June 3, 1941. F. W. CALDWELL ET AL 2,243,852

HYDRAULIC INTERMEDIATE PITCH LIMIT STOP

Filed July 31, 1937 4 Sheets-Sheet 1

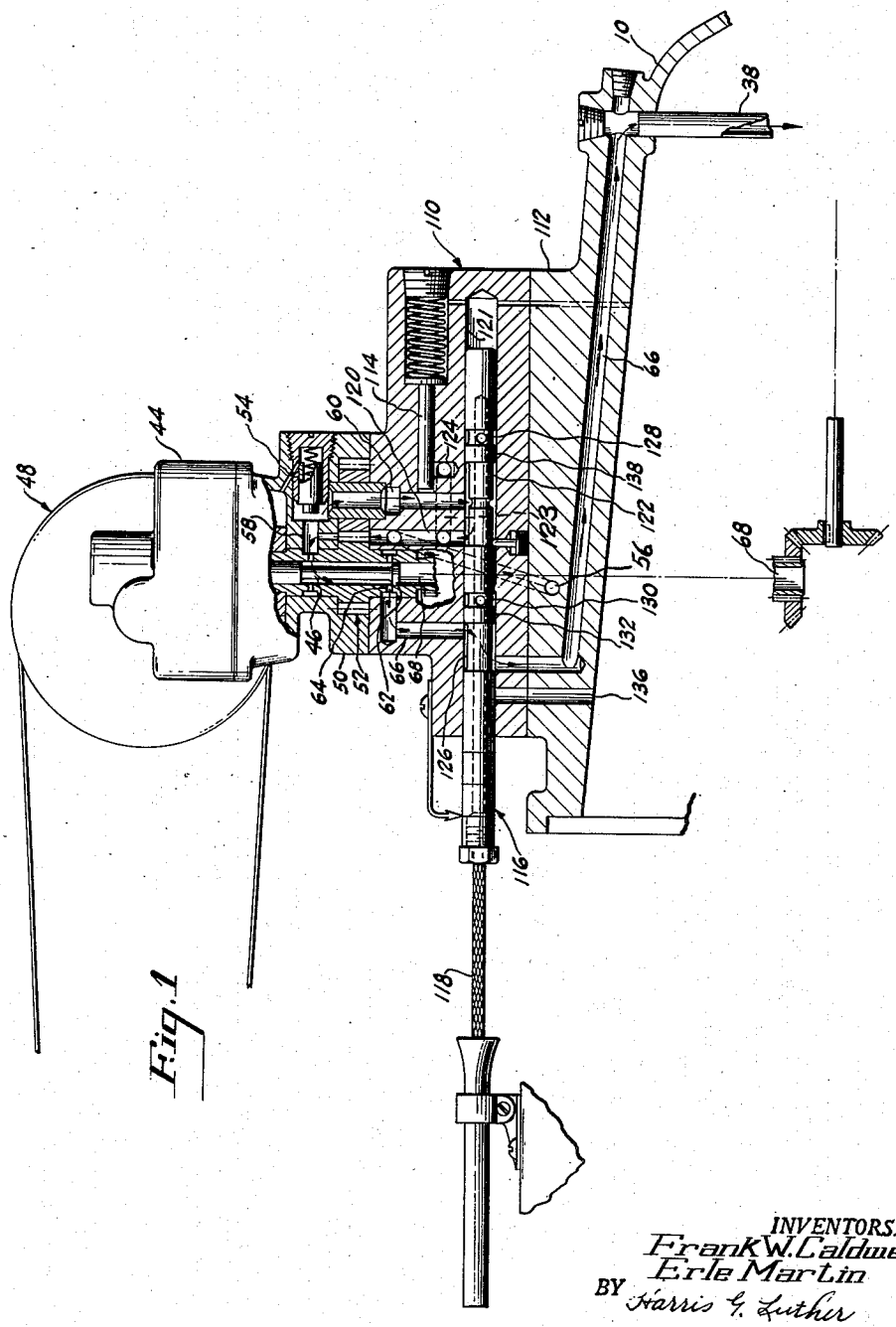


Fig. 1

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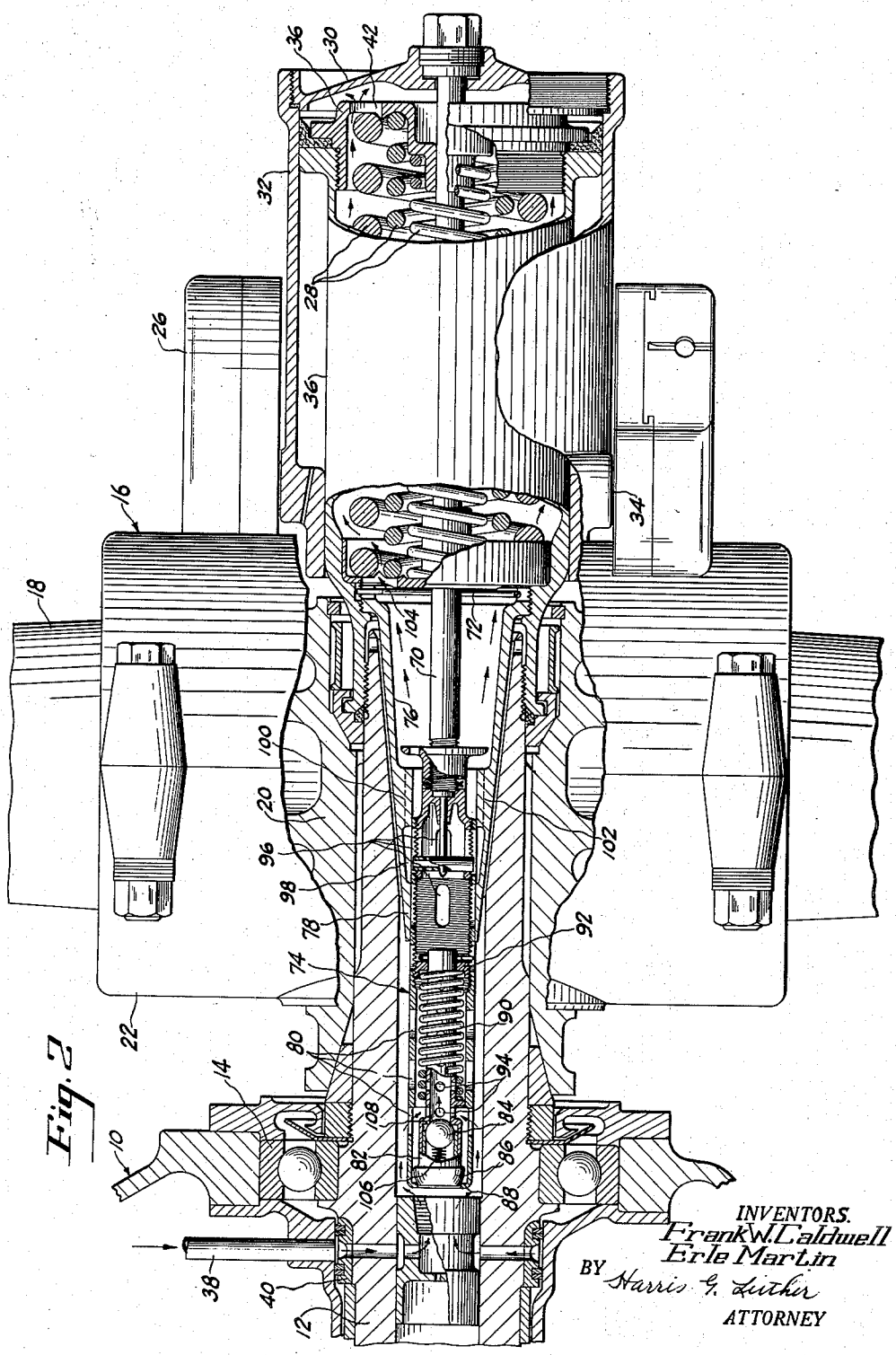


Fig. 2

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Filed July 31, 1937 4 Sheets-Sheet 3

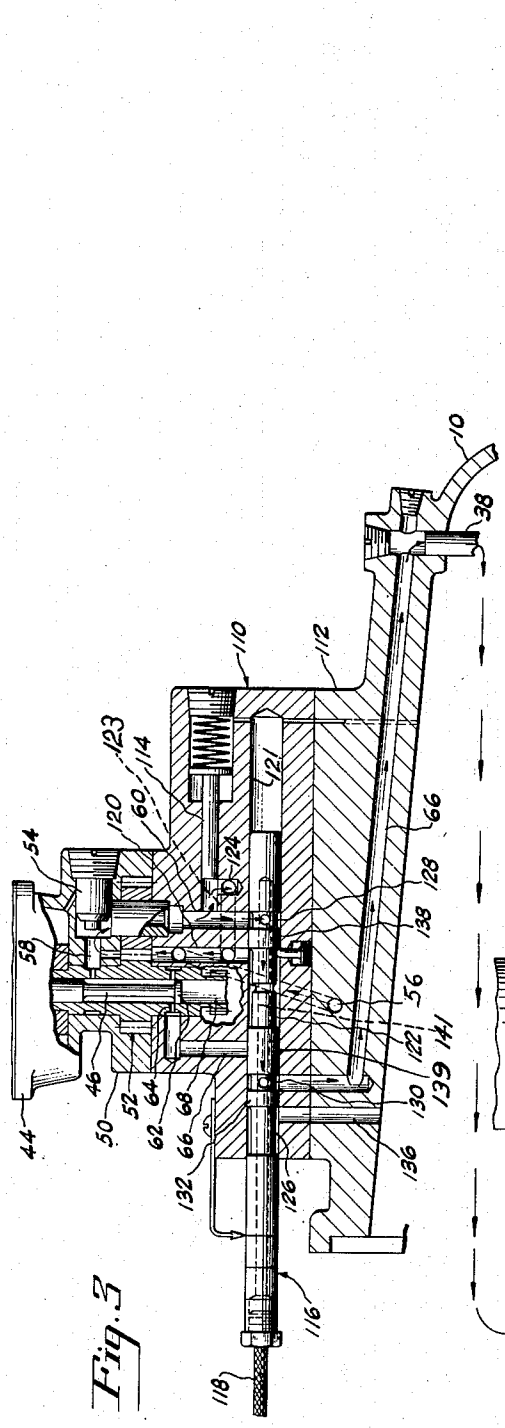


Fig. 3

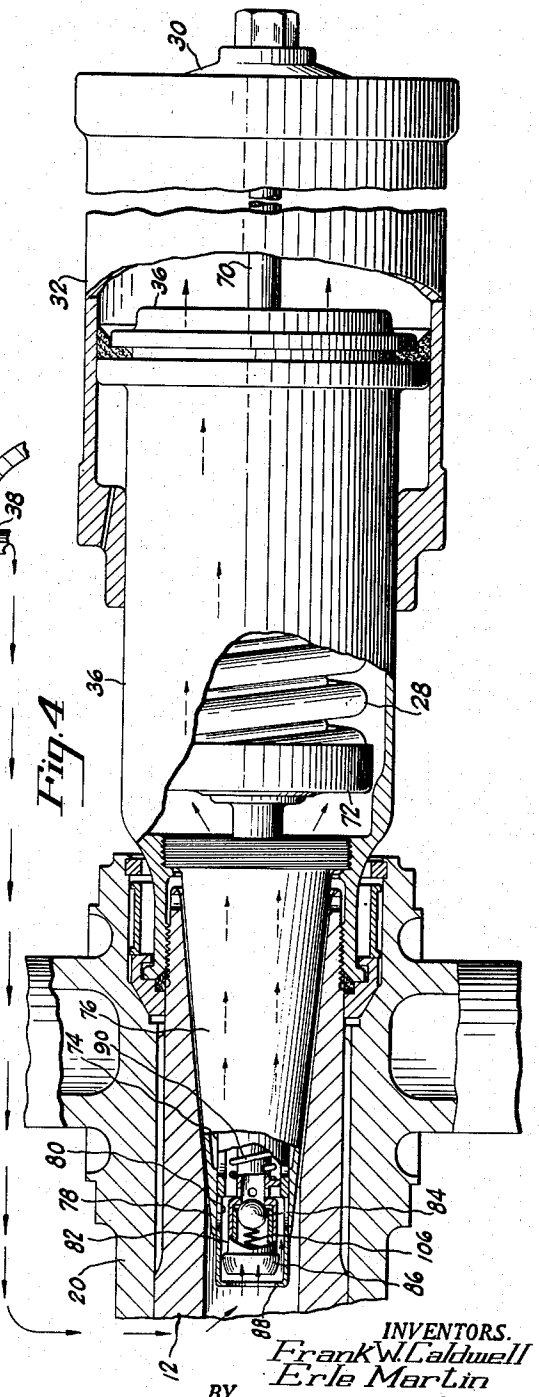


Fig. 4

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HYDRAULIC INTERMEDIATE PITCH LIMIT STOP

Filed July 31, 1937 4 Sheets-Sheet 4

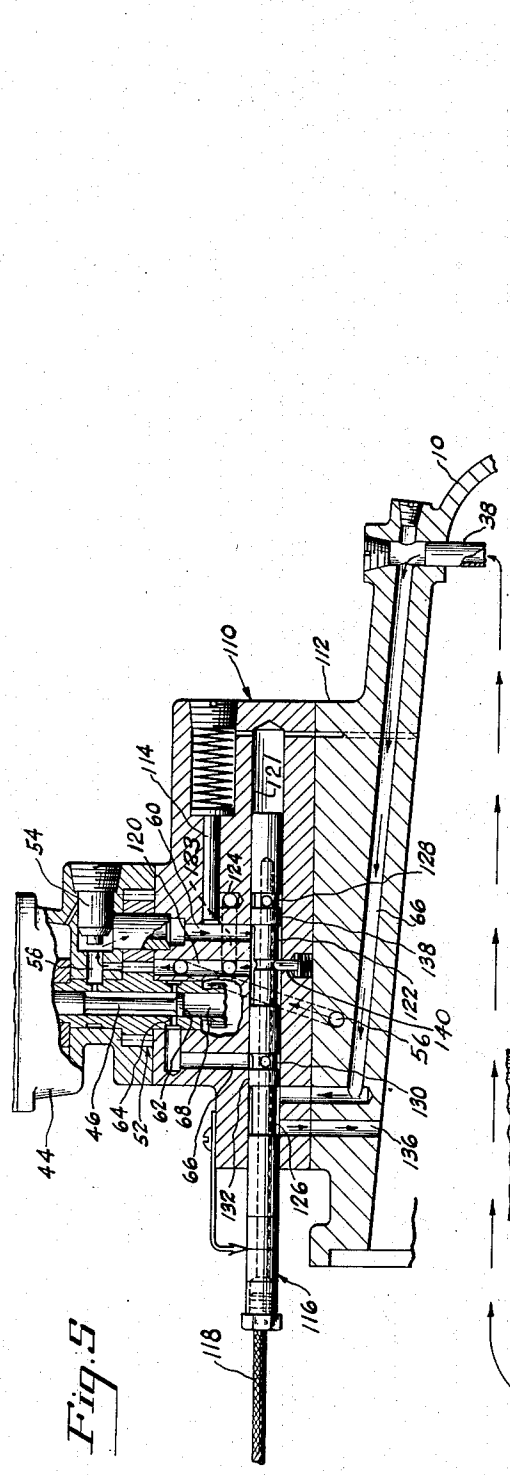


Fig. 5

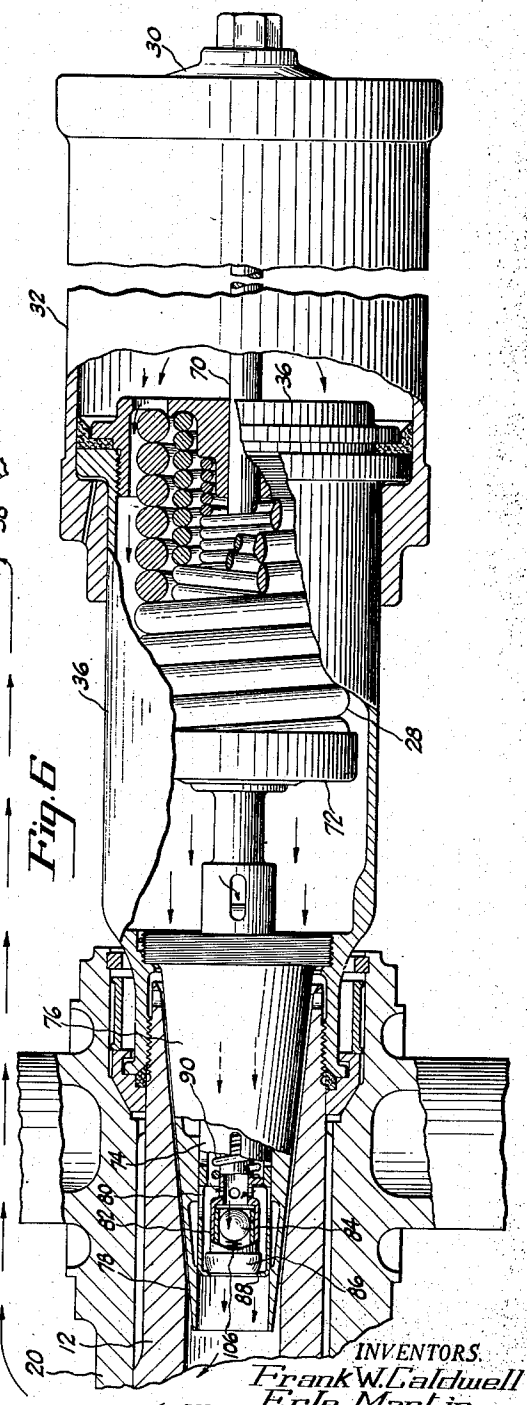


Fig. 6

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UNITED STATES PATENT OFFICE

2,243,852

HYDRAULIC INTERMEDIATE PITCH LIMIT STOP

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Application July 31, 1937, Serial No. 156,714

11 Claims. (Cl. 170—163)

This invention relates to improvements in propellers and has for an object the provision of an improved hydro-controllable propeller and control mechanism therefor incorporating an intermediate pitch limit stop for dividing the total extent of pitch changing movements of the propeller blades into two ranges, a normally operative a constant speed control range, and a range of adjustment outside of the range of normal propeller operation.

A further object resides in the provision of an improved hydro-controllable propeller and control means therefor, as indicated, including means by which the propeller may be manually induced to operate in either selected one of the two ranges of pitch adjustment.

A further object resides in the provision of means for accomplishing the above stated functions without the addition of cumbersome or complicated mechanism to the existing propeller and propeller control mechanism.

Other objects and advantages will be more particularly pointed out hereinafter or will become apparent as the description proceeds.

In the accompanying drawings in which like reference numerals are used to designate similar parts throughout, there is illustrated a suitable mechanical embodiment of what is now considered to be the preferred form of the idea of the invention. The drawings, however, are for the purpose of illustration only and are not to be taken as limiting the invention, the scope of which is to be measured entirely by the scope of the appended claims.

In the drawings

Fig. 1 is a vertical sectional view of a control device for a hydro-controllable propeller showing the application thereto of a manually actuatable valve constructed according to the idea of this invention and located in a selected one of a plurality of various operative positions.

Fig. 2 is a vertical sectional view of a hydro-controllable propeller including an intermediate pitch limit stop device constructed according to the idea of this invention.

Fig. 3 is a sectional view of the propeller control mechanism similar to Fig. 1 but showing the manually operable valve in a different selected operative position than the position illustrated in Fig. 1.

Fig. 4 is a vertical sectional view of the hydro-controllable propeller similar to Fig. 2 but showing the intermediate pitch limit stop device in a different operative position from that illustrated in Fig. 2.

Fig. 5 is a vertical sectional view of the propeller control device similar to Figs. 1 and 3 but showing the manually operable control member in a different selected operative position than the position illustrated in Figs. 1 and 3, and,

Fig. 6 is a vertical sectional view of the hydro-controllable propeller similar to Figs. 2 and 4 but showing the operative element of the propeller in a position different from the positions illustrated in Figs. 2 and 4.

Referring to the drawings in detail the numeral 10 generally indicates a portion such as the front end section or nose piece of a suitable propeller driving engine. The propeller shaft 12 projects from the nose piece 10 and is supported therein by suitable means such as the anti-friction roller bearing 14. The propeller, generally indicated at 16, is mounted upon the projecting end of the shaft 12 and comprises a plurality of blades 18, rotatably mounted upon the radially extending arms of a propeller hub member or spider 20, and retained thereon by a suitable hub barrel member 22. In the particular form of propeller illustrated the blades are urged to their high pitch position by the centrifugally actuated counter-weights 26, assisted by the coiled compression springs 28, and towards their low pitch position by the action of hydraulic fluid under pressure against the inner surface of the closed end 30 of the movable cylinder 32. While one form of propeller has been particularly illustrated in the accompanying drawings, it is to be understood that this disclosure is for illustrative purposes only and that the device of the invention may be applied to various forms of hydro-controllable propellers without in any way departing from the scope of the invention.

In the form of the propeller illustrated the counter-weights 26 are attached by suitable brackets to the base or root ends of the rotatable blades 18, and are also attached by suitable anti-friction cam connections 34 with the movable cylinder 32 adjacent to the hub end of the cylinder, such connections including adjustable positive high pitch limit stops arranged in a manner well-known to the art. With this arrangement, when the propeller is operating, the counter-weights 26 tend to fly outwardly under the action of centrifugal force and rotate the blades 18 to their high pitch position, at the same time moving the cylinder 32 inwardly with respect to the fixed piston 36. In this action the counter-weights may be assisted by other means, such as the coiled compression springs 28, so that there will be no

tendency for the propeller to stick in its limiting low pitch condition.

Hydraulic fluid under pressure is supplied to the propeller through the conduit 38, the collector ring 40 surrounding a portion of the hollow propeller shaft 12, and through the interior of the hollow propeller shaft to the interior of the piston 36 from which it may flow through suitable apertures 42 in the end of the piston to the space between the forward end of the piston and the closed forward end of the cylinder 32. The introduction of hydraulic fluid into this space will move the cylinder outwardly with respect to the fixed piston 36 and, because of the connections 34 between the cylinder and the counter-weights 26 will move the counter-weights 26 inwardly against the action of centrifugal force and rotate the propeller blades 18 towards their low pitched position.

The supply of hydraulic fluid under pressure to the space between the movable cylinder and the forward end of the relatively fixed piston may be normally controlled by a suitable constant speed device, such as the centrifugal governor 44 well-known to the art and particularly illustrated in part in Fig. 3.

In the control arrangement illustrated a suitable constant speed device, such as the centrifugal governor 44, driven by the engine 10, controls a valve 46 which regulates the supply of hydraulic fluid to the propeller in response to changes in the speed of the propeller driving engine to vary the propeller pitch to thereby vary the load on the engine and maintain the engine speed substantially constant. Such a governor may include centrifugally actuated fly weights balanced by a compression spring and operatively connected with the stem of the valve 46. Preferably the setting of the governor may be manually regulated by suitable means such as the manual control generally indicated at 48.

A suitable control device for this purpose is disclosed in detail in United States Patent No. 2,204,640 of Elmer E. Woodward, issued June 18, 1940, for Governor mechanism, and includes a hollow casing for the fly weights and reaction spring, and a base portion 50, which includes a booster pump, generally indicated at 52, and a pressure relief valve, generally indicated at 54. As particularly explained in the Woodward patent, referred to above, hydraulic fluid is received by the control mechanism from a suitable source, such as the engine lubricating pump, through the channel 56 which leads to the pump 52. After passing through the booster pump 52 the hydraulic fluid is delivered at an increased pressure to a chamber 58 which is connected at one side with the pressure relief valve 54 and at the other side with the governor controlled valve 46. If the pressure of the fluid in the chamber 58 exceeds the pressure for which the relief valve 54 is set, the fluid opens the valve and flows out of the chamber 58 into the passage 60, which ordinarily communicates at its lower end with the passage 56, so that the fluid may circulate around the booster pump through the relief valve and the by-pass channel 60. The governor controlled valve 46 has a piston portion 62 arranged to control the annular ports 64, which are in communication with a channel 66 leading to the conduit 38, and are also in communication with a drain channel 68, and with the chamber 58 through the space surrounding the reduced portion of the stem of the valve 46 above the valve piston 62. With this arrangement of parts, when the speed of the engine is high so that the fly weights of the governor are thrown outwardly by the action of centrifugal force, the piston 62 is raised so that the ports 64 communicate with the drain channel 68 thus permitting the drainage of hydraulic fluid from the propeller and thereby permit the counterweights 26 and springs 28 to rotate the propeller blades to a position of higher pitch to increase the load on the engine and reduce its speed. If the speed of the engine is below a predetermined rate, so that th governor fly weights are moved inwardly by the force of the balancing spring, the piston 62 will be below the ports 64 and the channel 66 will be connected with the chamber 58 thereby admitting hydraulic fluid under pressure to the propeller to overcome the centrifugal action of the counterweights 26 and the springs 28 and move the propeller blades to a position of lower pitch to thereby reduce the load on the engine and permit it to speed up to the predetermined constant speed rate. The above described control operation may take place for every variation in engine speed, to either supply additional hydraulic fluid to the propeller or to drain a quantity of hydraulic fluid from the propeller, depending upon the direction of the change in engine speed, to adjust the propeller in such a manner that by the change of the load imposed on the engine, the engine speed will be maintained substantially constant.

As above set forth, it has been found desirable in some cases to provide a hydro-controllable propeller with two ranges of pitch control adjustment such that in one range the propeller is under the control of the speed responsive mechanism and in the other range the propeller may be placed in an extreme pitch setting for special purposes. The extreme pitch setting may be either above or below the normally operative or constant speed range of propeller settings, and may be for the purpose of either decreasing or increasing the drag or negative thrust of the propeller under certain conditions of operation or for specified maneuvers. In the form of the invention illustrated in the accompanying drawings, the extreme pitch setting is below the range of normal or constant speed operation and is provided so that the propeller may be moved to a flat pitch position to increase its resistance to forward motion when operating as a windmill.

In order to provide the two ranges of pitch adjustment specified, it is obviously necessary to provide between the two ranges some form of intermediate pitch limit stop which will ordinarily be effective to limit the range of propeller pitch changes to the predetermined normally operative or constant speed range but which may be manually rendered inoperative to limit the pitch changing movements of the propeller blades so that the blades may be rotated to the desired extreme pitch condition.

Such an intermediate pitch limit stop device is particularly illustrated in Figs. 2, 4 and 6.

In the arrangement illustrated a rod or stem member 70, extends from the closed end 30 of the cylinder 32 and terminates in a screw-threaded end positioned within the end of the hollow propeller shaft 12. Intermediate its length this rod or stem member 70 carries an abutment 72 for the inner ends of the compression springs 28 the outer ends of which abut against the outer end of the piston 36 so that the force of the springs 28 may be applied in the proper direction to the movable cylinder 32. At its inner end

this rod member 70 is screw-threaded into the forward end of a cylindrical valve plunger generally indicated at 74. The cylindrical plunger 74 is slidably received in a guide member 76 rigidly secured in the end of the hollow propeller shaft 12 and provided at its rearward end with an annular valve portion 78. The valve mechanism including the members 74 and 78 is in effect, three valves in one, since the plunger 74 is provided in its side walls with apertures 80, arranged to be controlled by the annular portion 78 of the guide member 76, and is provided interiorly thereof with a pressure responsive valve 82, and a check valve 84. The valve 82 comprises a tubular member carrying at its rear end a valve portion 86 which seats against a valve seat 88 provided in the rearward end of the plunger 74. This inner plunger 86 is ordinarily maintained in sealing relation with the seat 88 by means of the coiled compression spring 90 which bears at its rearward end against a shoulder provided on the plunger 82 and at its forward end against an abutment 92 screw-threaded into the forward end of the main valve plunger 74. The inner plunger 82 is provided in its side walls with a plurality of apertures 94 so that hydraulic fluid, after passing through the apertures 80 in the side wall of the main valve plunger 74 and entering the space between the plunger 74 and the inner plunger 82, may flow into the interior of the inner plunger and out of the forward end of the inner plunger past the abutment 92 into the forward end of the main plunger 74 from which it flows through the slot 96 into an annular recess 98 in the guide member 76 forwardly of the annular valve portion 78 and from thence through longitudinal channel 100 in the forwardly disposed annular guide portion 102 of the member 76 into the forward open end of the member 76 and from thence through apertures 104 in the abutment 72 into the interior of the piston 36. To the rear of the apertures 94 the inner plunger 82 is provided with the ball check valve 84 which is maintained seated with slight pressure by the spring 106 against the seat 108 provided in the rearward portion of the inner valve plunger.

From the construction of the valve 74 as described above, it will be observed that when the valve plunger is in such a position that any of the ports 80 are to the rear of the annular portion 78 of the valve guide 76, hydraulic fluid may flow to and from the propeller through said ports 80, the ports 94, the slots 96, the channels 100, and the apertures 104, but that when the valve plunger 74 has been moved to such a position that no portion of the area of any aperture 80 is to the rear of the annular portion 78, the only way by which additional hydraulic fluid may flow to the propeller is by forcing open the valve 86. Hydraulic fluid may always flow away from the propeller to drain, either through the ports and channels enumerated above or by opening the ball check valve 84.

With the above described construction and arrangement of parts, including the provision that the spring 90 maintains the valve 86 closed with a force greater than the force required to open the pressure relief valve 54, the valve 74, is fully effective to limit the normally operative or constant speed range of propeller pitch changing movement in the pitch decreasing direction since, when the cylinder 32 has moved outwardly in the pitch decreasing direction to such an extent that all of the area of the ports 80 is past or covered by the annular valve portion 78 of the valve guide 76, no additional hydraulic fluid, at the ordinary operating or constant speed controlling pressure, can enter the space between the forward end of the cylinder 32 and the forward end of the piston 36 and therefore the forward movement of the cylinder will be definitely limited. The pitch angle at which this limitation occurs is determined by the dimensions and proportions of the parts 76 and 74 since the limitation will occur at that pitch angle at which all of the ports 80 have been covered by the annular valve portion 78 as is particularly illustrated in Fig. 4. When the ports 80 have been so covered the hydraulic fluid may leave the space behind the forward end of the cylinder 32 through the check valve 84 so that the propeller blades may turn towards a higher pitch position.

In order to provide a selective control so that the propeller may be moved to an extreme pitch condition when desired, an extra base member, generally indicated at 110, is interposed between the governor base 50 and the base receiving pad 112 on the engine 10. Within this additional base member 110 there is disposed a second pressure relief valve 114, set to impose upon the hydraulic fluid a pressure sufficient to open the valve 86, and a selectively actuatable valve plunger, generally indicated at 116, connected with control member 118 in the form of a Bowden wire or arms cable.

In the arrangement illustrated, the hydraulic fluid flowing from a source such as the engine lubricating pump enters the auxiliary base 110 through the channel 56 which is connected at its outlet end with a channel 120 which extends between the booster pump 52 and the bore 121, receiving the selector valve 116. A transverse channel 123 also connects the channel 120 with a chamber 124 opening into the passage controlled by the high-pressure pressure relief valve 114. When the selector valve 116 is in the position illustrated in Fig. 1, the reduced portion 122 thereof connects the channel 120 leading to the booster pump 52 with the by-pass channel leading from the pressure relief valve 54 so that the pressure imposed on the fluid by the pump 52 is controlled by the valve 54, the pressure relief valve 114, although hydraulically connected with the pump and by-pass, being inoperative as long as the valve 54 is controlling. A second reduced portion 126 spaced from the portion 122 along the valve 116, connects the portion of the channel 66 on the governor side of the selector valve with the portion of the channel 66 on the propeller side thereof so that hydraulic fluid at the pressure maintained by the pressure relief valve 54 may flow to the propeller, or hydraulic fluid may flow from the propeller to the drain channel 68 depending on the position of the governor controlled valve 62. With this position of the selector valve 116 it is apparent that the supply of hydraulic fluid to the propeller is under the control of the low pressure pressure-relief valve 114 and the governor controlled valve 62 and that the propeller will be controlled in its normally operative or constant speed range of pitch adjustment.

When it is desired to place the propeller in the extreme pitch position provided for a pressure on the hydraulic fluid sufficiently high to open the valve 86 is obtained by moving the selector valve 116 to the position illustrated in Fig. 3. In the indicated position of the selector valve the valve piston 138 interrupts the connection between the

pump intake channel 120 and the by-pass channel 60 leading from the chamber 58 through the pressure-relief valve 54 and renders the transverse channel 123 leading from the chamber 124 controlled by the high pressure pressure-relief valve 114 effective as the only connection between the pump intake and the by-pass thereby imposing on the output of the pump a pressure determined by the setting of the valve 114. The valve 54 will remain open and ineffective to control the pressure of the hydraulic fluid. At the same time the valve piston 139 blocks the portion of the channel 66 leading from the governor controlled valve 62 thereby rendering the valve 62 ineffective to in any way affect the action of the propeller. The high pressure fluid is supplied to the propeller from the pump 52 through a fluid passage 141 in the valve 116 which passage connects the annular grooves 128 and 130 which register respectively with the channel 60 leading from the pump 52 to the valve bore 121, and the portion of the channel 66 leading from the valve bore to the propeller through the channel 38 and associated connections. Both drain channels 68 and 136 are blocked by the valve pistons 139 and 132 respectively so that an hydraulic pressure as determined by the setting of the pressure relief valve 114 is continuously maintained on the propeller. As long as the valve plunger 116 is in the position illustrated in Fig. 3, hydraulic fluid at the high pressure will be supplied to the propeller and the propeller will be maintained in the extreme pitch condition provided for.

When it is desired to restore the propeller from the extreme pitch condition to the normally operative range of pitch changing movement, the valve stem 116 is first moved to the intermediate position, indicated in Fig. 5. In this position of the selector valve plunger the portion of the channel 66 between the pressure chamber 58 and the valve plunger is cut off so that no additional hydraulic fluid can be supplied to the propeller. At the same time the portion of the channel 66 between the conduit 38 and the valve 116 is connected through a reduced portion 126 in the valve stem with a channel 136 leading to a fluid sump or reservoir so that the propeller is directly connected with drain and the hydraulic fluid in the space between the forward end of the cylinder 32 and the piston 36 will be rapidly drained. This provision is made so that the propeller may be rapidly restored to its operative range of pitch changing movements regardless of the instant position of the piston 62 of the governor valve 46 and the restoring of the propeller to its operative range of pitch changing movement will not depend upon an increase in engine speed necessary to move the piston 62 to a position in which the channel 66 will be connected with the drain 68. At the same time the reduced portion 122 is brought into position to connect the channel 60 leading from the low pressure pressure-relief valve with the channel 120 thereby restoring the control of the fluid pressure to the pressure-relief valve 54 to bring about a reduction in pressure from the pressure required to move the propeller to the extreme pitch position. If, for any reason the operator should desire the propeller to go its extreme high pitch position, he could leave the valve plunger 116 in the position illustrated in Fig. 5 until all of the hydraulic fluid had drained from the propeller and the counterweights 26 and springs 28 had rotated the propeller blades to a position against the high pitch limit stop. However, as it is usually desired only to restore the propeller to the normally operative range, the manually operable valve stem will be maintained in the position indicated in Fig. 5 only until the pressure of the hydraulic fluid has dropped to the normally operative pressure as controlled by the valve 54 at which time the valve stem 116 will be moved to the position indicated in Fig. 1, in which the propeller is placed under the control of the constant speed governor.

The flow of hydraulic fluid through the valve 74 incident to the different positions of the manually controllable valve 116 has been indicated by arrows on Figs. 2, 4 and 6. When the manually controllable valve is in the position indicated in Fig. 1, in which the propeller is under the control of the constant speed governor, the hydraulic fluid flows to and from the propeller through the ports 80 and 96 and, when the propeller is in the intermediate low pitch position flows from the propeller through the check valve 84. When the manually controllable valve 116 is in the position illustrated in Fig. 3, the high pressure of the hydraulic fluid opens the valve 86 and the hydraulic fluid then flows to the propeller through the valve 86 the interior of the plungers 74 and 82 and the slots 96. When the manually actuatable valve 116 is in the position illustrated in Fig. 5, the hydraulic fluid under high pressure flows from the propeller through the slots 96, the interior of the inner plunger 82 and through the check valve 84.

The selector valve 116 may be releasably retained in any one of its various operative positions and the various positions may be indicated by suitable means such as the spring pressed detent 140 which cooperates with suitable appropriately spaced grooves or shoulders on the selector valve.

From the above description taken with the accompanying drawings, it will be observed that there has been provided a hydro-controllable propeller which has a normally operative range or constant speed range of pitch adjustment and which may be manually controlled to move to an extreme pitch setting outside of the normally operative or constant speed range at the will of the operator and which may also be returned from the extreme pitch setting to the normally operative or constant speed range at the will of the operator.

While there has been illustrated and described a suitable mechanical embodiment of what is now considered to be a preferred form of the idea of the invention, it is to be understood that the invention is not limited to the construction so illustrated and described, but that such changes in the size, shape arrangement of parts as come within the scope of the appended claims.

Having now described the invention so that others skilled in the art may clearly understand the same what it is desired to secure by Letters Patent is as follows:

1. Control means for a controllable pitch propeller having a hydraulically actuated pitch changing mechanism comprising, means for supplying hydraulic fluid to said pitch changing mechanism at pressures within either of two different preselected pressure ranges, a governor actuated valve for controlling the supply of hydraulic fluid at pressures within the lower of said ranges to said mechanism to vary the propeller pitch within one range of pitch adjustment,

a valve actuated by said mechanism to cut off the supply of hydraulic fluid at pressures within said lower pressure range to said mechanism to render said mechanism ineffective to change the pitch beyond said one range, a pressure responsive valve operative when subjected to fluid pressures within the higher predetermined pressure range to render said mechanism actuated valve ineffective to limit the propeller pitch changes to said one range of pitch adjustment and to admit hydraulic fluid to said mechanism to change said propeller pitch to a different range of pitch adjustment, and a manually operable pilot valve for selecting the pressure range of the hydraulic fluid supplied to said pitch changing mechanism.

2. Control means for a hydro-controllable propeller comprising, means for supplying hydraulic fluid at either of two different pressures to said propeller, means limiting the pitch changing movements of said propeller to less than the entire range of pitch variation when said hydraulic fluid is at the lower of said pressures, means responsive to the higher of said fluid pressures and operative during operation of said propeller to supply hydraulic fluid at the higher of said pressures to said propeller, to change its pitch beyond said limited pitch and render said pitch limiting means ineffective and a manually operable valve in the line through which hydraulic fluid is supplied to said propeller to select either of said two pressures for supply to said propeller.

3. Control means for a hydro-controllable propeller comprising, means for supplying hydraulic fluid to said propeller, a plurality of individual means for automatically regulating the pressure of said hydraulic fluid to different respective values, means limiting the pitch changing movements of said propeller when the pressure of the hydraulic fluid is at one of said respective values to less than the entire range of pitch variation and means actuated by fluid at a higher one of said respective values for supplying fluid at said higher pressure value to said propeller to change the pitch beyond said limited pitch and thus render said pitch movement limiting means ineffective to limit the pitch changing movements of said propeller when the pressure of said hydraulic fluid is at said higher one of said respective values, and manually operable valve means for selectively rendering anyone of said individual means effective to regulate the pressure of hydraulic fluid supplied to said propeller.

4. Control means for a hydro-controllable propeller comprising, means for supplying hydraulic fluid to said propeller, a plurality of individual means for regulating the pressure of said hydraulic fluid to different respective values, means limiting the pitch changing movements of said propeller when the pressure of the hydraulic fluid is at one of said respective values and means actuated by hydraulic fluid at a pressure higher than said one value for connecting the propeller with fluid at said higher pressure to change the propeller pitch beyond said limited pitch and render the pitch limiting means ineffective to limit the pitch changing movements of said propeller when the pressure of said hydraulic fluid is at said higher value, and manually operable valve means for selectively rendering anyone of said individual means effective to regulate the pressure of said hydraulic fluid or to render said fluid supplying means ineffective to supply fluid to said propeller and simultaneously provide a fluid drain from said propeller.

5. Control means for a hydro-controllable propeller having a normal range of pitch changing movement and a low pitch setting outside of said normal range comprising, means for supplying hydraulic fluid under pressure to said propeller, a plurality of individual means for regulating the pressure of said hydraulic fluid to different respective values, means carried by said propeller responsive to pitch changes when subjected to one of said pressure values to limit the pitch changing movements of said propeller to said normal range and means actuated by hydraulic fluid at a pressure higher than said one value for connecting the propeller with fluid at said higher pressure to change the propeller pitch beyond said limited pitch and render the pitch limiting means ineffective to limit the pitch changing movements of said propeller when hydraulic fluid to said higher pressure is supplied to said propeller whereby said propeller will be moved to said low pitch setting when supplied with hydraulic fluid at said higher pressure value, and manually operable valve means for selectively rendering anyone of said individual means effective to regulate the pressure of the hydraulic fluid supplied to said propeller.

6. Control means for a hydro-controllable propeller having a plurality of rotatably mounted blades and a hydraulic motor including a relatively fixed part and a relatively movable part operatively connected to said blades comprising, means for supplying hydraulic fluid under pressure to said motor, a plurality of individual means for regulating the pressure of said hydraulic fluid to different respective values, a valve including a fluid controlling portion secured to the movable part of said hydraulic motor and a cooperating fluid controlling portion secured to a relatively fixed part of said motor for limiting the pitch changing movements of said propeller, a by-pass for said valve arranged to open when subjected to one of said respective pressure values to render said first mentioned valve ineffective to limit the pitch changing movements of said propeller, and means for selectively rendering any one of said individual means effective to regulate the pressure of said hydraulic fluid.

7. Control means for a controllable pitch propeller comprising, means for supplying hydraulic fluid at at least two different pressures to said propeller, speed responsive means for controlling the pitch of said propeller, means effective at one of said pressures to limit the pitch changing movements of said propeller under the control of said speed responsive means to the upper portion of the possible range of pitch changing movements of said propeller, means operative under the higher of said pressures to connect said propeller with hydraulic fluid at the said higher pressure to render said limiting means ineffective and to effect a pitch changing movement of said propeller beyond said limited movement whereby said propeller will move to its extreme low pitch setting, and means for selectively rendering said fluid supply means effective to supply hydraulic fluid at either of said pressures to said propeller.

8. In combination with a controllable pitch propeller having a pitch changing mechanism operative to vary the propeller pitch through more than one range of pitch angles, means for supplying hydraulic fluid to said pitch changing mechanism at pressures within either of two different predetermined pressure ranges, a valve actuated by said pitch changing mechanism for

restraining said mechanism against decreasing the pitch of said propeller below a predetermined pitch angle when supplied with fluid at a pressure within the lower of said predetermined pressure ranges, a pressure responsive valve for rendering said first mentioned valve ineffective to restrict the action of said mechanism when said mechanism is supplied with fluid at a pressure within the higher of said predetermined pressure ranges, and manually controllable means for selecting the pressure range of the fluid supplied to said pitch changing mechanism.

9. In combination with a controllable pitch propeller having a pitch changing mechanism operative to vary the propeller pitch through more than one range of pitch angles, a valve actuated by said pitch changing mechanism for normally restricting the action of said mechanism to one range of pitch angles, a governor actuated valve for controlling the supply of hydraulic fluid at a predetermined pressure to said mechanism to control the action of said mechanism in changing the propeller pitch within said one range of pitch angles, a valve responsive to a fluid pressure higher than said predetermined pressure to render said first mentioned valve ineffective to restrict the action of said pitch changing mechanism, and a manually operable valve for controlling the application of fluid pressure to said pressure responsive valve.

10. Control means for a hydro-controllable propeller having a plurality of rotatably mounted blades and a hydraulic motor including a relatively fixed part and a relatively movable part operatively connected to said blades comprising, means for supplying hydraulic fluid under pressure to said motor, a valve for controlling the supply of fluid to said motor, said valve comprising a ported sleeve, through which fluid flowing to and from said motor passes, carried by one part of said motor and a fluid controlling element for closing said ports carried by another part of said motor said sleeve and element being telescopically related and relatively movable upon movement of said motor to cause said element to close said ports and stop the flow of fluid when the motor reaches a predetermined position, and a relief valve associated with one of said parts operable upon an increase in fluid pressure to bypass said controlling valve.

11. In combination with a controllable pitch propeller, a pitch changing mechanism having relatively movable parts operative to vary the propeller pitch through more than one range of pitch angles, a valve actuated by said pitch changing mechanism for normally restricting said mechanism to act only in one range of pitch angles and comprising a stationary sleeve having a contracted end, and a hollow cylindrical member closed at both ends but having apertures in the sides thereof and slidable to a position within said sleeve and closely fitting said contracted end, whereby the only apertures in said cylindrical member not closed by said sleeve will be inside said sleeve and so that fluid flow past said sleeve to said mechanism will be prevented and the operation of said mechanism will be restricted, a pressure responsive valve located in one end of said hollow cylindrical member for opening a passage to the inside of said hollow cylindrical member and said sleeve for rendering said first mentioned valve inoperative to restrict the action of said mechanism, and means for controlling the application of fluid pressure to said pressure responsive valve.

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