

June 25, 1940.

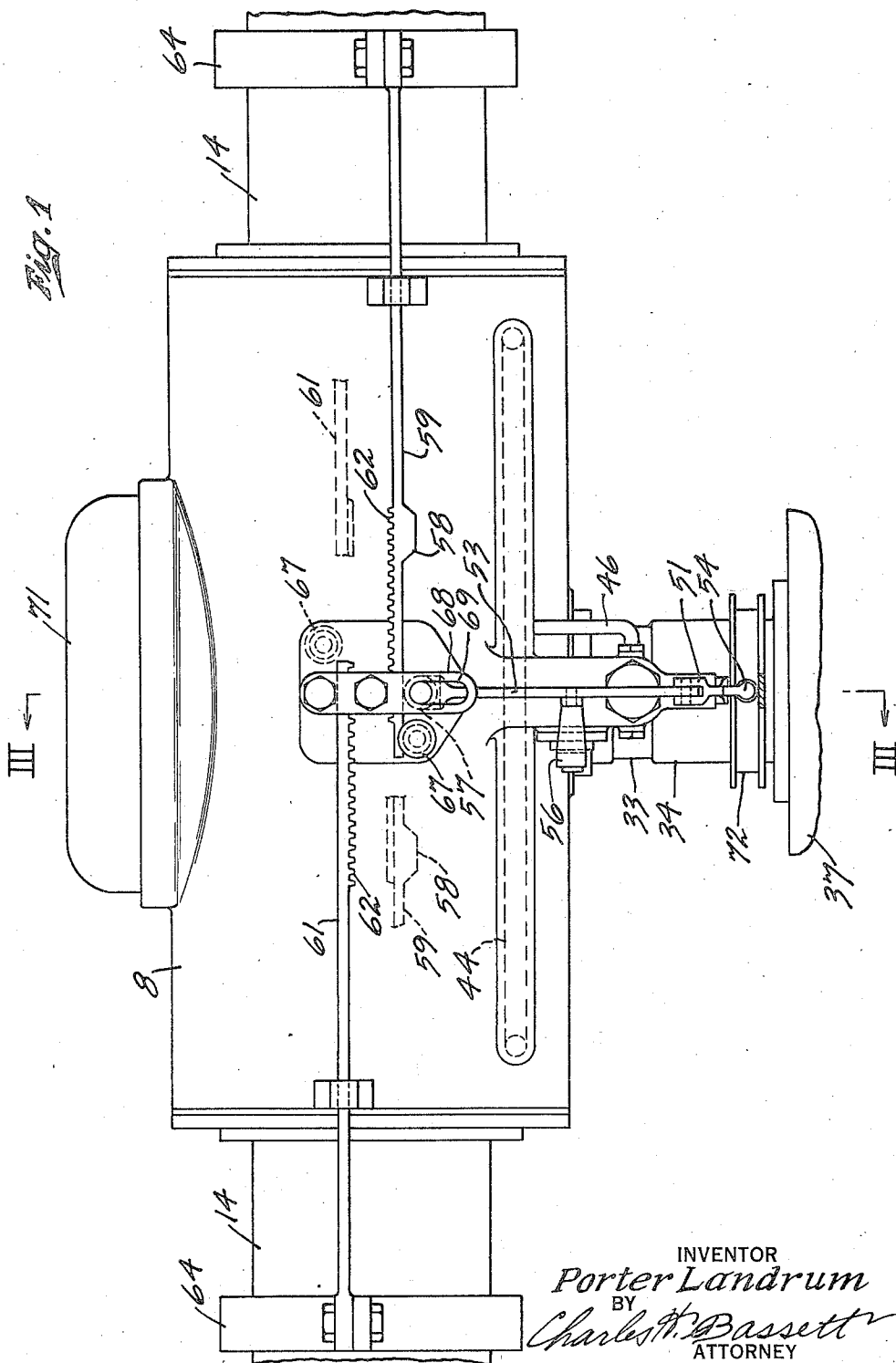
P. LANDRUM

2,205,835

AIRCRAFT PROPELLER

Filed April 22, 1937

3 Sheets-Sheet 1



June 25, 1940.

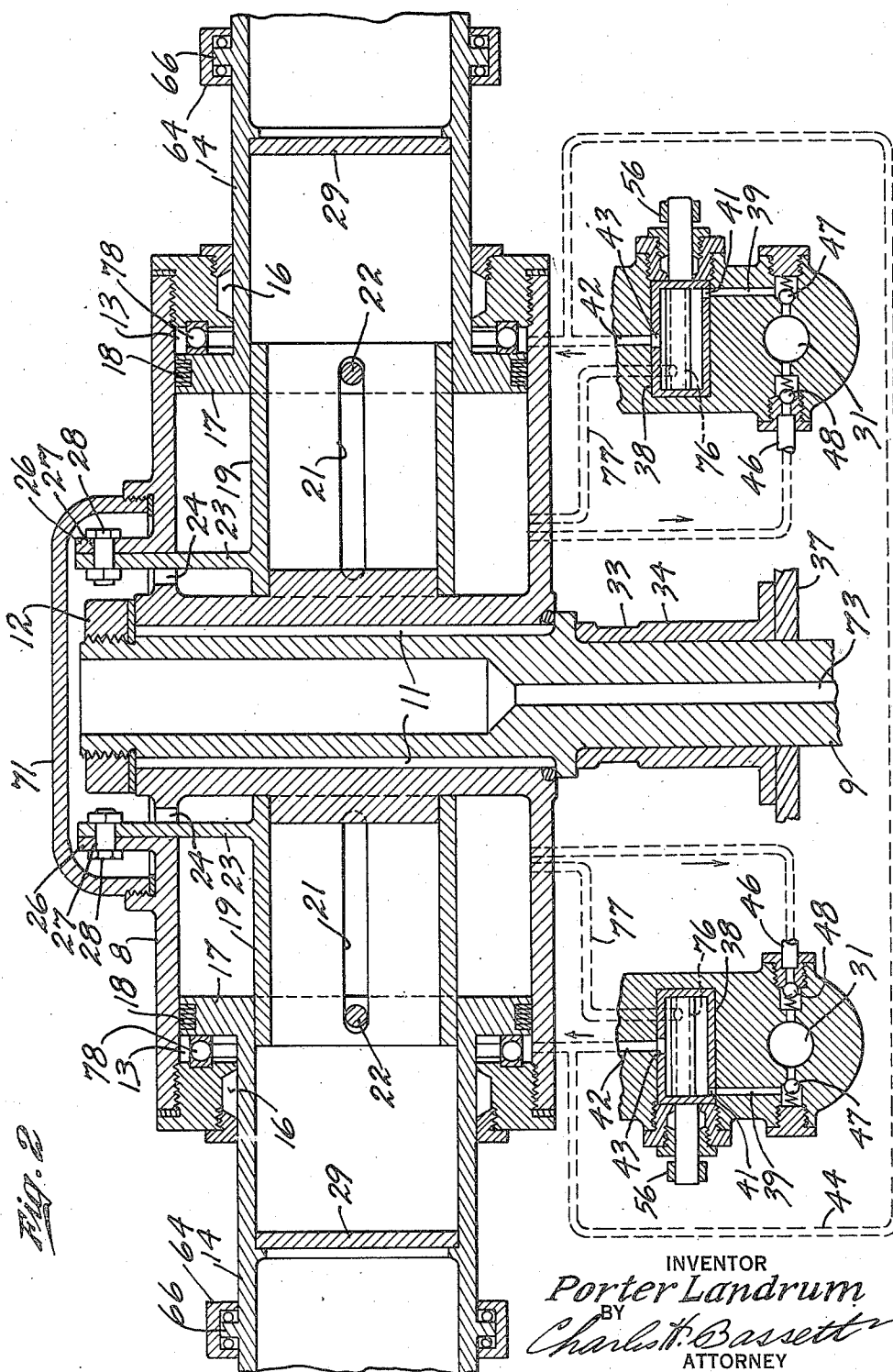
P. LÄNDRUM

2,205,835

AIRCRAFT PROPELLER

Filed April 22, 1937

3 Sheets-Sheet 2



June 25, 1940.

P. LANDRUM

2,205,835

AIRCRAFT PROPELLER

Filed April 22, 1937

3 Sheets-Sheet 3

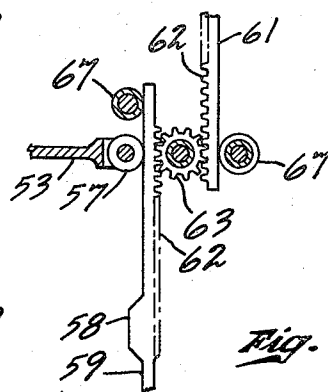
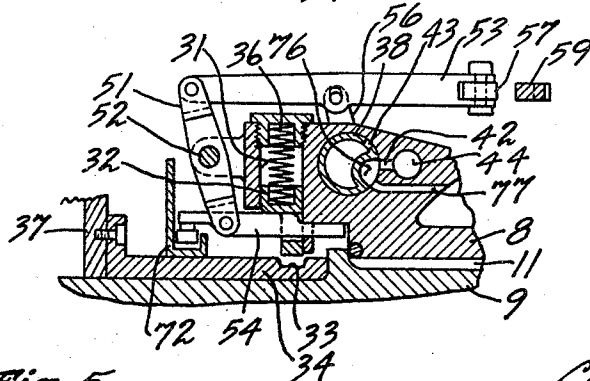
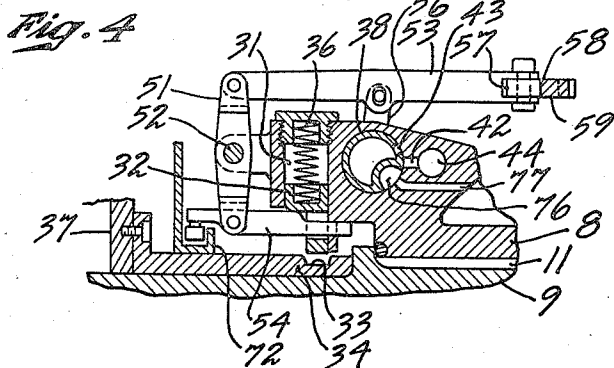
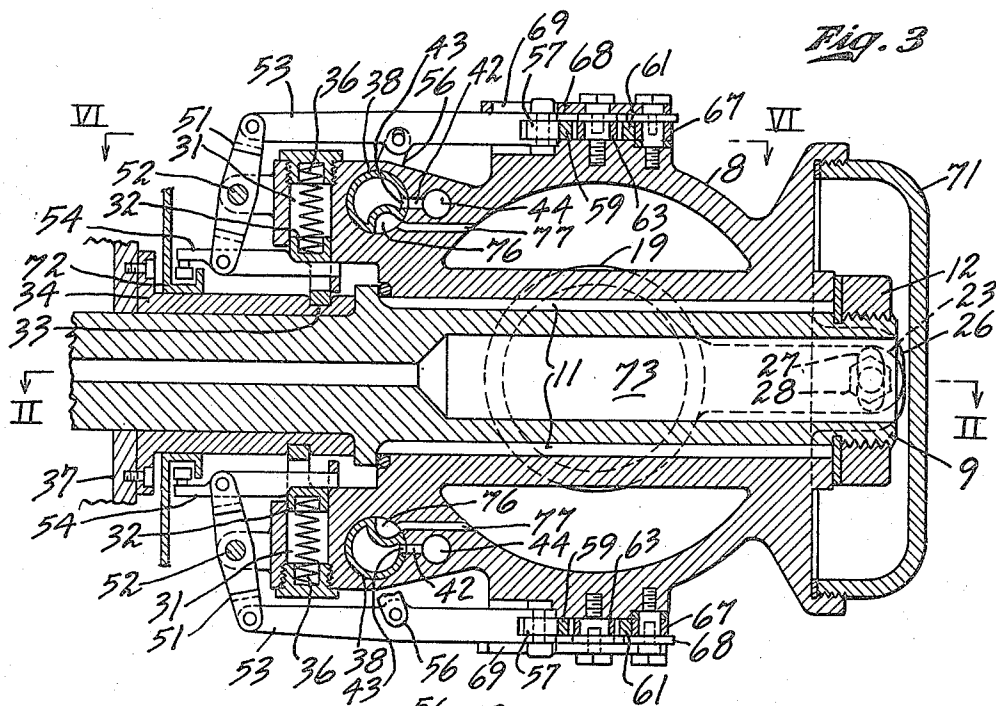


Fig. 6

INVENTOR

Porter Landrum

BY

BY *Charles H. Bassett*
ATTORNEY

ATTORNEY

UNITED STATES PATENT OFFICE

2,205,835

AIRCRAFT PROPELLER

Porter Landrum, Birmingham, Ala.

Application April 22, 1937, Serial No. 138,326

6 Claims. (Cl. 170-163)

My invention relates to aircraft propellers and more particularly concerns the type of propeller which is provided with blades adjustably mounted on the hub of the propeller and adapted to be regulated to suit various flying conditions.

My invention further contemplates the provision of a propeller embodying means for changing the pitch of the blades.

My invention further contemplates the provision of a propeller having means for moving the propeller blades radially for increasing or decreasing the diameter of the propeller.

My invention further contemplates the provision of hydraulic means for decreasing the diameter of the propeller and manual and automatic means for controlling the movement of the propeller blades.

Briefly, my invention comprises a propeller hub having cylinders formed therein to receive the piston-shaped ends of the propeller blades. A pair of pumps are mounted on the hub of the propeller and are adapted to be either manually or automatically entered into engagement with a cam for forcing liquid into the cylinders to decrease the diameter of the propeller. Valve means are provided for draining the liquid from the cylinders to increase the diameter of the propeller and means are provided for equalizing the movement of the propeller blades. An arm is provided for engagement with each propeller blade and adjustably connected to the hub of the propeller for changing the pitch of the blades.

My invention embodies other novel features, details of construction, and arrangement of parts which are hereinafter set forth in the specification and claims and illustrated in the accompanying drawings, forming part thereof, wherein:

Fig. 1 is a plan view of my improved propeller, showing the propeller blades in their outer position;

Fig. 2 is a sectional view taken along the line II-II of Fig. 3, showing the propeller blades in their outer position and a rather diagrammatic illustration of the pumps, valves, and conduits employed for increasing and decreasing the diameter of the propeller;

Fig. 3 is a sectional view taken along the line III-III of Fig. 1, showing the pumps in position to be actuated by the cams to direct liquid through the valves and conduits for decreasing the diameter of the propeller;

Fig. 4 is a fragmentary sectional view showing a pump held out of engagement with its operating cam, and its control valve disposed to prevent the passage of liquid therethrough to maintain the blades of the propeller against movement;

Fig. 5 is a fragmentary view similar to Fig. 4 in which the pump is held out of engagement

with its cam and the valve is positioned to permit the liquid to flow from the blade cylinders back to the liquid reservoir thereby causing the blades to be moved outwardly by centrifugal force; and

Fig. 6 is a sectional view taken along the line VI-VI of Fig. 3, showing the equalizing mechanism for the propeller blades.

Referring now to the drawings for a better understanding of my invention I show a propeller comprising a housing 8 which is secured on the end of the propeller shaft 9 by means of splines 11 and a nut 12. Cylinders 13 are formed in opposite ends of the housing to receive the piston shaped ends of the propeller blades 14 and are provided with stuffing-boxes 16 to prevent leakage of liquid from the cylinders. The ends of the blades are flanged at 17 and provided with piston rings 18 for liquid-tight, frictional engagement with the cylinder walls.

The inner ends of the blades are hollow to receive the pitch changing sleeves 19 which are slotted at 21 to receive their respective cross pins 22 mounted in the blades. Each sleeve 19 is provided with an adjustment arm 23 which projects through an opening 24 in the housing for engagement with a boss 25 formed on the housing. The bosses 25 are slotted at 27 to receive the bolts 28 for locking the adjustment arms. A partition 29 is provided within each blade to prevent a flow of liquid into the ends of same.

A pair of pump cylinders 31 are formed in the housing on opposite sides of the propeller shaft to receive plungers 32 adapted to be forced inwardly of the cylinders by the cam surface 33 formed on the cam sleeve 34. The plungers are moved outwardly and held in operating contact with the cam surface by compression springs 36. The cam sleeve is secured to the engine housing 37.

A rotary control valve 38 is provided for each pump and controls the flow of liquid from the pump to the cylinders and from the cylinders to the reservoir. A passageway 39 leads from each pump to a port 41 in the valve. A passageway 42 leads from a port 43 in the valve to an equalizing passageway 44 and thence to the outer end of each cylinder, and a passageway 46 leads from the inner end of each cylinder to its respective pump.

A check valve 47 is interposed in each of the passageways 39, and a check valve 48 is placed in each of the passageways 46. A pair of valve and pump control mechanisms are provided, one on each side of the propeller shaft, and as they are identical in construction and operation only one shall be described. A rocker arm 51 is pivotally mounted on the housing at 52 and has its outer end connected to a control rod 53 and its inner end connected to a plunger lift rod 54.

The control rod is also engaged to its respective valve 38 by means of an arm 56 and carries a roller 57 at its end for engagement with a cam surface 58 provided on the equalizing bar 59.

5 The equalizing bar 59 and its companion bar 61 are provided with teeth 62 for engagement on opposite sides of a pinion 63 and are provided with collars 64 for rotatable engagement with flanges 66 formed on the propeller blades. Rollers 10 67 are provided to serve as guides for the equalizing bars, and a plate 68 is slotted at 69 to serve as a guide for the end of the control rod 53. A cap 71 is provided on the front of the housing to cover the end of the propeller shaft and the adjustment arms 23, and thrust bearings are interposed between the blade flanges 17 and the stuffing-boxes 16. A control collar 72 is slidably mounted on the cam sleeve 34 and engages the ends of the plunger lift rods 54.

20 In the operation of my propeller to change its diameter, liquid is supplied from a suitable source through the passageway 73 in the propeller shaft to the inside of the housing. When the blades 14 are in their outer position, they may be moved 25 inwardly by manually moving the control collar away from the housing to the position shown in Fig. 3, thereby causing the plungers to be actuated by cam surface 33 and bringing the ports 41 and 43 into register with the passageways 39 30 and 42, respectively.

When the propeller blades 14 have been forced to their inner position by hydraulic pressure in cylinders 13, their movement is automatically 35 stopped by means of the cam surfaces 58 on the equalizing bars 59 coming in contact with the rollers 57 provided on the control rods 53. This movement of the control rods causes the valves 38 to rotate to their closed position, shown in Fig. 4, in which the passageways 42 are closed to hold the liquid within the cylinders 13. The 40 control rods also cause the lift rods 54 to move the plungers 32 out of contact with the cam surface 33.

In order to return the propeller blades to their outer position, the control collar 72 is move 45 outwardly to the position shown in Fig. 5. This causes the valves 38 to be rotated to bring the drainage ports 76 into registry with the passageways 42 and the drainage passageways 77 which lead back to the housing 8 and thence to the 50 reservoir.

It will be seen that the propeller blades may readily be moved to and maintained in any position between their inner and outer positions and that automatic means may readily be employed 55 for moving the control collar 72 for maintaining the propeller blades at their proper positions at all times. The pitch of the propeller blades may be adjusted by moving the adjustment arms 23, and it will be seen that this may be accomplished by automatic means if desired as several devices 60 now on the market may be applied thereto. The thrust bearings 78 are employed between the flanges 17 and stuffing-boxes 16 when automatic means are employed for changing the pitch 65 of the blades.

While I have shown my invention in but one form, it is obvious to those skilled in the art that it is not so limited but is susceptible of various 70 changes and modifications without departing from the spirit thereof; and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art.

I claim:

1. In an aircraft propeller, a housing, cylinders formed in said housing, propeller blades having pistons formed on their inner ends and mounted for reciprocation within said cylinders, pump 5 means for supplying liquid to the cylinders to move the propeller blades inwardly, valve means for controlling the flow of liquid to and from the cylinders, and means actuated by the movement of the propeller blades for operating the valve 10 means to bring the propeller blades to rest.

2. In an aircraft propeller, a housing, cylinders formed in said housing, propeller blades having pistons formed on their inner ends and mounted for reciprocation within said cylinders, pump 15 means for supplying liquid to the cylinders to move the propeller blades inwardly, valve means for controlling the flow of liquid to and from the cylinders, and means actuated by the movement of the propeller blades for operating the valve 20 means and the pump means to bring the propeller blades to rest.

3. In an aircraft propeller, a housing, cylinders formed in said housing, propeller blades having pistons formed on their ends and mounted for 25 reciprocation within said cylinders, equalizing members connecting the propeller blades for equalizing their reciprocating movement, pump means for supplying liquid to the cylinders to move the propeller blades inwardly, valve means 30 for controlling the flow of liquid to and from the cylinders, and means actuated by the equalizing members for operating the valve means to bring the propeller blades to rest at a predetermined position. 35

4. A device according to claim 3 in which, the equalizing members comprise racks having their outer ends connected to the propeller blades and their inner ends engaging a common pinion 40 mounted on the housing.

5. In an aircraft propeller, a housing, cylinders formed in said housing, propeller blades having pistons formed on their ends and mounted for reciprocation within said cylinders, pump means 45 mounted on the housing, valve means mounted on the housing, a liquid supply conduit leading from the inner ends of the cylinders to the pump means thence to the valve means and thence to the outer ends of the cylinders, a liquid outlet 50 conduit leading from the valve means to the inner ends of the cylinders, and common means for operating the pump means and valve means to cause liquid to flow to and from the outer ends of the cylinders to vary the diameter of the propeller. 55

6. In an aircraft propeller, a housing, cylinders formed in said housing, propeller blades having pistons formed on their ends and mounted for reciprocation within said cylinders, pump means 60 mounted on the housing, valve means mounted on the housing, a liquid supply conduit leading from the inner ends of the cylinders to the pump means thence to the valve means and thence to the outer ends of the cylinders, a liquid outlet 65 conduit leading from the valve means to the inner ends of the cylinders, common means for operating the pump means and valve means to cause liquid to flow to and from the outer ends of the cylinders to vary the diameter of the propeller, and means actuated by the propeller blades 70 for operating said common means.

PORTER LANDRUM.