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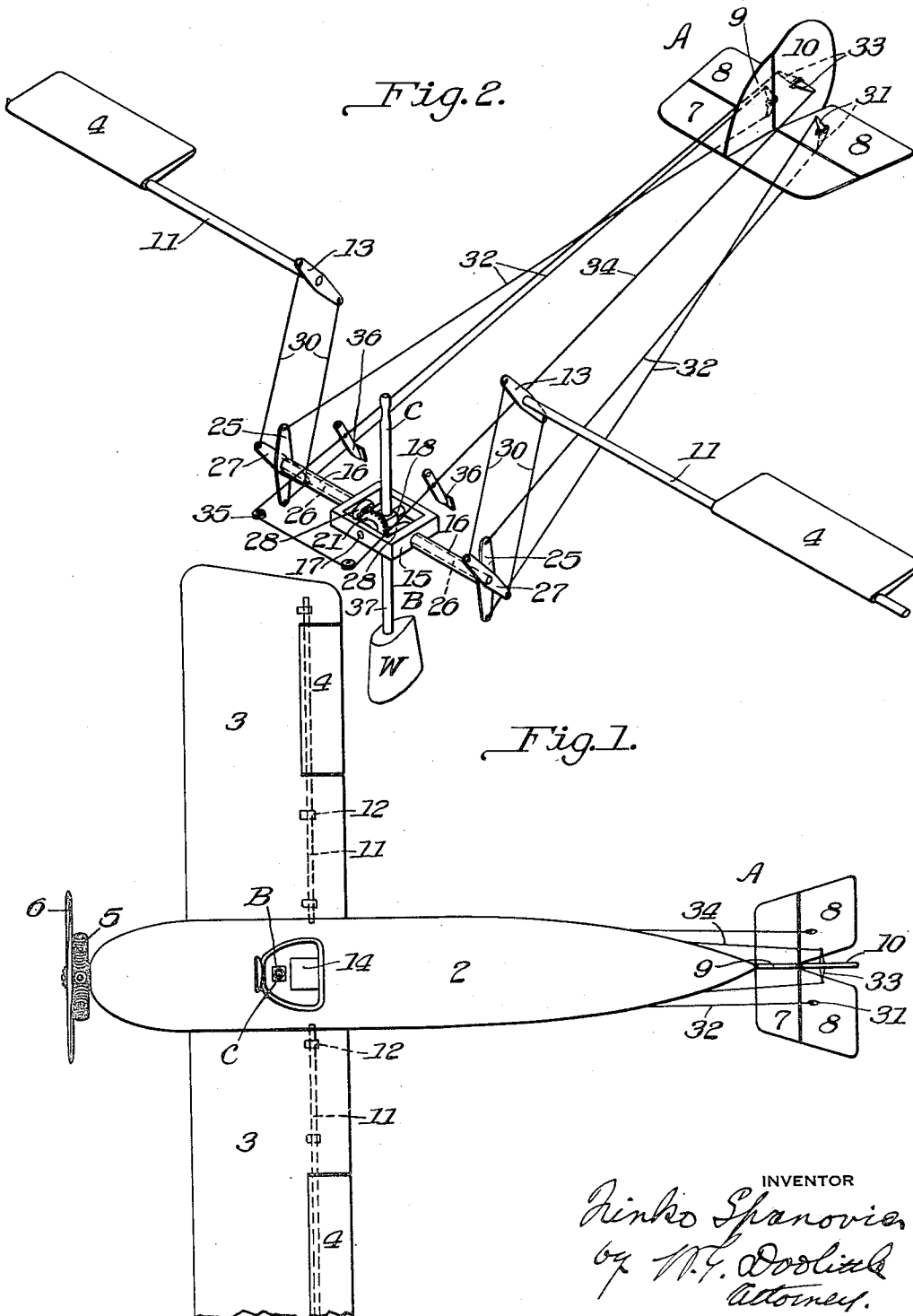
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1,832,254

AIRPLANE

Filed Aug. 28, 1929

2 Sheets-Sheet 1



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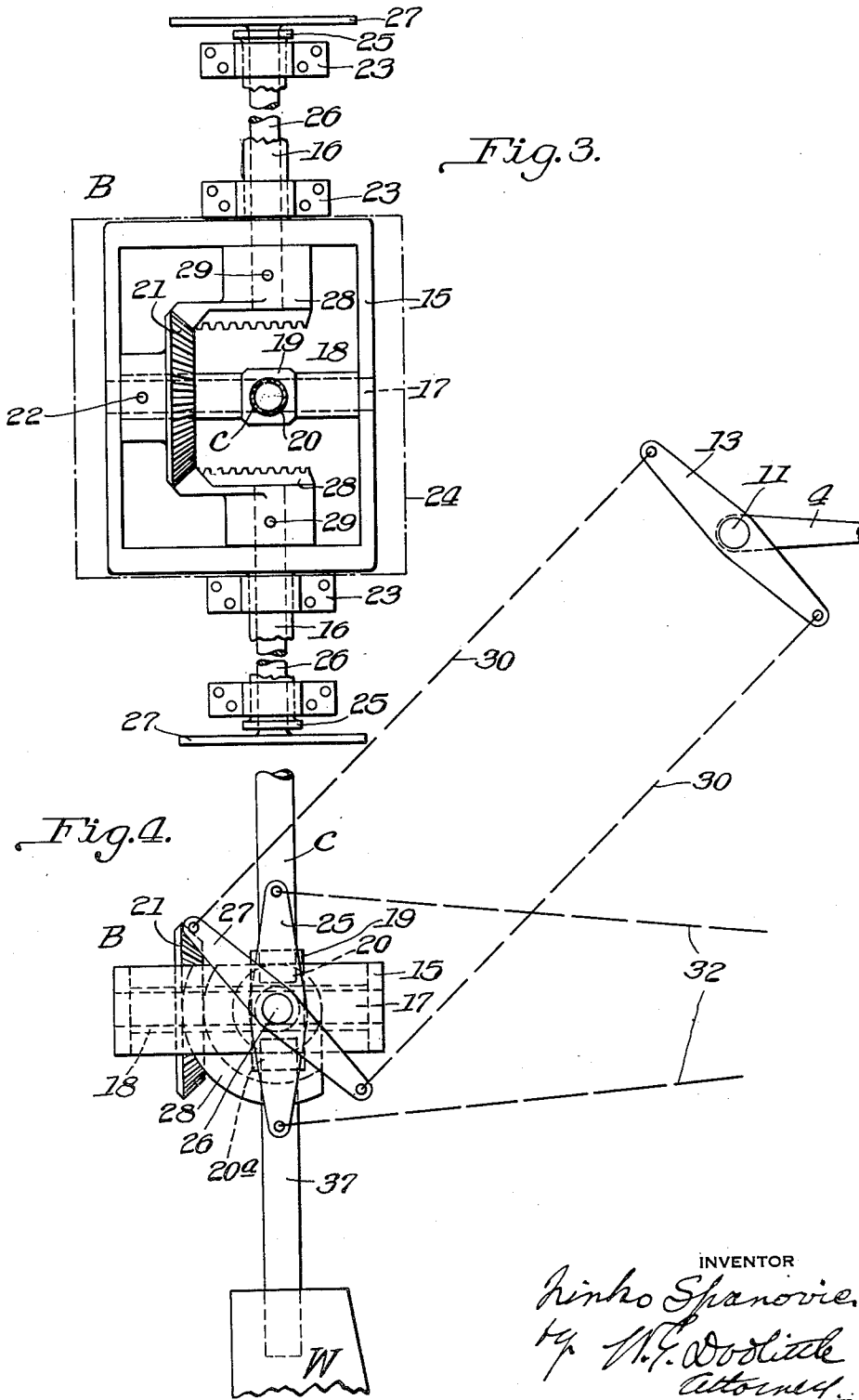


Fig. 3.

Fig. 4.

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AIRPLANE

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This invention relates to improvements in airplanes, and more particularly to control means therefor.

The prime object of my invention is to provide control means for an airplane, associated with the usual control lever or stick, whereby the ailerons and elevators of said airplane may be moved simultaneously in opposite directions to control the forward and aft movement of the airplane by a movement of said stick in the direction of longitudinal axis of the airplane; and by the same control means effect a movement of the ailerons only, in opposite directions, by a lateral movement of the stick, to control the banking or tipping of the airplane.

It is a further object of my invention to provide a gravity stabilizer associated with the control mechanism, whereby the airplane may be maintained in its normal flying position by the action of gravity.

Additional objects and advantages will become apparent from the foregoing specification taken in connection with the accompanying drawings, wherein:

Fig. 1 is a plan view of one type of airplane to which my invention may be applied;

Fig. 2, a diagrammatic perspective view particularly showing my control means connected to the ailerons and elevators of an airplane;

Fig. 3, a top plan view of my control mechanism; and

Fig. 4, a side elevation thereof.

Referring to the drawings, the airplane comprises essentially a fuselage 2, fixed planes or wings 3 extending laterally from said fuselage, movable planes or ailerons 4 positioned at the rear edges of the wings, a motor 5, and a propeller 6 positioned at the forward end or nose of the airplane. The empennage A of the airplane comprises a fixed horizontal stabilizer fin 7, elevators 8 hinged thereto, a vertical stabilizer fin 9, and a rudder 10 hinged to said fin 9, and extending vertically between the elevators.

The ailerons 4 are preferably formed integral with laterally extending shafts 11, which shafts extend through the wings 3 and are mounted in bearings 12 secured within

the wing framing in any suitable manner. Said shafts have their inner ends extending into the fuselage 2 and are provided with arms or members 13 welded or otherwise secured thereto and angularly disposed with respect to the ailerons.

Positioned within the fuselage 2 and in front of the pilot's seat 14, I provide my control mechanism, generally designated B. Said mechanism includes a skeleton frame member 15, preferably rectangular in configuration and provided with laterally extending hollow trunnions 16 integral therewith or fixedly secured and movable there-

with. Frame member 15 carries a revoluble cross shaft 17 which extends parallel to the longitudinal axis of the airplane and at right angles to the trunnions 16. Mounted on said shaft is a sleeve 18 having a centrally disposed boss 19 thereon extending at right angles to the axis thereof and having openings 20 and 20a therein. A bevel pinion 21 is also mounted on the sleeve 18 and is adapted to be rotated with the sleeve and its cross shaft 17, the pinion being secured thereto by a pin 22, or, if desired, the pinion may be formed as an integral part of the sleeve.

The trunnions 16 are rotatably mounted in suitable bearings 23, secured to the fuselage 2 at either side of an opening 24 in the fuselage, indicated by the broken line in Fig. 3, and are provided with vertically extending arms 25 at their outer ends.

Rotatable within said trunnions and extending therethrough, I provide shafts 26 having arms 27 at their outer ends and opposed mutilated bevel gears 28 secured to their inner ends, as at 29, and adapted to engage the bevel pinion 21. The arms 27 extend parallel to the respective members 13 of the aileron shafts 11, and are preferably of the same length, said arms being maintained in parallelism by means of connecting rods or cables 30, secured to their outer ends.

The elevators 8 are provided with projecting horns 31 extending above and below the elevators and are designed for connection with the arms 25 by means of crossed cables

or wires 32. The rudder 10 is also provided with projecting horns 33 for securing the operating or steering cable 34 thereto; said cable passes over pulleys 35 attached to the fuselage and is connected with foot pedals 36 pivoted to the fuselage.

C designates a control lever or stick fixedly secured in the opening 20 of boss 19 of sleeve 18, said stick being of sufficient length and positioned to be readily grasped and manipulated by the pilot of the airplane.

Control mechanism B is assembled within the fuselage and connected with the cooperating parts described in such a manner that when the airplane is in its normal flying position, viz: with ailerons and elevators in the neutral position, the frame member 15 will be horizontal and the control stick C will be vertical.

The operation of my control means is very simple and efficient. For example, when it is desired to bank the airplane to the left, the control stick C is moved or tilted laterally to the left of the airplane. This movement causes a rotation of the sleeve 18, cross-shaft 17, bevel pinion 21, opposed mutilated bevel gears 28 and their shafts 26, thereby effecting a rotation of the aileron shafts 11 in opposite directions through the arms 27 and 13, and their connecting rods or cables 30. The aileron 4 on the left wing will be raised, causing that wing to be lowered and the aileron on the right wing will be lowered, causing the right wing to be raised, thereby effecting a bank to the left. Moving the control stick laterally to the right will effect a right bank in a similar manner.

Heretofore, the control of the forward and aft movement of an airplane has usually been effected entirely by means of the elevators. In the present invention, however, it is a prime object to facilitate such movement of the airplane by simultaneously moving the ailerons with the elevators, but in opposite directions. Thus, when the pilot desires to climb, as when taking off from the ground, he pulls backwardly on the control stick in the longitudinal direction of the airplane. This movement rotates the frame member 15 and its trunnions 16, thereby rotating the arms 25, and by means of the crossed cables 32 and horns 31, the elevators 8 are raised, tending to lower the empennage of the airplane. Since the mutilated bevel gears 28 are meshed with the bevel pinion 21, rotation of the frame member 15 will produce a similar rotation of the shafts 26, arms 27 and 13, and cables 30, and cause the ailerons 4 to be lowered simultaneously as the elevators are raised, thereby producing an increased upward lift to the front portion of the airplane.

Similarly, a forward motion of the stick C will raise the ailerons and lower the elevators simultaneously, thereby causing the

airplane to nose downwardly. It will be understood that by my construction, the control stick C may be moved angularly with respect to the movements described for producing various combinations thereof. The movement of the control stick C should always be in the direction of the motion of the airplane. In order to bring the airplane back to its normal flying level, it is necessary to return the stick to its vertical position.

An important feature of my construction resides in the provision of means for returning the controls to their neutral position in the event that a pilot should lose control. Accordingly, I provide a depending arm or rod 37, fixedly secured in the opening 20a of boss 19 of the sleeve 18, said arm extending downwardly below the fuselage and having at its lower end a gravity means or stabilizer in the form of a suitable weight W. This weight is preferably stream-line in shape and may be positioned behind a deflecting cowl or similar device to reduce the air pressure thereon when the airplane is flying through the air.

The operation of my gravity stabilizer is as follows. In the event that the pilot has taken his hands from the control stick, and the airplane encounters a puff of wind which banks or tips the airplane to the right, the control stick will remain in a vertical position. This action by the control stick will be, in effect, a movement to the left with respect to the then inclined airplane, thereby returning the plane to its normal flying level. In other words, the effect of the gravity stabilizer is to immediately counteract any unbalanced condition of the controls of the airplane. It will, of course, be seen that this is true of forward and aft movements of the airplane also.

Various changes and modifications are contemplated, providing they fall within the scope of the following claims.

I claim:

1. In an airplane, the combination with movable ailerons and elevators, of a frame member, hollow trunnions on the frame member, a cross shaft mounted on the frame member at right angles to said trunnions, a bevel pinion on said shaft, rotatable shafts in the trunnions, mutilated bevel gears secured to the said shafts and meshing with the bevel pinion, arms on the trunnions, arms on said shafts, connections between the trunnion arms and the elevators, and connections between the shaft arms and the ailerons.

2. In an airplane, the combination with movable ailerons and elevators, of a frame member, hollow trunnions on the frame member, a cross shaft and a sleeve mounted on the frame member at right angles to said trunnions, a bevel pinion on said sleeve, rotatable shafts in the trunnions, mutilated bevel gears secured to the inner ends of the

shafts and meshing with the bevel pinion,
arms on the outer ends of said trunnions,
arms on the outer ends of the rotatable shafts,
connections between one set of arms and the
5 ailerons, connections between one set of arms
and the elevators, and a control stick carried
by the sleeve on the cross-shaft.

In testimony whereof I affix my signature.

NINKO SPANOVIC.

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