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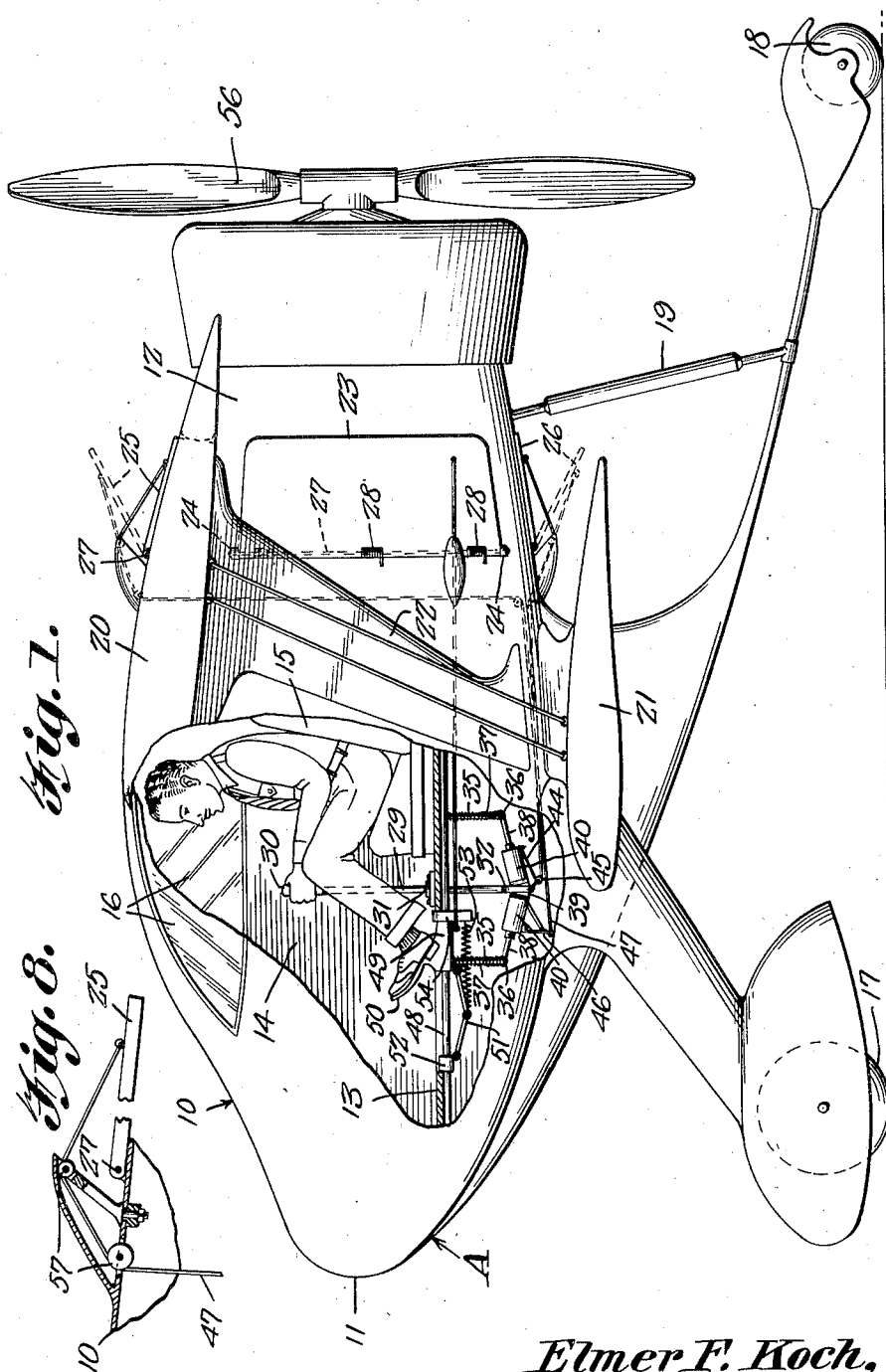
E. F. KOCH

2,227,784

AIRPLANE CONSTRUCTION

Filed May 22, 1940

3 Sheets-Sheet 1



Elmer F. Koch,
INVENTOR

BY Victor J. Evans & Co.
ATTORNEYS

WITNESS
P. Hickey

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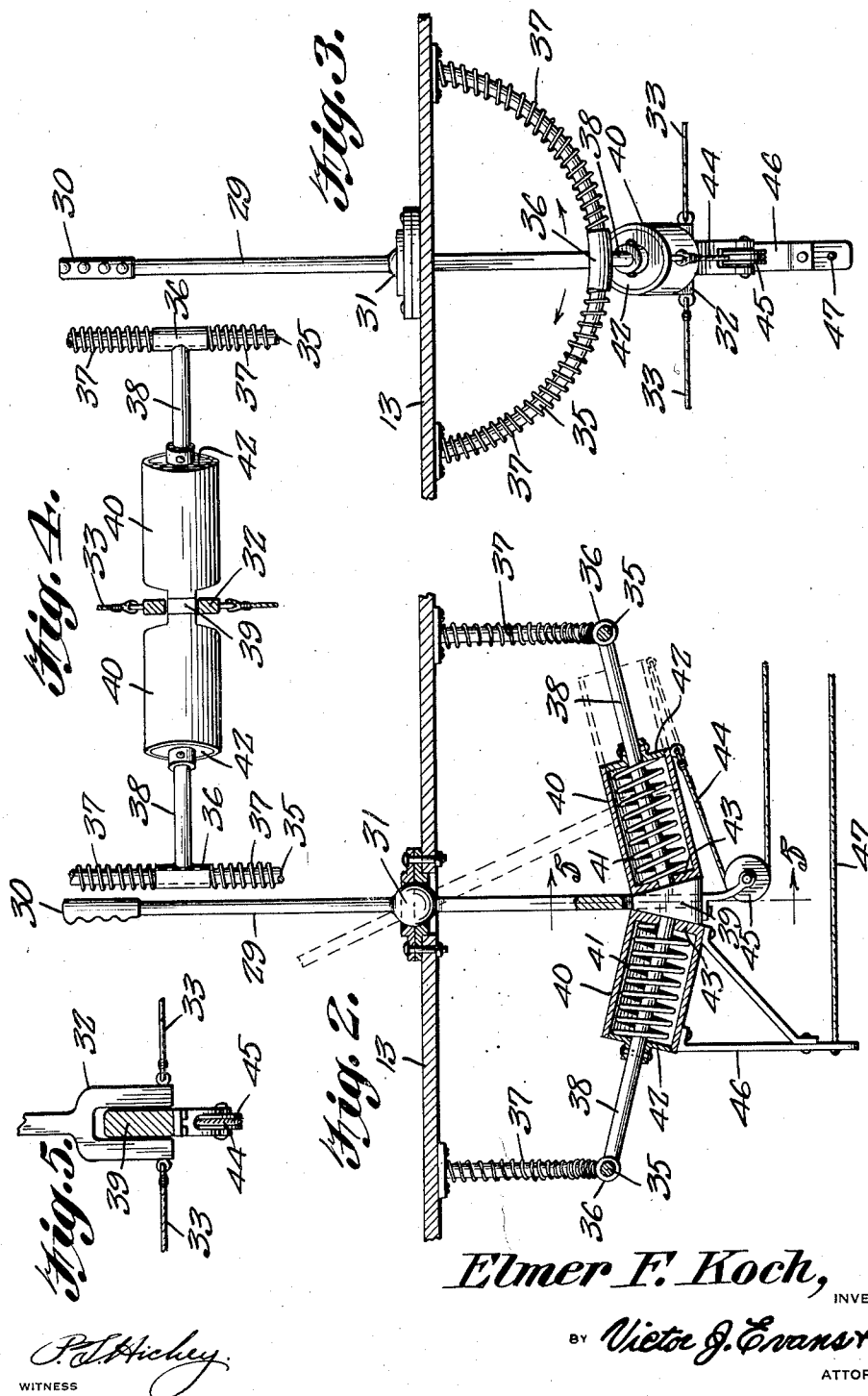
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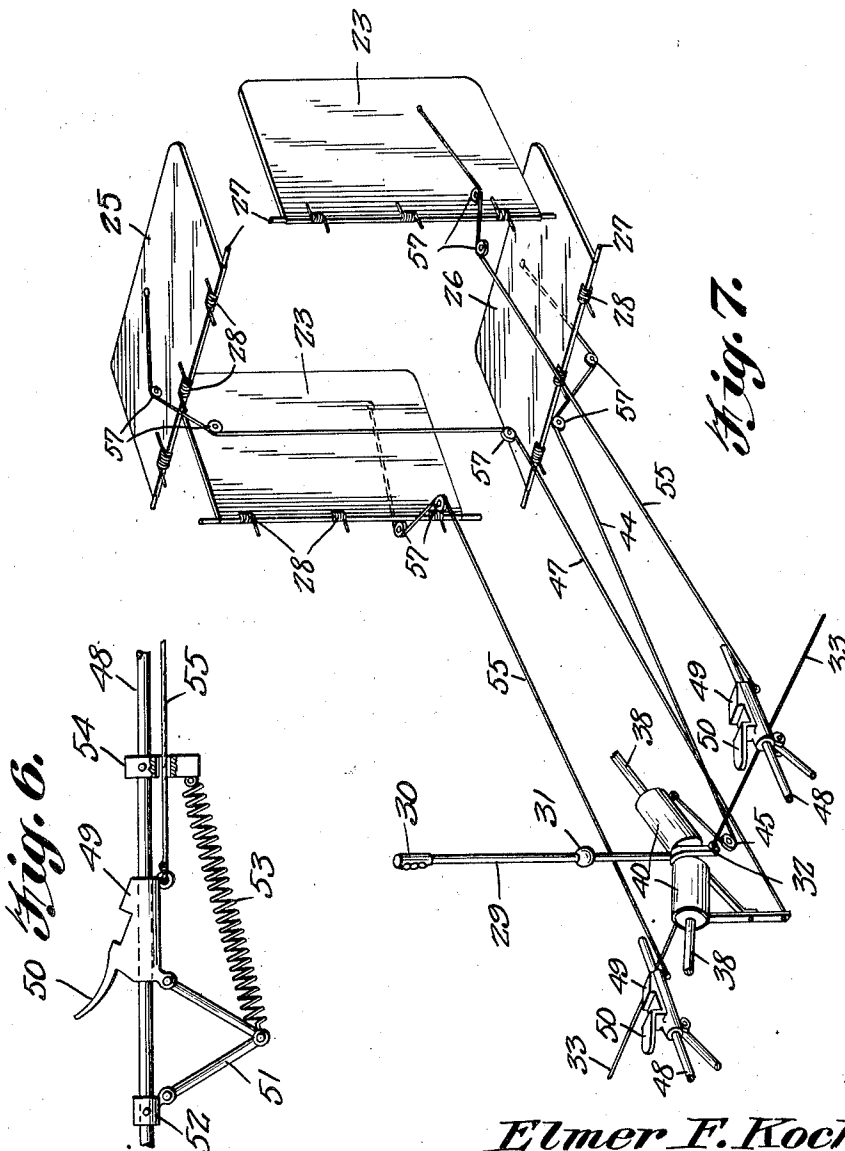
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UNITED STATES PATENT OFFICE

2,227,784

AIRPLANE CONSTRUCTION

Elmer F. Koch, Washington, D. C.

Application May 22, 1940, Serial No. 336,672

3 Claims. (Cl. 244—83)

The invention relates to an airplane construction and more especially to a tailless airplane.

The primary object of the invention is the provision of an airplane of this character, wherein the propeller is arranged at the trailing end of the fuselage and the rudders, elevators and ailerons are controlled in a novel manner, the rudders being controlled by the feet while the elevators and ailerons are controlled by a stick or hand controlled, the controls being automatically returned to neutral or normal position on release thereof and through such controls the operator or pilot has perfect command of the plane enabling ascent, descent and direction of flight thereof.

Another object of the invention is the provision of an airplane of this character, wherein the same being devoid of a tail enables an operator or pilot to have better vision aft of the craft with the result that a more perfect control of the ship will be assured.

A further object of the invention is the provision of an airplane of this character, wherein the controls are of novel construction and in the working thereof assure freedom to the operator in that it is unnecessary that both feet be in action for control purposes and likewise it is not required that both hands be in action for control purposes, the controls being automatically returned to neutral position when freed.

A further object of the invention is the provision of an airplane of this character, which is simple in its construction, thoroughly reliable and effective in operation, possessed of streamlined effect, strong, durable, and inexpensive to manufacture.

With these and other objects in view, the invention consists in the features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings, which disclose the preferred embodiment of the invention and pointed out in the claims hereunto appended.

In the accompanying drawings:

Figure 1 is a side elevation partly broken away of an airplane constructed in accordance with the invention.

Figure 2 is a fragmentary vertical longitudinal sectional view thereof on an enlarged scale.

Figure 3 is a fragmentary vertical transverse sectional view.

Figure 4 is a fragmentary horizontal sectional view.

Figure 5 is a sectional view taken on the line 5—5 of Figure 2 looking in the direction of the arrows.

Figure 6 is a fragmentary vertical longitudinal sectional view showing one of the foot controls.

Figure 7 is a fragmentary perspective view showing the control assembly.

Figure 8 is a fragmentary vertical longitudinal sectional view taken through one of the ailerons.

Similar reference characters indicate corresponding parts throughout the several views in the drawings.

Referring to the drawings in detail, A designates generally the airplane including a fuselage 10 which is of streamlined effect having the tapered nose or fore end 11 and the reversely tapered aft end 12 while interiorly of said fuselage is a flooring 13 to the pilot compartment 14, the latter having arranged therein the pilot seat 15. Vision from the compartment 14 is had through windows 16, these being built into the fuselage 10 as is clearly shown in Figure 1 of the drawings.

Depending from the fuselage 10 fore and aft with respect thereto are the front and rear wheels 17 and 18, respectively. The rear wheels 18 have in association therewith a shock absorber 19 and the said wheels 17 and 18 are used in the landing of the plane and in the takeoff thereof as is customary.

Extending laterally from each side of the fuselage are the upper and lower wings 20 and 21, respectively, having in association therewith the wing brace 22. The upper wing 20 is equipped with an aileron (not shown) while at opposite sides of the fuselage are the laterally swinging rudders 23 hinged for horizontal swinging movement upon hinge pintles 24 suitably fitted with the fuselage. Above and below the fuselage are the upper and lower elevating flaps 25 and 26, respectively, these vertically swingable upon hinge pintles 27 suitably built with the fuselage. The pintles 24 and 27 have fitted therewith coiled springs 28 which act upon the rudders 23 and the flaps 25 and 26 to hold the same neutral or inwardly against the fuselage. Arranged fore of the seat 15 within the compartment 14 is a control stick 29 having an upper hand grip 30, being swiveled at 31 in the form of ball and socket fitting at the flooring 13 while at the lower end of this stick is a fork 32 to which are connected at opposite sides thereof the cables 33 extended to the ailerons (not shown) and are for control thereof through movement of the said stick laterally toward opposite sides of the longitudinal axis of the fuselage.

Depending from the floor 13 forwardly and rearwardly with respect to the stick 29 are downwardly arched rod-like brackets 35 upon which are fitted slidable sleeves 36 having at opposite sides thereof and coiled about the said brackets 35 compression springs 37, these active to hold the sleeves in neutral or central position on the brackets. The sleeves are formed with guide stems 38 reversely angled to each other and are joined with one another at a medial point between the brackets 35 by a coupling neck 39 straddled by the fork 32 of the stick 29. Slidable upon the stems 38 are cylinders 40 reversely movable with respect to each other and have confined therein coiled

compression springs 41, these being seated against abutment heads 42 fixed to the stems 38 and closing the outer open ends of said cylinders 40, the inner ends 43 of these cylinders being closed, and the purpose of the springs 41 is to hold the said cylinders 40 in normal or neutral position. The cylinder 40 rearward with respect to the stick 29 has connected thereto a cable 44 trained over a guide pulley 45 stationarily mounted upon the neck 39 and has connection with the lower flap 26 so that on displacement of the cylinder 40 having connection therewith, the said flap 26 can be swung outwardly to the dotted line position shown in Figure 1 of the drawings. The cylinder 40 forwardly of the stick carries a bracket 46 to which is connected a cable 47 having connection with the elevator flap 25 and on the movement of this cylinder in one direction, the said flap 25 will be swung outwardly to the dotted line position shown in Figure 1 of the drawings. The stick 29 on forward and backward motion will operate alternately the cylinders 40 through contact of the fork 32 with the same at the closed ends 43 thereof. On pulling upon the stick 29, the lower elevator flap 26 will swing outwardly and on reverse or forward motion of the said stick the elevator flap 25 will swing outwardly. Now when the stick 29 is released, the springs 28 act upon these flaps 25 and 26 to swing the same inwardly to neutral position while the springs 41 move the cylinders 50 to neutral position on the stems 38. The sleeves 36 slidably fitting the brackets 35 allow the stick to be swung laterally without affecting the elevator flaps 25 and 26 and when such stick is freed of lateral motion, the springs 37 return the sleeves 36 to neutral position on the brackets.

Spaced outwardly laterally beyond opposite sides of the stick 29 and longitudinally disposed within the fuselage are guide rods 48 on which are fitted sleeve-like runners 49, these having foot pedals 50 and each runner at the forward end thereof has double pivotal linkage 51, elbow acting with a stop collar 52 fixed to said rod 48 and associated with this linkage is a coiled retractile spring 53 which is also connected with a stop 54 stationarily mounted on the rod 48 aft of the pedal 50, the stop 52 being fore thereof. Each runner 49 has connected thereto a cable 55, which is also connected with a rudder 23, there being one for each of the pair of rudders and also one pedal for each one. The spring 53 is active for returning the pedal 50 to neutral position after being released from foot engagement. Arranged at the trailing end 12 of the fuselage 11 is a rotary bladed propeller 56 operated from a motor (not shown) and as usual carried within the fuselage.

The stick 29 in the operation thereof controls the ailerons as well as the elevator flaps 26 and 27 while the pedals 50 control solely the rudders 23 and the release of the said stick and pedals, the ailerons, elevators and rudders automatically return to neutral position.

The cylinders 40 when actuated move in reverse directions to each other against the resistance of the springs 41 confined therein, the heads 42 closing the outer open ends of the said cylinders

40 being fixed to the stems 38 on a push and pull action of the said stick 29. The lateral motion of the stick is not resisted because the cylinders 40 are free to move in a lateral direction by the sliding of the sleeves 36 upon the brackets 35 and this lateral motion of the stick 39 affects only the ailerons. The cables 33 and 47 coast with guide pulleys constituting part of the equipment, the guide pulleys for the cables 47 being indicated at 57.

What is claimed is:

1. In an airplane construction having a joystick, a pair of brackets built within the airplane and arranged one at each side of said stick, sleeves slidably fitting said brackets for movement in reverse directions thereon, means supported by the bracket and active upon the sleeve to hold the same in neutral non-active position with relation to each other, stems formed with said sleeves, a coupling neck between said stems for joining the same and having loose interfitting with the said stick, displaceable cylinders carried by said stem separately engageable by the said stick, means within the cylinders for the tensioning thereof and normally holding the same in close relation to the coupling neck, and movable parts on the fuselage and having flexible connections with the said cylinders.

2. In an airplane construction having a joystick, a pair of bracelets built within the airplane and arranged one at each side of said stick, sleeves slidably fitting said brackets for movement in reverse directions thereon, means supported by the bracket and active upon the sleeve to hold the same in neutral non-active position with relation to each other, stems formed with said sleeves, a coupling neck between said stems for joining the same and having loose interfitting with the said stick, displaceable cylinders carried by said stem separately engageable by the said stick, means within the cylinders for the tensioning thereof and normally holding the same in close relation to the coupling neck, movable parts on the fuselage and having flexible connections with the stick for operation thereby independently of the operation of said stick upon said cylinders.

3. In an airplane construction having a joystick, a pair of brackets built within the airplane and arranged one at each side of said stick, sleeves slidably fitting said brackets for movement in reverse directions thereon, means supported by the bracket and active upon the sleeve to hold the same in neutral non-active position with relation to each other, stems formed with said sleeves, a coupling neck between said stems for joining the same and having loose interfitting with the said stick, displaceable cylinders carried by said stem separately engageable by the said stick, means within the cylinders for the tensioning thereof and normally holding the same in close relation to the coupling neck, movable parts on the fuselage and having flexible connections with the said cylinders, parts having connection with the stick for operation thereby independently of the operation of said stick upon said cylinders, and a fork formed on the stick and straddling the said coupling neck.

ELMER F. KOCH.