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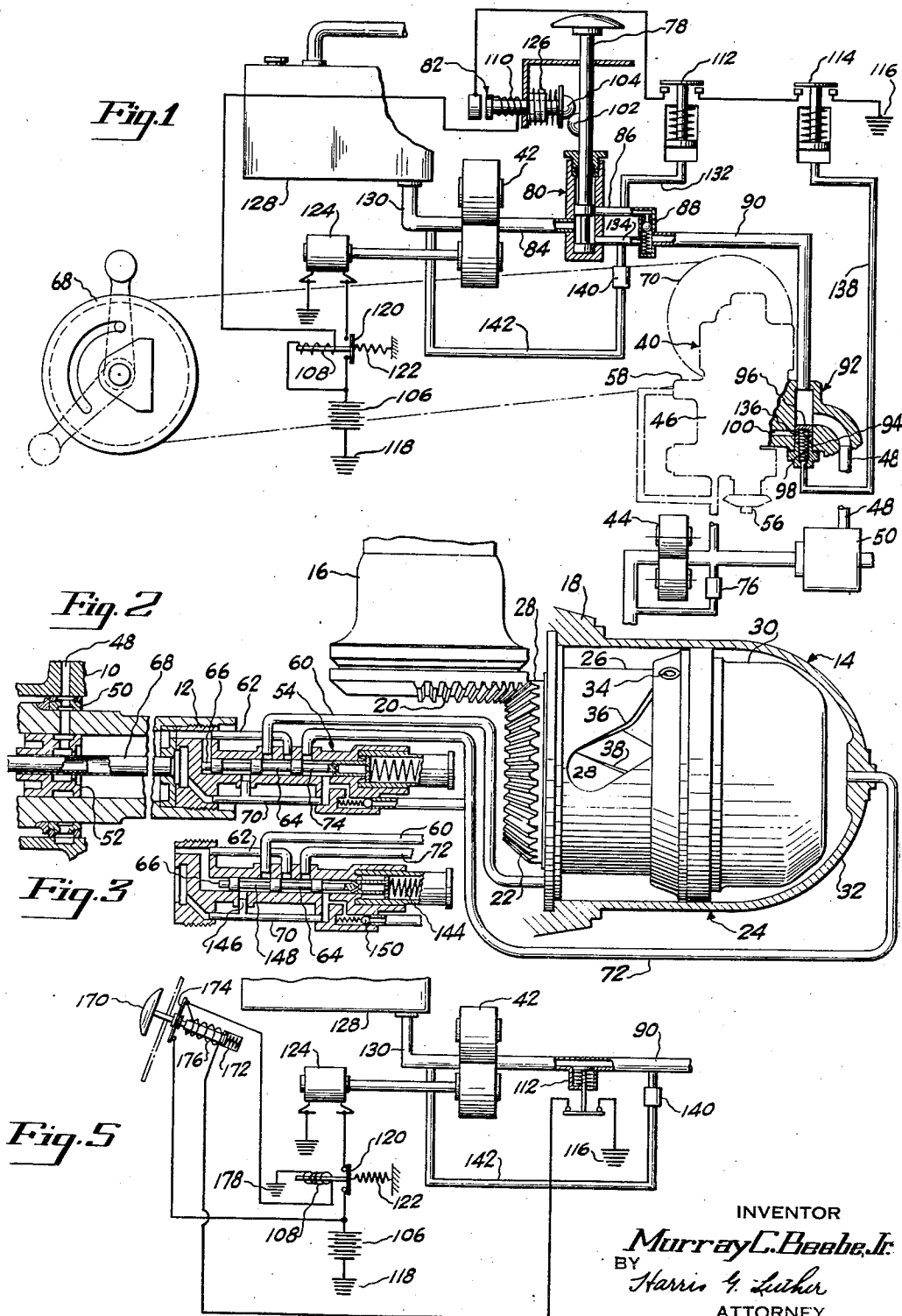
M. C. BEEBE, JR

2,333,973

ELECTRIC FEATHERING CONTROL

Filed Nov. 16, 1939

2 Sheets-Sheet 1



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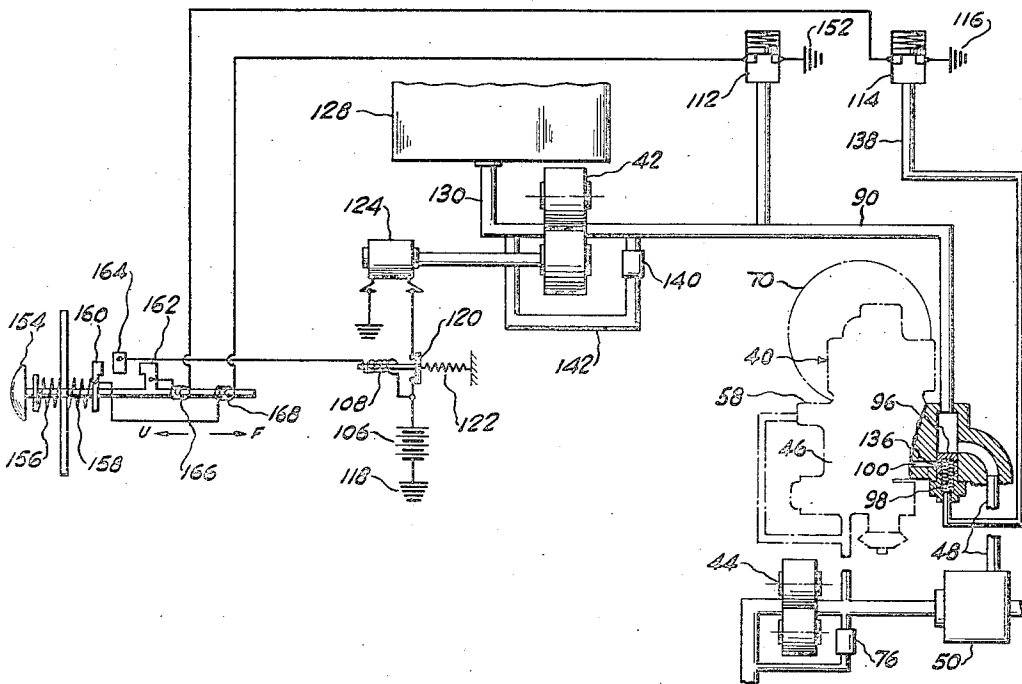
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Fig. 4.



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ELECTRIC FEATHERING CONTROL

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11 Claims. (Cl. 170-163)

This invention relates to improvements in controls for controllable-pitch propellers and has particular reference to an improved control for a feathering type controllable-pitch propeller.

An object of the invention resides in the provision of an improved control for the pitch changing mechanism of a feathering type propeller effective to discontinue operation of the pitch changing mechanism when the propeller has reached a feathered condition but which may be manually actuated to continue operation of the pitch changing mechanism after the feathered condition has been reached to return the propeller blade from the feathered condition to the operative range of propeller pitch angles.

A further object resides in the provision of a propeller feathering and unfeathering pump control of the character indicated which may operate to discontinue operation of a propeller feathering pump when the feathered condition of the propeller has been reached and also when the propeller has been returned from its feathered condition to its operative range of pitch angles.

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 somewhat diagrammatically illustrated in three slightly different forms a suitable embodiment for the purpose of disclosing the invention. The drawings, however, are for the purpose of illustration only and are not to be taken as limiting the scope of the invention as it will be apparent to those skilled in the art that various changes may be made in the illustrated arrangements without in any way exceeding the scope of the invention.

In the drawings,

Fig. 1 is a somewhat diagrammatic illustration of one form of control for a controllable-pitch feathering type propeller.

Fig. 2 is a somewhat diagrammatic view of a controllable-pitch feathering type propeller and constitutes a continuation of the combination shown in Fig. 1.

Fig. 3 is a sectional view of the propeller fluid distributing valve of the propeller shown in Fig. 2 and shows the valve in a different operative position from the position illustrated in Fig. 2.

Fig. 4 is a diagrammatic illustration of a somewhat modified form of a feathering and unfeathering control for a feathering type controllable-pitch propeller, and

Fig. 5 is a diagrammatic illustration of a still

further modified form of feathering and unfeathering control for a feathering type controllable-pitch propeller.

Referring to the drawings in detail, and particularly to Fig. 2, the numeral 10 generally indicates a propeller driving engine from which projects a propeller drive shaft 12 carrying a controllable-pitch propeller, generally indicated at 14. The engine has been indicated by a fragmentary portion only as it may be any one of various types well known to the prior art, and the propeller has been diagrammatically illustrated for the purpose of aiding the description of the control apparatus constituting the subject matter of the invention. For a more detailed description of a suitable type of propeller reference may be had to United States Patent No. 2,280,714, granted April 21, 1942, by Erle Martin for Feathering propeller control, and assigned to the assignee of this application.

In general, such a propeller may have a plurality of movably mounted blades, one of which is indicated at 16, supported in a hub structure 18 mounted on the drive shaft 12. The blades are operatively connected by suitable means, such as the gear elements 20 and 22, with a hydraulic blade turning mechanism generally indicated at 24 and including a fixed cam 26, a movable cam 28 carrying the gear 22, and a piston 30 reciprocable in a domed cylinder 32 and carrying cam followers, as indicated at 34, to rotate the rotatable cam 28 relative to the fixed cam 26 upon reciprocation of the piston in the cylinder 32. The piston acts under the influence of a preponderance of hydraulic forces or of hydraulic and centrifugal forces acting on one side or the other thereof to move the cam followers 34 through the cam slots, as indicated at 36 and 38, to rotate the movable cam member 28 and thereby rotate the propeller blade 16 in a pitch changing direction by reason of the inter-engagement of the gear elements 20 and 22.

The propeller has a constant speed range of pitch angles in which it is under the control of the speed responsive governor 40, and also has a feathered position in which the blades are turned to a position substantially parallel to the axis of the shaft 12, to which position the blades are brought by the action of the motor driven feathering pump 42. The pump 42 is also operative to return the propeller from the feathered position to the governor controlled range of pitch angles in a manner which will presently appear.

For the governor controlled operation, hydraulic fluid may be supplied from the engine

lubricating oil pump 44 to the governor 40 where its pressure may, if desired, be increased by a booster pump 46 in a manner well known to the art and particularly illustrated and described in United States Patent No. 2,204,640, issued June 18, 1940, to Elmer E. Woodward.

From the governor intake or from the outlet of the booster pump 46, the oil is supplied to a governor actuated valve which may also be of the construction particularly set forth in the United States Patent 2,204,640 referred to above.

The governor valve is hydraulically connected by a suitable conduit 48 with an oil collector ring 50 which leads oil from the booster pump 46 through a plug 52 to the interior of the propeller drive shaft 12 from which it is conducted through the distributing valve, generally indicated at 54, to the cylinder 32 of the pitch changing mechanism. The governor valve is provided with a drain which may extend through the hollow governor drive shaft 56, as is particularly shown in the United States Patent 2,204,640 referred to above, so that the governor actuated valve is operative to connect the interior of the drive shaft 12 ahead of the plug 52 with hydraulic fluid under a pressure regulated by the governor or booster pump relief valve 58, or with drain through the shaft 56, depending upon the engine speed change demands of the speed responsive governor 40. This action of the governor valve operates to connect the space to the left of the piston 30, as viewed in Fig. 2, with pressure or with drain through the conduit 60, the valve 54, the interior of the shaft 12, the plug 52, the collector ring 50 and the conduit 48. When subjected to fluid pressures not greater than the pressure of the output of the booster pump 46, the distributing valve 54 retains substantially the operative position shown in Fig. 2 in which it connects the interior of the propeller shaft 12 with the space at the inner or pitch increasing side of the piston 30 through the passages 60 and 62 and the annular groove 64 provided in the slidable valve stem 66.

The space within the cylinder 32 at the outer or pitch decreasing side of the piston 30 is connected at all times during governor controlled operation with the engine lubricating system through the conduit 68 extending concentrically through the shaft 12 and plug 52, the passages 70 and 72 and the annular groove 74 in the slidable valve stem 66. Since the lubricating oil pump 44 operates whenever the engine is operating there will always be fluid pressure acting upon the outer or pitch reducing side of the piston 30 whenever the engine and propeller are operating under power. As the governor oil pressure as maintained by the relief valve 58 is higher than pressure of the engine lubricating oil as maintained by the pressure relief valve 76, when the governor actuated valve is operated to connect the space at the inner side of the piston 30 with the booster pump 46 the greater pressure produced by this pump acting on the pitch increasing side of the piston 30 will move the piston to increase the pitch of the propeller. When the governor actuated valve is positioned to connect the space at the inner or pitch increasing side of the piston 30 with drain, however, the pressure of the engine lubricating oil on the outer or pitch decreasing side of the piston will assist the action of centrifugal force acting on the propeller blades to move the piston in a pitch decreasing direction to turn the blades to a lower pitch position, all as particularly set forth in United

States Patent No. 2,280,714, referred to above.

The governor may be manually adjusted to set any selected speed, within its operative range, for the engine propeller combination by suitable means, such as the manual control 88 which turns the pulley 70 to change the loading on the governor speeder spring in the manner clearly set forth in the United States Patent 2,204,640 referred to above.

The spring 144 of the distributor valve 54 exerts a force on the plunger 66 of the distributor valve such that the plunger does not materially change its position during governor controlled operation or during the feathering operation of the propeller, but moves to change the fluid connection to the pitch changing motor for unfeathering operation of the motor, the position of this valve for the unfeathering operation being particularly illustrated in Fig. 3.

In the form of control diagrammatically illustrated in Fig. 1, the feathering and unfeathering operations of the propeller are instigated by a manually controllable lever 78. This lever simultaneously controls a fluid valve, generally indicated at 80, and an electric switch, generally indicated at 82, and is movable in one direction to swing the propeller to its feathered condition and in the other direction to return the propeller from its feathered condition to the constant speed control range of governor pitch angles.

Assuming that it is desired to change the propeller from the constant speed control range to a feathered condition, the lever 78 is moved upwardly, as shown in Fig. 1, to connect the conduit 84 leading from the outlet of the pump 42 with the channel 86 leading from the valve 80 through the check valve 88 to the conduit 90 which leads to a cylindrical aperture 92 formed in the governor 40 or some convenient part of the propeller driving engine and connected with the conduit 48. Within the bore 92 there is a check valve generally indicated at 94 having a slidable plunger 96 urged upwardly by a compression spring 98. The outlet from the governor actuated valve is connected with the valve chamber 92 through a suitable passage 100. The construction and operation of the valve 94 is particularly illustrated and described in United States Patent No. 2,174,717 for Multiposition controllable pitch propellers, issued October 3, 1939, to Frank W. Caldwell et al. It is believed sufficient for the purpose of this disclosure to state that when the fluid pressure in the conduit 90 exceeds the pressure in the channel 100 the valve plunger 96 is forced downwardly to connect the channel 90 with the channel 48 and simultaneously block the channel 100 from the channels 90 and 48 so that the high pressure fluid used for feathering the propeller will not feed back through the governor and the booster pump 46. When the pressure in the conduit 90 is relieved the spring 98 will force the plunger 96 upwardly to again connect the channel 100 with the conduit 48 to thereby restore the propeller to the governor control.

When the lever 78 is moved upwardly to connect the feathering pump outlet 84 with the conduit 90 it simultaneously closes the switch 82 as the rounded protuberance 102 on the lever moves past the rounded head 104 of the switch stem. When the switch 82 is closed a circuit is established from the battery 106 through the solenoid 108, the solenoid 110, the switch 82, and the pressure responsive switches 112 and 114 to the ground 116, the opposite side of the battery being

grounded at 118 to provide a complete circuit. Energization of the solenoid 108 closes the relay switch 120 against the force of the spring 122 and energizes the feathering pump motor 124 so that the feathering pump 42 is put into operation. Energization of the solenoid 110 maintains the switch 82 closed against the force of the spring 126.

With the pump motor 124 energized the pump 42 withdraws hydraulic fluid from the reservoir or tank 128 through the pump inlet 130 and forces the fluid through the channels 84, 86 and the valve 88 into the conduit 90 wherein the fluid acts to force the valve plunger 96 downwardly and flow into the conduit 48 leading to the collector ring 50 and the pitch changing motor 24 through the interior of the drive shaft 12 and the distributor valve 54. The fluid flows from the distributor valve 54 through the channel 60 to the pitch increasing side of the piston 30 and moves this piston to its limiting position in the outer end of the cylinder 32 incidentally rotating the blades 16 to their feathered position. As soon as the blades have reached their feathered position and the piston has reached its limiting position so that further flow of fluid to the pitch changing motor is stopped a rapid increase in the pressure of the fluid in the line between the pump 42 and the pitch changing motor takes place. The pressure responsive switch 112 is connected with the channel 86 through a suitable conduit 132 so that this pressure increase is applied to the switch 112 to open the switch. As soon as the pressure responsive switch is open the electric circuit above described is broken and the solenoids 108 and 110 are de-energized. De-energization of the solenoid 108 permits the spring 122 to open the switch 120 and discontinue operation of the motor 124 while de-energization of the solenoid 110 permits the spring 126 to open the switch 82. As soon as the pump 42 ceases operation the pressure in the line between this pump and the pitch changing motor falls off permitting the pressure responsive switch 112 to close but, as the switch 82 is now open, operation of the pump 42 will not be resumed and the propeller may be permitted to remain in its feathered condition until it is desired to return it to the operative range of pitch angles.

When it is desired to restore the propeller to operation, the lever 78 is forced downwardly closing the channel 86 and simultaneously connecting the channel 84 with the channel 134 which connects with the conduit 90 around the check valve 88 which prevents the application of the unfeathering fluid pressure to the switch 112. This downward movement of the lever 78 closes the switch 82 and starts operation of the pump 42 by energizing the motor 124 in the manner described above. The pump 42 will continue operation building up a sufficient pressure to move the propeller blades out of their feathered position. As soon as the blades come out of their feathered position the propeller will begin to windmill due to the action of air forces thereon and will rotate the propeller driving engine and drive the pump 46. As soon as the pump 46 begins to operate at a reasonable speed it builds up hydraulic pressure in the channel 100 and causes hydraulic fluid to flow through the ports 136 in the hollow valve member 96 and through the conduit 138 to the pressure responsive switch 114. This switch operates at a relatively low pressure, for example two hundred pounds per square inch, to break the electric circuit energizing the solenoid 108

thereby permitting the spring 122 to open the switch 120 and de-energize the motor 124. When the pump 42 has ceased operation the fluid pressure in the conduit 90 will be relieved and the spring 98 will move the valve member 96 upwardly to connect the channel 100 with the conduit 48 and restore the propeller to the control of the governor 49. Since the solenoid 110 will also have been de-energized and the switch 82 opened by the spring 126 the pump 42 will not resume operation until the lever 78 is again operated to feather the propeller.

In case the propeller should stick in its feathered position or it should be attempted to unfeather the propeller when the connected engine is not capable of rotation, the relief valve 140 will open to connect the outlet of the pump 42 with the inlet thereof through the channel 142 to prevent the pump building up a fluid pressure which might endanger the control system.

It will be noted that when the unfeathering pressure is applied to the distributor valve 54 the valve plunger 66 will be moved against the force of the spring 144 to the position shown in Fig. 3 in which the channel 70 is connected through the branch 146 and annular groove 148 in the stem 66, with the channel 80 leading to the pitch increasing side of the piston 30, and the channel 62 is connected through the annular groove 64 in the stem 66 with the channel 72 leading to the pitch decreasing side of the piston 30, to apply the hydraulic pressure to the pitch decreasing side of the piston while simultaneously connecting the pitch increasing side with the engine lubricating system so that any fluid trapped on this side of the piston may vent through the pressure relief valve 76.

In the form of invention shown in Fig. 3, a safety valve 150 may be incorporated in the distributing valve 54 in order to relieve the fluid pressure in the outer end of the cylinder 32 before such pressures reach a dangerous value.

In the form of the invention shown in Fig. 4 the wiring system has been slightly rearranged and the hydraulic valve 80 omitted. In this arrangement the ground 116 is applied to the pressure responsive switch 114 only and the switch 112 has an independent ground connection 152. The manually operable lever 154 has a neutral position, as illustrated, to which it is urged by the opposed compression springs 156 and 158 and carries two opposed switch elements 160 and 162 which cooperate with a single relatively fixed switch element 164 disposed between them. The lever is also operatively associated with two electro-magnets 166 and 168 for holding it in either one of its operative positions.

With the arrangement shown in Fig. 4, when it is desired to feather the propeller the lever or button 154 is pushed inwardly until the element 160 contacts the element 164. An electric circuit will then be completed from the ground 118 to the battery 106, the solenoid 108, the switch elements 164 and 160, the solenoid 168, the pressure responsive switch 112 to the ground 152. Energization of the solenoid 108 will close the switch 120 and energize the motor 124 to operate the feathering pump 42. Energization of the solenoid 168 will hold the lever 154 in position with the contacts 160 and 164 closed. The pump will then operate to displace the valve element 96 and supply high pressure fluid to the pitch increasing side of the propeller pitch changing motor in the manner described above

in connection with Fig. 1. As soon as the propeller has reached its feathered condition, the pressure surge in the line between the pump 42 and the pitch changing motor will operate the pressure responsive switch 112 to break the circuit between the ground 118 and the ground connection 152 thereby de-energizing the solenoids 108 and 168. When the solenoid 108 is de-energized the spring 122 will open the switch 120 and discontinue operation of the feathering pump 42 in the manner described above and when the solenoid 168 is de-energized the spring 156 will return the lever 154 to the neutral position illustrated breaking the contact between the switch elements 160 and 164. The propeller will then be left in its feathered condition and the pressure in the pitch changing motor and the line between this motor and the pump 42 will be relieved through the pump 42.

When it is desired to return the propeller to the operative or governor controlled range of pitch angles, the lever or button 154 is pulled outwardly to bring the element 162 in contact with the switch element 164. The solenoids 108 and 166 are then energized and the current flows from the battery 106 through the solenoid 108, the solenoid 166 and the pressure responsive switch 114 to the ground connection 116 thus completing the circuit between the ground connections 118 and 116. The solenoid 108 closes the switch 120 and puts the pump 42 into operation and the solenoid 166 maintains the switch elements 164 and 162 closed until the propeller has been unfeathered. As soon as the propeller starts rotating at sufficient speed to operate the pump 42 and build up pressure from this pump in the line 138, in the manner described above, the pressure responsive switch 114 operates to break the above described circuit and de-energize the solenoids 108 and 166. When the solenoid 108 is de-energized, the switch 120 is opened by the spring 122 to discontinue operation of the feathering pump and when the solenoid 166 is de-energized the spring 158 returns the lever 154 to the neutral position illustrated, in which the switch elements 160 and 162 are both out of contact with the switch element 164. The pump 42 will then remain inoperative and the control of the propeller pitch will be taken up by the governor 40.

In the arrangement shown in Fig. 5 the hydraulic valve 80 and the pressure responsive switch 114 are both omitted providing a slightly different method of operation but one which is entirely satisfactory for certain installations. In this arrangement the manually controlled lever or button 170 is urged outwardly by a spring 172 to open the switch 174 and is retained in switch closing position by a solenoid 176.

If it is desired to feather the propeller with the control mechanism illustrated in Fig. 5 the button 170 is pushed inwardly until the switch 174 is closed. The current will then flow from the battery 106 through the switch 174 and through the solenoid 108 to the solenoid ground connection 118 and will also flow by a parallel circuit through the solenoid 176 and the pressure responsive switch 112 to the ground connection 116, the opposite side of the battery having a ground connection 118 as described above. Energization of the solenoid 108 will close the switch 120 and operate the pump motor 124 in the manner described above and energization of the solenoid 176 will maintain the switch 174 closed during the feathering operation. When

the propeller reaches its feathered position and the travel of the piston 30 ceases the consequent pressure surge in the line between the pump 42 and the propeller pitch changing motor will operate the pressure responsive switch 112 to interrupt the circuit including the solenoid 176. This de-energization of the solenoid 176 will permit the spring 172 to move the lever 170 and open the switch 174 which will in turn de-energize the solenoid 108 thereby permitting the spring 122 to open the switch 120 and de-energize the motor 124. If it is now desired to return the propeller from the feathered condition to the operative or governor controlled range of pitch angles the lever 170 is again pushed in to close the switch 174 to resume operation of the high pressure pump 42. Since it requires a higher pressure to unfeather the propeller than to bring the propeller to its feathered condition the pressure responsive switch 112 would operate to break the circuit of the solenoid 176 before the propeller moves from the feathered condition and it is, therefore, necessary to manually hold the member 170 in position to maintain the switch 174 closed until the propeller comes out of feather and under the influence of aerodynamic forces. As soon as the propeller has returned to the operative or governor controlled range of pitch angles the member 170 will be released to discontinue operation of the pump 42 as otherwise the propeller would be moved to and retained in its limiting low pitch condition.

The pump 42 and motor 124 will ordinarily be constructed as a unitary electric pump device and may be disposed in any convenient location in the aircraft and may also be utilized to furnish hydraulic fluid under pressure for other purposes such as operating wing flaps and retractable landing gear mechanism of the airplane. The governor control 88 and switch control 78, 174 or 170, are disposed in locations easily accessible to the pilot or flight engineer, for example, on the instrument panel of the airplane.

While a particular arrangement of a propeller feathering and unfeathering control has been hereinabove described and somewhat diagrammatically illustrated in three slightly different forms, it is to be understood that the invention is not limited to the particular arrangements so illustrated and described, but that such changes in the size, shape and arrangement of the various parts may be resorted to as come within the scope of the sub-joined 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. In a control for a feathering type controllable-pitch propeller, a power driven pump for feathering and unfeathering said propeller, manually operable means for controlling the operation of said pump driving means, means operative to discontinue operation of said pump driving means when said propeller has reached its feathered condition, said manually operable means being operable to resume operation of said pump driving means after the propeller has reached its feathered condition to return the propeller to its operative range of pitch angles, and means operative to again discontinue operation of said pump driving means when said propeller has been returned from its feathered condition.

2. In a control for a feathering type controllable-pitch propeller, a fluid pressure pump for feathering and unfeathering said propeller, electric motor means for driving said pump, a manually operable switch for controlling the operation of said pump driving means, a first pressure operated switch for discontinuing operation of said pump driving means when said propeller has reached its feathered condition, and a second pressure operated switch for discontinuing operation of said pump driving means when said propeller is returned from its feathered condition to its operative range of pitch angles.

3. In a control for a feathering type controllable-pitch propeller, a fluid pressure pump for feathering and unfeathering said propeller, an electric motor drivingly connected with said pump, a relay switch for controlling the motor, a spring for opening and a solenoid for closing said switch, a manually operable switch for controlling the solenoid circuit, a spring for opening said manually operable switch and a second solenoid in said solenoid circuit for maintaining said manually operable switch closed, and two fluid pressure responsive switches in said solenoid circuit one of which acts to break said solenoid circuit when the propeller is fully feathered and the other of which acts to break said solenoid circuit when the propeller is unfeathered.

4. In a control for a feathering type controllable-pitch propeller, a fluid pressure pump for feathering and unfeathering said propeller, an electric motor drivingly connected with said pump, a relay switch for controlling the motor circuit, a spring for opening and a solenoid for closing said switch, a manually operable switch for controlling the solenoid circuit, a spring for opening said manually operable switch and a second solenoid in said solenoid circuit for maintaining said manually operable switch closed, two fluid pressure responsive switches in said solenoid circuit one of which is operatively connected with the outlet of said pump and acts to break said solenoid circuit when the fluid pressure in said pump outlet exceeds a propeller feathering value and the other of which acts to break said solenoid circuit when the propeller is unfeathered, and a fluid valve operatively associated with said manually operable switch to disconnect said one pressure responsive switch from said pump outlet when said manually operable switch is actuated to unfeather said propeller.

5. In a control for a feathering type controllable-pitch propeller having a fluid pump and a governor for controlling the pitch thereof in the operative range of pitch angles, a feathering and unfeathering pump, a motor therefor, a relay switch for controlling the operation of said feathering and unfeathering pump motor, a spring for opening and a solenoid for closing said relay switch, a manually operable switch in the solenoid circuit, a spring for opening said manually operable switch and a solenoid controlled by said manually operable switch for maintaining the same closed, and a pair of fluid pressure responsive switches in said solenoid circuit one of which is operatively connected with the outlet of said feathering and unfeathering pump to break said solenoid circuit when the fluid pressure in said pump outlet exceeds a feathering pressure and the other of which is connected with the outlet of said governor to break said solenoid circuit upon a resumption of control function by said governor when said propeller is unfeathered.

6. The arrangement as set forth in claim 5 including a fluid valve operated in conjunction with said manually operable switch to disconnect said one pressure responsive switch from said pump outlet when said manually operable switch is actuated to unfeather the propeller.

7. In a control for a feathering type controllable-pitch propeller, a pump for feathering and unfeathering said propeller, a motor therefor, a solenoid operated switch for controlling said pump motor, a manually actuated switch for closing the circuit for said solenoid, a second solenoid in said circuit for maintaining said manually actuated switch closed, a pressure actuated switch in said circuit for releasing said manually actuated switch when said motor driven pump develops a hydraulic pressure sufficient to feather said propeller to interrupt said circuit and discontinue operation of said pump motor, said manually actuatable switch being manually operable to reclose said circuit and continue operation of the pump motor to unfeather said propeller.

8. In a control for a feathering type controllable-pitch propeller, a pump for feathering and unfeathering said propeller, a motor therefor, a manually actuatable switch, a spring urging said switch to open position, a solenoid for maintaining said switch closed when said solenoid is energized, a circuit for said solenoid including said manually actuatable switch and a pressure actuated switch in series, said pressure actuated switch being effective to interrupt said solenoid circuit and open said manually actuatable switch when said pump develops a hydraulic pressure sufficient to feather said propeller, a relay switch for controlling said motor, a spring urging said relay switch to open position, a second solenoid in said circuit for closing said relay switch to energize said pump motor, whereby operation of said motor may be initiated by closing said manually actuatable switch, continued by said first solenoid, discontinued by said pressure operative switch and resumed by reclosing said manually actuatable switch.

9. In combination with a controllable-pitch propeller having a governor controlled range of pitch adjustment and a blade feathering position outside of said governor controlled range, a governor, a source of hydraulic fluid at a first pressure for changing the propeller pitch within said governor controlled range, a motor driven pump for supplying hydraulic fluid at a second pressure higher than said first pressure to feather said propeller and for supplying hydraulic fluid at a third pressure higher than said second pressure to unfeather said propeller, and a source of power for said pump driving motor, a switch between said source of power and said motor, a spring urging said switch to open position, a solenoid for closing said switch, a circuit for energizing said solenoid, a manually actuatable switch in said circuit, a spring for urging said manually actuatable switch to open position, a second solenoid in said circuit for maintaining said manually actuatable switch closed to continue operation of said pump, and a pressure actuated switch in said circuit operative to interrupt said circuit and thereby discontinue operation of said pump when the fluid pressure developed by said pump reaches said second pressure, said manually actuatable switch being effective when reclosed to resume operation of said pump to develop said third pressure.

10. In combination with a controllable-pitch propeller having movably mounted blades and

pitch changing means operative to move said blades to a feathered position, a pump for supplying hydraulic fluid under pressure to said pitch changing means for feathering and unfeathering said propeller, a motor for driving said pump, a fluid pressure operated reversing valve automatically operative to apply the pressure fluid from said pump to said pitch changing means in a manner to unfeather said propeller upon continuation of pump operation after the propeller has been brought to a feathered condition, manually operable means for controlling said pump motor, and means operated automatically by the increase in pressure of said pressure fluid when said propeller reaches a feathered condition to discontinue operation of said pump when said feathered condition is reached, said manually operable means being operative upon manual actuation thereof with said propeller in feathered position to resume operation of said pump to unfeather said propeller.

11. In a control for a feathering-type control-

lable-pitch propeller, a fluid pressure pump for feathering and unfeathering said propeller, an electric motor drivingly connected with said pump, a relay switch for controlling said motor, 5 a spring for opening and a solenoid for closing said switch, a manually operable switch for controlling the solenoid circuit, a spring for opening said manually operable switch and a second solenoid in said solenoid circuit for maintaining said manually operable switch closed, and a fluid pressure responsive switch in said solenoid circuit automatically actuated by the rise in said fluid pressure when said propeller reaches its fully feathered position to interrupt said solenoid circuit and discontinue operation of said pump, said manually operable switch being operative upon manual closing thereof with the propeller in feathered condition to resume operation of said pump to unfeather said propeller.

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