Nov. 14, 1939. F. W. CALDWELL ET AL 2,179,492

CONTROL MEANS FOR AERONAUTICAL PROPELLERS

Filed Nov. 27, 1936 2 Sheets-Sheet 1

Fig. 1

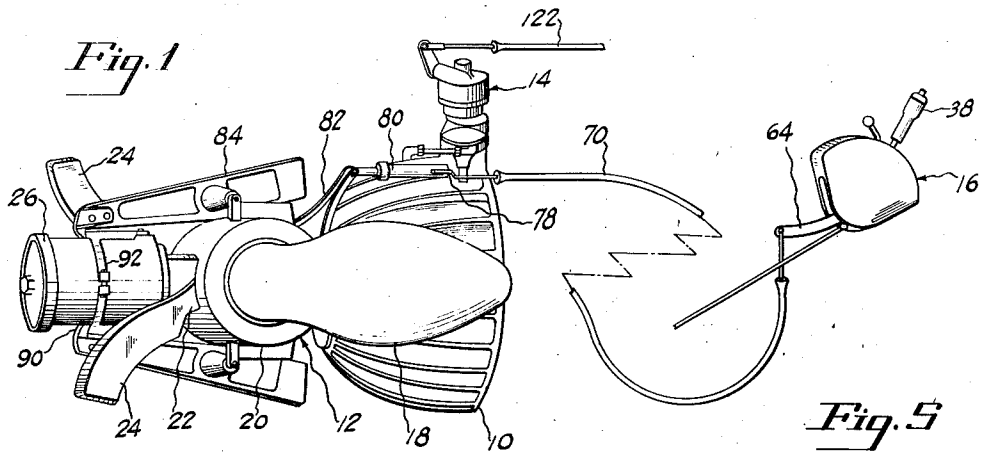


Fig. 5

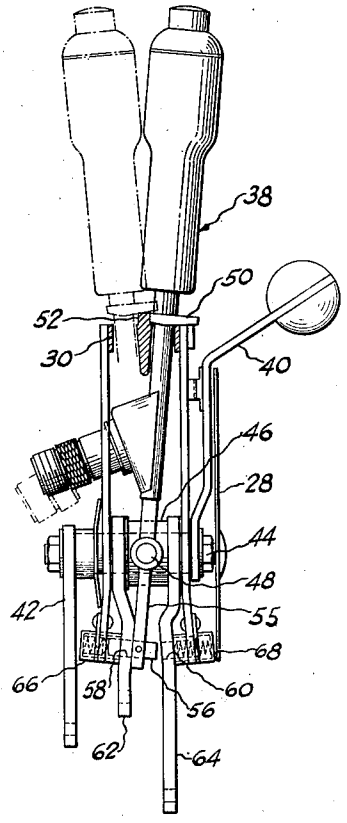


Fig. 4

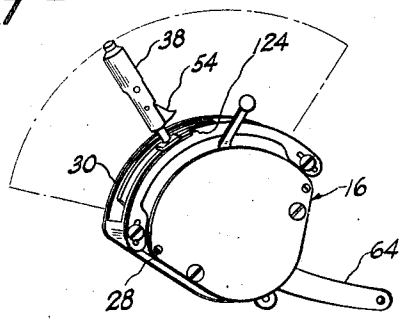
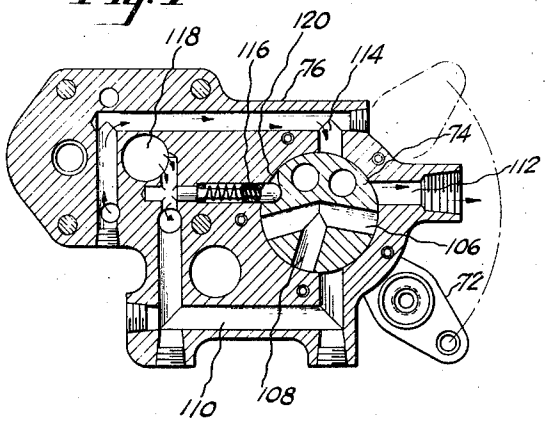


Fig. 7



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CONTROL MEANS FOR AERONAUTICAL PROPELLERS

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Fig. 2

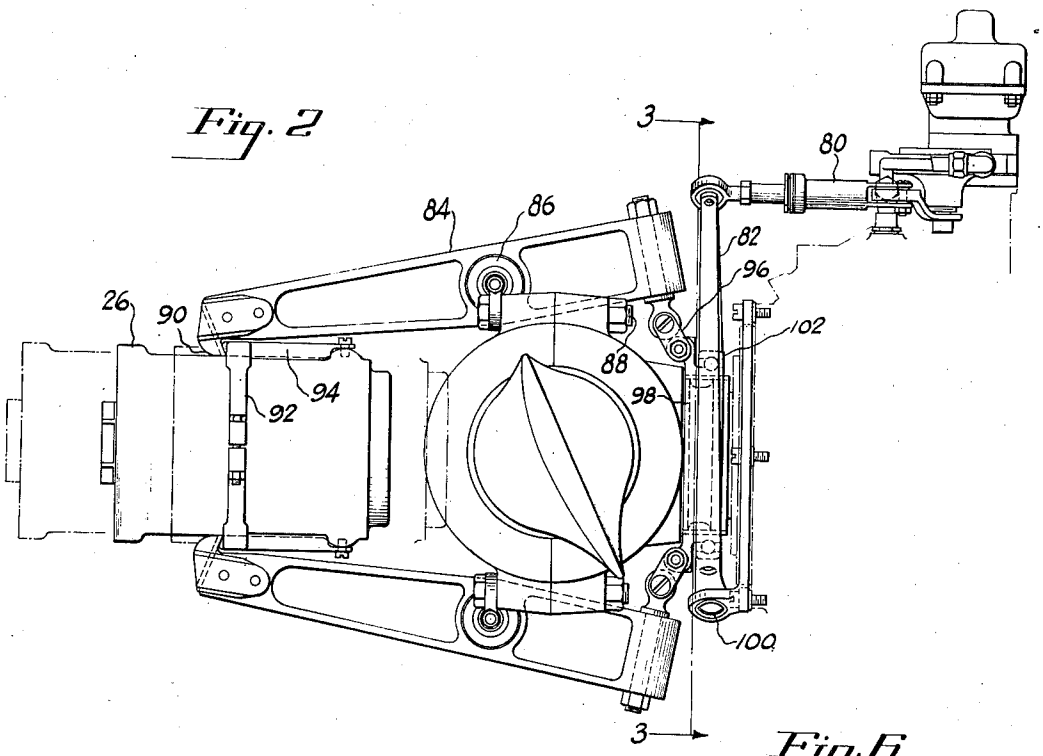


Fig. 6

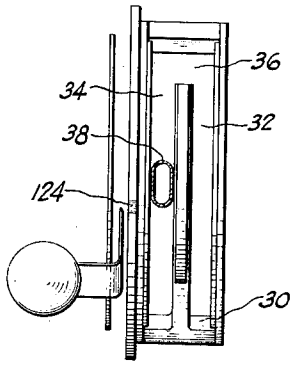
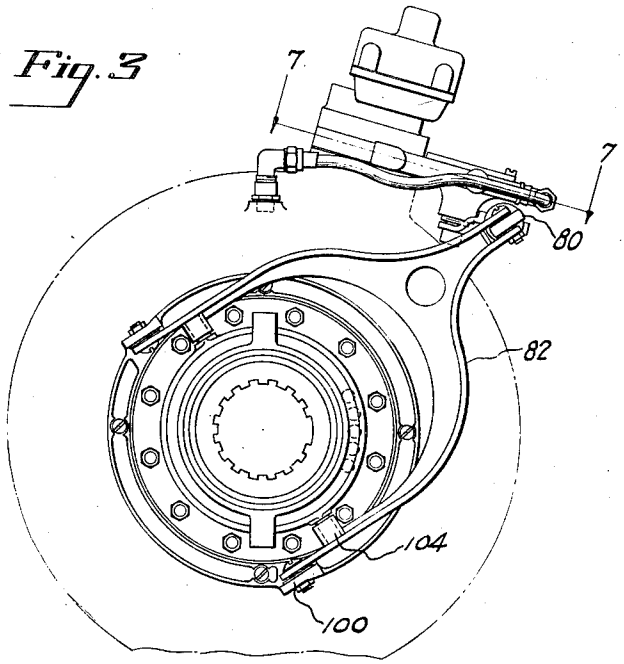


Fig. 3



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UNITED STATES PATENT OFFICE

2,179,492

CONTROL MEANS FOR AERONAUTICAL PROPELLERS

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Application November 27, 1936, Serial No. 113,022

13 Claims. (Cl. 170—135.6)

This invention relates to improvements in control means for aeronautical propellers and has particular reference to control means for controllable pitch aeronautical propellers having a wide range of pitch adjustment such as are used on high performance airplanes as for instance military airplanes of the classes known as dive bombers and pursuit ships.

An object of the invention resides in the provision of an improved propeller control mechanism by means of which the pilot may readily control the range of pitch adjustment of the propeller to bring the range of adjustment within limits suitable for a particular maneuver.

A further object resides in the provision of an improved propeller control means combined with the manual engine throttle lever so that the pilot may control the propeller and the speed of the engine with a single operation.

A still further object resides in the provision of improved means for temporarily bringing an automatically controlled or constant speed propeller under manual control for the duration of particular maneuvers of the airplane.

Other objects and advantages will be 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, Figure 1 is a partly schematic projectional view of a propeller control mechanism constructed according to the idea of this invention.

Figure 2 is an elevational view on a somewhat enlarged scale of a controllable pitch propeller and control mechanism therefor, showing the application thereto of a control device constructed according to the idea of the invention.

Figure 3 is a sectional view on the line 3—3 of Figure 2 looking in the direction of the arrow.

Figure 4 is a projectional view of a manually actuatable combined engine throttle control and propeller control device constructed according to the idea of the invention.

Figure 5 is a vertical sectional view of the manually actuatable throttle and propeller control device illustrated in Figure 4.

Figure 6 is a plan view of the manually actuatable engine throttle and propeller control device illustrated in Figure 4.

Figure 7 is a sectional view on a somewhat enlarged scale on the line 7—7 of Figure 3.

In the operation of modern types of heavily loaded, high-speed aircraft, it has been found desirable to provide propellers so arranged and constructed that the pitch angle of the propeller blades may be varied for different operating conditions of the airplane. For example, during takeoff and steep climb, it has been found desirable to use a propeller having a relatively flat pitch angle so that the engine may quickly come up to speed and develop its maximum rated horsepower for the altitude at which it is operated.

During cruising of the airplane at high velocity, it is desirable to use a propeller having a relatively steep blade angle in order that the spiral path of the propeller through the air may be elongated and the engine will not be required to operate at an excessive speed.

These and other objects have been successfully accomplished by the provision of a propeller having blades rotatable about their longitudinal axis and power actuated means for rotating the blades to the proper pitch angle requisite for the particular operating conditions.

It has also been found desirable to provide such propellers with control means responsive to engine speed so that the blade angles of the propeller may be varied in response to initial increments of variation in engine speed to maintain the engine speed constant for the duration of a particular phase of airplane operation. It has also been found desirable to provide manually actuatable means to vary the limits of the speed range within which the speed responsive means constrains the engine to operate.

Particularly in connection with high performance military airplanes, it has been found desirable to provide controllable pitch propellers having excessively wide ranges of pitch angle adjustment speed responsive means for controlling the propeller to maintain the engine speed substantially constant for the duration of particular phases of operation, and to provide in connection with such airplanes manually operable propeller control means which may be actuated at any time to supersede the speed responsive control means and instantly place the propeller in condition for a particular maneuver. This idea has particular application to military airplanes of the dive bomber and pursuit classes.

Modern airplanes of the military classes specified have been developed with such cleanness of design that in a prolonged dive, they reach unsafe terminal velocities and various means have been developed to increase the drag of such a ship during a dive to thereby give it a lower terminal velocity, the effects of such means, of course, being entirely eliminated during other maneuvers of the airplane.

The most practical and effective means so far discovered for reducing the terminal velocity of an airplane in a dive is to provide the propeller with an extremely flat pitch and allow the negative thrust on the propeller disc to act as a brake against the speed of the airplane. This arrangement has the further advantage that with an extremely flat pitch the propeller does not tend to speed up the engine to dangerously high speeds.

In accordance with the above described conditions, it is among the objects of this invention to provide means whereby the pilot may readily place the propeller in a flat pitch condition upon starting into a dive.

As airplanes of the classes specified are frequently somewhat difficult to land and as pilots do not always accurately judge their landing distances, particularly when visibility is low because of bad weather conditions, it is sometimes necessary to turn a landing glide into a takeoff climb by bringing the engine up to climbing speed from its idling speed during the glide. With the usual type of controllable pitch constant speed propeller the propeller tends to go into its flat pitch position whenever the engine speed is reduced to idling, as it would be for a landing glide. The drag of the propeller in the flat pitch position is so great as to give the airplane a dangerously high rate of descent. This condition can be corrected by placing the propeller in fixed high pitch. If, however, the pilot desires a sudden increase of thrust, the high pitch condition is less desirable than an intermediate pitch which will allow the engine to develop its full power. So far no practical means has been devised for instantaneously changing a controllable pitch propeller from a flat pitch or a high pitch condition to an optimum thrust producing condition such as is necessary for a takeoff.

In view of these conditions, the present invention contemplates the provision of manually actuatable means for maintaining the propeller in a thrust producing condition during a landing glide so that if necessary the glide may be instantly converted into a takeoff climb by simply opening the engine throttle.

From the above discussion, it will be observed that the invention contemplates the provision of propeller control means which will place the propeller in a flat pitch condition whenever the engine is brought down to idling speed preparatory to going into a dive and which will maintain the propeller in an intermediate thrust producing condition whenever the engine speed is reduced preparatory to going into a landing glide. The invention further contemplates the combination of such a propeller control with the manually operable throttle controlling lever in such a manner that the pilot will not have to consciously control any mechanism other than his engine throttle. The invention further contemplates the provision of improved propeller controlling means of the character specified which will automatically restore the propeller to the control of the engine speed responsive mechanism whenever the throttle is open to cause the engine to operate under power producing conditions.

One suitable mechanical construction for carrying out the above object has been particularly illustrated in the accompanying drawings in which the numeral **10** indicates the front or nose portion of an internal combustion engine such as a radial air-cooled engine ordinarily employed for the propulsion of airplanes, a disclosure of the engine itself being omitted for the sake of clearness in the illustration. The numeral **12** generally indicates a controllable pitch propeller driven by the engine for supplying propulsive force for the airplane.

The propeller illustrated is of a type particularly developed for military airplanes of the classes referred to and has an excessively wide range of pitch angle adjustments, a range of pitch angle adjustments of approximately 30° being not uncommon in propellers of this type. It is to be understood, however, that the particular propeller disclosed is shown only for purposes of convenience in the illustration and that the improved control mechanism may be applied to various other types of controllable pitch propellers without in any way exceeding the scope of the invention.

The numeral **14** generally indicates a governing mechanism which is responsive to engine speed and arranged to control the pitch angle of the propeller to maintain the engine speed substantially constant for the duration of particular operating phases of the airplanes.

The numeral **16** generally indicates a manually operable combined engine throttle and propeller control mechanism located within reach of the pilot for actuation by him during operation of the airplane.

The particular type of controllable pitch propeller illustrated has two or more blades, one of which is indicated at **18**, rotatably supported at their base end in a hub structure **20**. Within the hub structure, the base ends of the propeller blades are fitted with brackets **22** by means of which the blades may be rotated about their longitudinal axes and these brackets carry counterweights **24** extending outwardly in a forward direction from the propeller blades to apply the effects of centrifugal force when the propeller is rotating to urge the blades towards their high pitch condition. An axially movable hydraulic cylinder **26** is slidably mounted upon a fixed piston disposed immediately in front of the propeller in such a manner that the cylinder lies between the counterweights **24**. The cylinder is connected with the counterweight by suitable means such as an elongated curved antifriction bearing as shown in application Ser. No. 28,888 of Erle Martin filed June 28, 1935, in such a manner that when the cylinder **26** is forced outwardly or forwardly from the propeller this movement of the cylinder moves the counterweights **24** and brackets **22** to rotate the propeller blades **18** towards their low pitch condition. Hydraulic fluid under pressure is supplied to the hydraulic cylinder **26** through the hollow shaft upon which the propeller **12** is mounted, the hydraulic fluid passing through a valve controlled by the governor **14** on its way to or from the hydraulic propeller controlling mechanism **26**.

The manually actuatable combined throttle and propeller control device comprises a hollow bracket portion **28** having a curved top plate **30** particularly illustrated in Figure 6. The plate

30 is provided with a pair of parallel guide slots, 32 and 34, connected together at their adjoining ends by a cross-over gate 36 to provide a substantially U-shaped guideway for the manually actuatable throttle control lever, generally indicated at 38. In the following description of the construction and operation of the device, the guide slot 32 will be referred to as the dive slot and the slot 34 will be referred to as the power slot.

A mixture control handle 40 is pivotally mounted upon the brackets 28 and operates a lever member 42 operatively connected with the mixture adjusting mechanism of the engine carburetor. As this mixture control does not constitute a necessary part of the present invention, it is believed that a further description thereof is unnecessary for the purpose of this disclosure.

The throttle handle 38 projects through the plate 30 and is pivotally supported within the hollow bracket member 28 upon a journal pin 44 by means of the rotatable sleeve or bushing member 46. The bushing 46 supports the throttle lever 38 for angular movements along the slots 32 and 34. An additional pivotal mounting 48 supports the throttle handle upon the bushing 46 in such a manner that the handle may be moved transversely through the cross-over gate 36.

Overlying the plate 30, the throttle handle 38 is provided with a movable latch member 50 which engages with a stop 52 on the plate 30 to restrain the throttle handle from movement out of the power slot 34 except when the latch 50 is voluntarily released by the pilot. The latch may be released by squeezing the trigger member 54, illustrated in Figure 4. When the latch is raised, as shown in the dotted line position of the handle in Figure 5, the handle may be moved transversely through the cross-over gate 36 and entered into the dive slot 32.

The throttle handle has a portion 55 extending below the pivotal connection 48 and provided adjacent its lower end with a transverse pin 56, the opposite ends of which are adapted to engage in apertures 58 and 60 provided in lever members 62 and 64 respectively, rotatably mounted on the journal pin 44 and depending therefrom. Whenever the throttle lever is in the power slot 34 the pin 56 will engage in the aperture 58 in the throttle lever 62 to open and close the engine throttle as the lever handle is moved along the slot. When the handle is swung through the cross-over gate 36, the pin 56 will be disengaged from the throttle lever 62 and engaged in the aperture 60 in the propeller control lever 64. Suitable spring pressed detents, 66 and 68, are mounted upon the lower portion of the hollow bracket 28 in such position that when the pin 56 is disengaged from the aperture in the lever 62 or the lever 64 the corresponding detent will immediately enter such aperture to lock the lever securely in position so that the lever which has been released from the throttle handle will be held in a fixed position while the other lever is being operated.

From the above description it will be observed that when the pilot desires to land the airplane, he will move the throttle handle 38 to throttle closing position in the power slot 34 and that this operation, through mechanism presently to be described, will maintain the propeller within a range of pitch angles suitable for landing. If, on the other hand, the pilot desires to put the airplane into a dive, he will first move the throttle handle 38 to throttle closing position in the power slot 34, then release the latch 50, move the throttle handle through the cross-over gate 36 into the slot 32, and then move the handle through the slot 32 to a position similar to the wide open throttle position of the throttle handle when in the slot 34. This operation through the mechanism about to be described, will place the propeller in an extremely flat pitched position in which it is effective to act as a brake to reduce the terminal velocity of the airplane when in a dive.

Thus, it will be observed that the pilot may place the propeller in condition for either a landing glide or a dive by a simple operation of his throttle control handle but such manipulation of the handle to place the propeller in the diving position necessitates sufficient special actuation to avoid accidental manipulation of the handle to attain this result.

The propeller control lever 64 is connected through a suitable flexible connection, such as an Arens cable 70, with the free end of the actuating lever 72 of a rotatable valve 74 provided in the base pad 76 of the governor 14. The free end of the valve operating lever arm 72 is also connected by means of a link 78 with one end of a slidable lost motion connection 80, the other end of which is pivotally connected to a yoke member 82 pivotally mounted upon the front end of the engine adjacent to the propeller 12 for a purpose to be presently described.

A pair of latch members 84 are pivotally mounted upon the propeller 12 on opposite sides thereof by means of suitable bearings 86 supported by the propeller hub clamp bolts 88. These latch members 84 extend forwardly and rearwardly from the bearings 86 and, at their forward ends overlying the hydraulic cylinder 26 of the propeller control mechanism, they are provided with hooks 90 which engage contacting surfaces provided on a ring member 92 clamped upon the cylinder 26 intermediate its length. Guideways 94 are provided rearwardly from the contact surfaces of the ring 92 to maintain the hooks on a level with the outer surface of the ring when the ring has been allowed to pass beyond the hooks to facilitate the re-engagement of the hooks with the contact surfaces of the ring.

The ring 92 is located upon the cylinder 26 in such a position that its engagement with the hooks 90 of the latch members 84 provides a positive stop for movement of the cylinder 26 tending to turn the propeller blades towards their low pitch position to provide a practical range of pitch adjustment for normal operation of the airplane. It is only when the propeller is to be used as a diving brake for the airplane that it is desired to have the propeller pitch lower than the pitch angle determined by the stop provided by the contact of the hook 90 with the ring 92.

By this arrangement, one range of propeller pitch adjustment is provided for normal operation of the airplane and a second range of adjustment is provided for diving.

At their rear ends, the latch members 84 are connected by means of pivotally mounted links 96 with the inner race 98 of a ball bearing mounted upon the propeller shaft between the engine and the propeller, sufficient space being provided between the engine and the propeller to permit a limited amount of freedom of axial movement for the bearing including the inner race 98. The yoke 82 is pivotally mounted, at its end opposite

the lost motion connection 80, upon the front end of the engine by suitable bearings 100 and is also pivotally connected intermediate its length to the outer race 102 of the ball bearing by suitable pivotal connections 104.

From this description, it will be observed that a rearward movement of the ball bearing including the races 98 and 102 will swing the latch members 84 about the bearings 86 by reason of the change in the angular relation of the links 96 to release the hooks 90 from the ring 92. Likewise a forward movement of the ball bearing will permit the latch members 84 to swing about the bearings to engage the hooks 90 with the contact surfaces of the ring 92. Rearwardly of the bearings 86, the latch members 84 are provided with relatively heavy portions which tend, under the action of centrifugal force incident to rotation of the propeller, to urge the hooks 90 into engagement with the contact surfaces of the ring 92.

The valve 74 is provided with a substantially straight through channel 106 and a channel 108 connecting with the channel 106 and disposed at an angle thereto.

The operation of this valve is substantially as follows: When the throttle handle is moved forwardly through the dive slot 32, movement of the handle will be free until the slack has been taken up in the lost motion connection 80. During this part of the movement of the handle, the valve operating lever 72 is swung to a position in which the channel 106 connects the propeller oil channel 110 with the drain opening 112. During this movement of the valve control lever 72 movement of the link 78 has been taken up by the lost motion connection 80 and the yoke 82 has not been moved.

When the pilot has moved the throttle handle in the dive slot to a position corresponding to the limit of the free movement of the lost motion connection 80, he will encounter a resistance to further movement of the handle due to the frictional resistance to disengagement of the hooks 90 from the contact surfaces of the ring 92. However, as the valve 74 has been placed in position to drain oil from the cylinder 26, the counterweights 24 will almost immediately rotate the blade 18 to a slightly higher pitch position incidentally moving the cylinder 26 towards the propeller 12 so that the hook 90 will be released from the contact surfaces of the ring 92. As soon as this occurs further movement of the throttle handle along the dive slot may take place. This additional movement of the throttle handle causes an additional rotation of the valve 74 to block off the channel 108 and connect the channel 106 across the space between the high-pressure oil channel 114 leading from the governor booster pump and the propeller channel 110 to supply oil or other hydraulic fluid under pressure to the cylinder 26. This same movement of the throttle handle moves the upper end of the yoke 82 rearward to increase the angular inclination of the pivoted links 96 to thereby swing the rearward end of the latch members 84 inwardly and release the hooks 90 from the contact surfaces of the ring 92. As soon as the hooks 90 have been released from the ring 92, the hydraulic fluid under pressure flowing into the cylinder 26 will force the cylinder outwardly or away from the propeller to its limiting forward position in which position the cylinder causes the propeller blades 18 to assume their limiting flat pitch condition in which they are effective to act as a brake for a diving airplane.

Initial rotation of the valve control lever 72, by movement of the throttle handle in the dive slot, actuates the cut-off valve 116 to cut off the connection between the governor control valve 118 and the channel 110 leading to the propeller so that, during all movements of the throttle handle in the dive slot, after the initial movement, the governor is rendered ineffective to in anyway control the pitch setting of the propeller and, with the throttle handle in the dive position at the forward end of the dive slot, the propeller will be maintained in its limiting flat pitch position and the engine throttle will simultaneously be maintained in its closed position by reason of the interlock of the throttle lever 62 with the detent 66.

When the airplane is brought out of the dive and it is desired to resume power operation, the throttle handle is moved in the dive slot toward the position corresponding to the throttle closing position. The first part of said movemer takes up the slack in the lost motion connection 80 and rotates the valve control lever 72 to a position in which the supply of hydraulic fluid under pressure is cut off from the propeller actuating mechanism and the propeller supply line 110 is connected with the drain 112 through the valve channel 108 and 106.

At this point the throttle handle will encounter a positive resistance due to the inability of the hook 92 to re-engage behind the contact surfaces of the ring 92. However, once the hydraulic device 26 is connected with drain, the counterweights 24 will almost immediately rotate the propeller blades 12 towards their high pitch position by an amount sufficient to bring the cylinder 26 towards the propeller the distance necessary to allow the hooks 90 to engage over the ring 92. The heavy end of the latch members 84 adjacent to the front end of the engine will apply the effect of centrifugal force to urge the hook end of the latch members inwardly to engage the ring. As the hook ends of the latch members 84 move inwardly, the yoke 82 may be moved forwardly by the connection 80 and link 78 to decrease the angular relation of the pivoted links 96 and maintain the latch members in their position of engagement with the ring. As soon as further movement of the throttle handle is resumed the valve 74 is rotated by the valve operating lever 72 to a position in which the valve channels 106 and 108 are blocked off by the walls of the valve casing and the cut-off valve 116 is registered with the cam-shaped pocket 120 in the rotatable valve body, thereby opening the cut-off valve 116 and restoring the propeller actuating mechanism to the control of the governor 14. At this point the throttle handle may be crossed over through the cross-over gate 36 into the power slot and normal operation of the airplane may be resumed with the range of propeller adjustment limited by the positive stop, comprising the hooks 90 and ring 92, to a range suitable for normal practical operation, the excessive low-pitch range being used only for diving.

The propeller 12 is provided with adjustable positive high-pitch and low-pitch limit stops incorporated in the counterweights 24 as particularly set forth in Patent No. 2,032,255 issued to Frank W. Caldwell February 25, 1936.

The governor 14 is provided with a suitable manual adjustment 122 leading to the pilot's compartment and by means of which the engine

speed setting of the governor may be adjusted at the will of the pilot. By means of this adjustment, the governor may be controlled to maintain the propeller in either its positive high-pitch condition or its positive low-pitch condition as determined by the limit stops including the hooks **90** and ring **92**, and may also be adjusted to control the propeller to maintain the engine speed substantially constant at various speeds in revolutions per minute between the positive high pitch and positive low pitch setting of the propeller. A suitable speed responsive governor and control, therefore, is particularly illustrated and described in application No. 33,034 of Erle Martin and F. W. Caldwell filed July 25, 1935.

The plate **30** of the throttle lever bracket **28** is preferably provided with a resilient stop **124** to indicate the throttle position for maximum power permitted at sea level and with a frictional lock for the throttle handle, constructed in a well-known manner.

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

What is claimed is:

1. In combination, a controllable pitch aeronautical propeller having a limiting high pitch setting and a limiting low pitch setting, an engine driving said propeller, a throttle for said engine, and a manually actuatable handle for said throttle, releasable means carried by said propeller providing an intermediate limit for the low pitch setting of said propeller, means for releasing said releasable means, and means rendering said throttle handle effective to alternatively actuate either said throttle or said releasing means.

2. In combination, a controllable pitch aeronautical propeller having a limiting high pitch setting and a limiting low pitch setting, an engine driving said propeller, a throttle for said engine, and a manually actuatable handle for said throttle, said handle having a plurality of alternative paths of movement, releasable means providing an intermediate limit stop for the low pitch setting of said propeller, means operatively connecting said handle when in one of said paths with said throttle, and means operatively connecting said handle when in another of said paths of movement with said releasable means for releasing the same.

3. In combination, a controllable pitch aeronautical propeller having a limiting high pitch setting and a limiting low pitch setting, an engine driving said propeller, a throttle for said engine, and a manually actuatable handle for said throttle, said handle having a plurality of paths of movement, means operatively connecting said handle with said throttle when said handle is in one of said paths of movement, releasable means providing an intermediate limit stop for the low pitch setting of said propeller, means operated by said throttle handle when in another of said paths of movement for releasing said releasable means, and means releasably locking said throttle in closed position whenever said handle is in said another path of movement.

4. In combination, a controllable pitch aeronautical propeller having a limiting high pitch setting and a limiting low pitch setting, an engine driving said propeller, a throttle for said engine, and a manually actuatable handle for said throttle, said handle having a plurality of paths of movement, means operatively connecting said handle with said throttle when said handle is in one of said paths of movement, releasable means providing an intermediate limit stop for the low pitch setting of said propeller, means operated by said throttle handle when in another of said paths of movement for releasing said releasable means, and latch means for restraining said handle against accidental movement into said intermediate stop releasing path.

5. In combination, a controllable pitch propeller having a positive high pitch setting and a positive low pitch setting, centrifugally actuated means for moving said propeller toward one positive pitch setting, hydraulic means for moving said propeller toward the opposite pitch setting, releasable means providing an intermediate low pitch setting for said propeller, and manually actuatable means for releasing said releasable means and controlling said hydraulic means to place said propeller in said positive low pitch setting.

6. In combination, a controllable pitch propeller having a positive high pitch setting and a positive low pitch setting, centrifugally actuated means for moving said propeller toward one positive pitch setting, hydraulic means for moving said propeller toward the opposite pitch setting, releasable means providing an intermediate low pitch setting for said propeller, a valve for controlling said hydraulic means, a yoke member for releasing said releasable means, manually actuatable means for controlling said valve and moving said yoke member to release said releasable means and place said propeller in said positive low pitch setting, and a lost motion connection between said valve and said yoke member.

7. In combination, a controllable pitch propeller having a positive high pitch setting and a positive low pitch setting, centrifugally actuated means for moving said propeller towards said high pitch setting, hydraulic means for moving said propeller towards said low pitch setting, releasable means providing an intermediate low pitch setting for said propeller, means for releasing said releasable means, a three-way valve associated with said hydraulic means operative in one position to relieve hydraulic pressure in said hydraulic means for rendering said centrifugal means effective to move said propeller towards said high pitch setting, and effective in another position to supply hydraulic fluid under pressure continuously to said hydraulic means to move said propeller towards said low pitch setting, manually actuatable means for operating said valve and said releasing means, and a lost motion connection between said valve and said releasing means whereby said manual means may first operate said valves to render said centrifugal means effective to move said propeller toward said high pitch setting to free said releasable means and subsequently operate said valve and said releasing means to release said releasable means and move said propeller to said positive low pitch setting.

8. In combination, a controllable pitch propeller having a positive high pitch setting and a

positive low pitch setting, centrifugally actuated means for moving said propeller toward said positive high pitch setting, and hydraulic means for moving said propeller toward said positive low pitch setting, an engine driving said propeller, a governor responsive to the speed of said engine for controlling said hydraulic means, a releasable latch providing an intermediate low pitch setting for said propeller, means for releasing said latch, a three-way valve for controlling said hydraulic means, manually actuatable means for operating said valve and said latch releasing means and a lost motion connection between said valve and said latch releasing means whereby said valve may be first actuated to a position to render said governor ineffective to control said hydraulic means and to relieve the pressure of hydraulic fluid in said hydraulic means to render said centrifugal means effective to move said propeller toward said high pitch setting to release said latch and to subsequently release said latch and move said valve to a position to supply hydraulic fluid under pressure continuously to said hydraulic means to move said propeller to said positive low pitch setting.

9. In a propeller control system, a prime mover, propulsive means connected thereto having automatically operating means for controlling the speed of said prime mover by varying, through a restricted range the work done by said propulsive means, releasable stop means for limiting the variations of said propulsive means, manual means for independently varying the power output of said prime mover, and manual means operatively dependent on said first mentioned manual means for releasing said stop and simultaneously rendering said automatically operating means inoperative.

10. In combination with a propeller having its blades rotatably mounted for pitch changing movements, fluid pressure operated means for turning said blades in one direction, centrifugal means for turning said blades in the opposite direction, releasable means constituting a limit stop for limiting the pitch changing blade movements caused by said centrifugal means, and manually operable means for releasing said releasable means and simultaneously rendering said fluid pressure means ineffective to oppose the action of said centrifugal means.

11. In combination with an engine, a propeller driven by said engine, power actuated means for changing the pitch of said propeller, and a throttle for said engine, a releasable intermediate pitch stop for said pitch changing means, manually operable means for releasing said intermediate pitch stop, and an interlock between said intermediate pitch stop releasing means and said throttle effective to maintain said releasing means inoperable except when said throttle is locked in closed position.

12. In combination with an engine, a propeller driven by said engine, means for changing the pitch setting of said propeller, speed responsive means driven by said engine for rendering the action of said pitch changing means automatic, a throttle for said engine, and a manually operable handle for controlling said throttle; releasable means for limiting the movements of said pitch changing means, and means interconnecting said releasable means, said speed responsive means and said throttle handle for coincidentally closing said throttle, releasing said releasable means and disabling said speed responsive means.

13. In combination, a controllable pitch constant speed propeller having a limiting high pitch setting and a limiting low pitch setting, a motor device for changing the pitch of said propeller from a high pitch condition to a low pitch condition against the action of centrifugal force tending to change the pitch of said propeller from a low pitch condition to a high pitch condition, a releasable latch mechanism providing an intermediate low pitch stop for said motor device, a movable yoke member for releasing said latch mechanism, centrifugal means for reengaging said latch mechanism, and manually operable means for moving said yoke to release said latch and simultaneously rendering said motor device ineffective to resist the action of centrifugal force in decreasing the pitch of said propeller.

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