by 8 **percent than that of a fixed propeller.**

Furthermore, the propeller disclosed in my U.S. Pat. No. 3,122,207, which is of the type where the blades are adjusted in luffward direction, has the advantage that when the blades are in luff position they act in a retarding sense and thus make it possible for the turbine to enter into the braking maneuver at maximum power whereby the full braking effectiveness is obtained immediately, by contrast to what is known from the art where it is necessary to at least briefly throttle the turbine to prevent it from turning through at non-load conditions.

It will be appreciated that the ship's drive and methods of operation according to the present invention makes possible a completely new approach to maneuvering in that a ship's officer is now capable, beginning with the lowest ahead drive mode from which a reversal of the blades to astern mode takes place in leeward direction, the drive can be rapidly and continuously varied upwardly to the highest load, and at any given moment it is possible to be certain that output of the turbine, drive speed and position of the blades are in optimum relationship with reference to one another, whereby maximum total effectiveness of the propulsion unit is obtained at all times.

The lesser effectiveness of the drive when at low speed the blades are to be moved to the reverse position in leeward direction, is acceptable under the circumstances because at such times the turbine operates only at reduced power in any case and the losses, considered in absolute terms, are insignificant. Also, at low speed movements it is not necessary to obtain a drastic braking action such as is afforded by adjustment of the blades in luffward direction, because more time is available for stopping the vessel and because more time is available for stopping the vessel and because under these circumstances displacement of the blades in leeward direction is adequate. However, this is not true at higher speeds and in case of a collision danger it is essential to be able to utilize the full power of the propulsion unit in reverse at once, that is without any losses, which can be achieved only by reversing the blades in luffward direction according to the invention.

Moreover, the invention provides two different possibilities for braking at high speed, and this is also important. Braking at maximum engine power is an emergency or panic procedure which places the greatest strains upon the entire vessel and which should be used only in times of genuine emergency, that is for instance imminent collision. At other times, or when the danger of collision has not yet reached the point of certainty or immediacy, it should be attempted to stop the vessel by using the screw propeller with its blades reversed in luffward direction but with the engine output at less than fully emergency rating. This approach is normally preferable because it places a lesser strain on the vessel; obviously, when an emergency braking attempt is made by operating the override button **7**, maximum strain is placed upon the vessel and may lead to damage of the engine, propeller shaft, hull and/or other components. Of course, in the case of a genuine and imminent emergency such possibilities are accepted as less dangerous than an actual collision.

The normal braking effort is carried out at a predetermined power output of the engine, an output which is below the maximum emergency output. It is advantageous that this predetermined output—and the distance required for stopping the vessel under this circumstance—is determined once and for all before the vessel is placed into service, for instance during the so-called"shake-down cruise". It can be determined in terms of that engine output of which vibrations of the drive drain and the vessel hull—caused by the blades of the propeller in luffward displacement—do not exceed a predetermined (and acceptable) maximum. By determining in advance the maximum braking distance required for a vessel under normal braking operations, and under emergency braking operations, a valuable tool can be made available to the commanding officer in avoiding collisions.

By resorting to the present invention it is possible to bring to a standstill any ship, especially any turbine ship, within a distance which is smaller by at least two-thirds than the distance previously required. Furthermore, this can be achieved (in the case of turbine-powered vessels) with the main turbine, whereas the need for a secondary or reverse turbine has been eliminated. Thus, the present invention not only provides for greater economy in the construction of a vessel, but also for substantially greater safety in national and international navigation.

Coupling of the motor controller unit **18** with the propeller reversion control unit **20** can be carried out in known manner and as required in individual instances. The unit **20** advantageously uses an oil hydraulic system with stationary cylinders; a suitable unit may be found disclosed in my aforementioned prior patents.

The effects of an emergency braking action on the vessel, especially in terms of vibrations, may be mitigated by making the drive shaft of two sections with an intermediate section being coupled to and connecting them with one another. This is already known in this art and has a twofold purpose, namely to protect the drive shaft from bending moments resulting from bending of the hull, and to absorb longitudinal displacement of the drive shaft at the axial thrust bearing for the same.

It will be appreciated that the present invention not only provides an improved ship's drive, but also a highly effective and versatile research tool which makes it feasible to operate a vessel for study purposes in all possible drive and braking modes and under a variety of circumstances. This, in turn, makes it possible to determine optimum parameters for the operation of vessels of many different sizes and under many different circumstances. The adjustable screw propeller which is disclosed in my prior U.S. Pat. No. 2,916,095 is so constructed that its blades can be adjusted through 145°, an extend of angular displacement not possible with any of the other prior art adjustable propellers.

This substantial degree of adjustability makes it possible to deviate for study purposes from the operative settings of the blades as disclosed herein, and to select the "astern", "stop", "ahead" and "astern" modes in different sequences in order to study maneuvering and propulsion characteristics resulting therefrom.

The drive according to the present invention is especially well suited for use in vessel having a mixed propulsion system, such as a diesel engine as well as a gas turbine. For instance, the drive according to the present invention makes it possible to adjust the blades of the propeller even at high speed of the vessel, for which purpose the wake current is utilized in an auxiliary capacity, i.e. as an aid. The effects of the wake current, and how it can be utilized in the manner just mentioned, is fully disclosed in my earlier-mentioned prior U.s. Patents. The wake current is strongest at highest speed, so that precisely the most abrupt meneuver—namely the emergency braking action can be carried out with its aid with lowest force requirements for adjustment of the blades of the propeller. This, incidentally, will be recognized as an important factor in special-use vessels, such as high-speed naval vessels.

It should still be pointed out that no problems exist in adapting the drive according to the present invention to various different dimensional and/or output requirement, so that for instance propeller diameters as great as 9 m can be readily utilized.

It is to be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a ship's drive, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A ship's drive, comprising in combination, a prime mover operable for providing a first power output, a higher second power output, and a highest third power output; at least one screw propeller mounted for rotation by said prime mover about a main axis and having a plurality of blades angularly displaceable about transverse pivot axes in leeward and optionally in luffward direction between at least a first, a second and a third position which respectively correspond to a full ahead, astern and emergency fully astern drive mode; and means coupling said screw propeller with said prime mover for displacement of said blades towards said first position in leeward direction when said prime mover provides said first power output, from said first position towards said second position in luffward direction when said prime mover provides said second power output, and to said third position in luffward direction with concomitant operation of said prime mover at said third power output.

2. A ship'drive as defined in claim 1, and means comprising a control panel having a slot, a pointer mounted in said slot for displacement longitudinally of the same, indicia means on said panel spaced along said slot and indicative of said first, second and third positions, and actuating means linked with said pointer and with said screw propeller and prime mover.

3. A ship's drive as defined in claim 2, wherein said actuating means comprises an actuating member for moving said pointer between said first and second positions, and an override member for moving said pointer to said third position and for simultaneously displacing said blades to said third position from either of said first and second positions while concomitantly initiating operation of said prime mover at said third power output.

4. A ship's drive as defined in claim 3, said override member comprising an override pushbutton.

5. A ship's drive as defined in claim 1, said means comprising detecting means operable for effecting displacement of said blades to said third position and concomitant operation of said prime mover at said third power output in automatic response to acquisition of predetermined information by said detecting means.

6. A ship's drive as defined in claim 5, wherein said detecting means comprises a radar unit.

7. A ship's drive as defined in claim 5, wherein said detecting means comprises a measuring device for measuring the speed of a drop in the ambient temperature.

8. A ship's drive as defined in claim 5, wherein said detecting means comprises a measuring device for measuring the ambient magnetic field.

9. A method of operating a ship's drive of the type having a prime mover operable for providing a first power output, a higher second power output and a highest third power output, and further having at least one screw propeller mounted for rotation by the prime mover about a main axis and provided with a plurality of blades which are angularly displaceable about transverse pivot axes in leeward and optionally in luffward direction between at least a first, a second and a third position which respectively correspond to a full ahead, astern and emergency full astern drive mode, said method comprising the steps of displacing said blades towards said first position in leeward direction only when said prime mover provides said first power output; displacing said blades towards said second position in luffward direction only when said prime mover provides said second power output; and displacing said blades to said third position with concomitant initiation of the operation of said prime mover at said third power output.

10. A method as defined in claim 9, wherein said ship's drive further comprises a detecting device for detecting predetermined information; and further comprising the step of displacing said blades to said third position and operating said prime mover at said third output in automatic response to acquisition of said predetermined information by said detecting device.

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