July 2, 1935. H. H. SEMMES 2,006,515

AERIAL VEHICLE CONTROL

Filed July 8, 1930 2 Sheets-Sheet 1

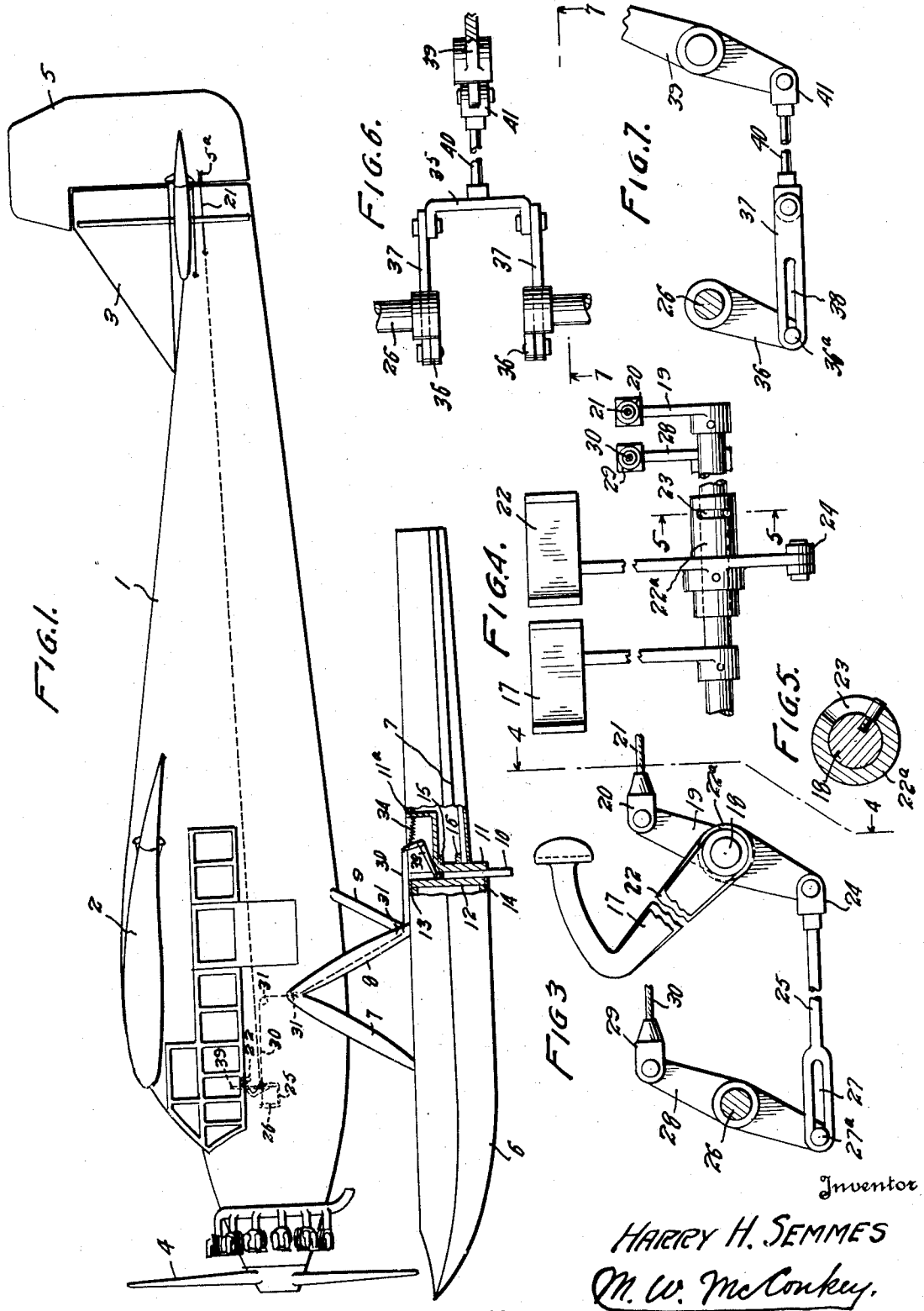

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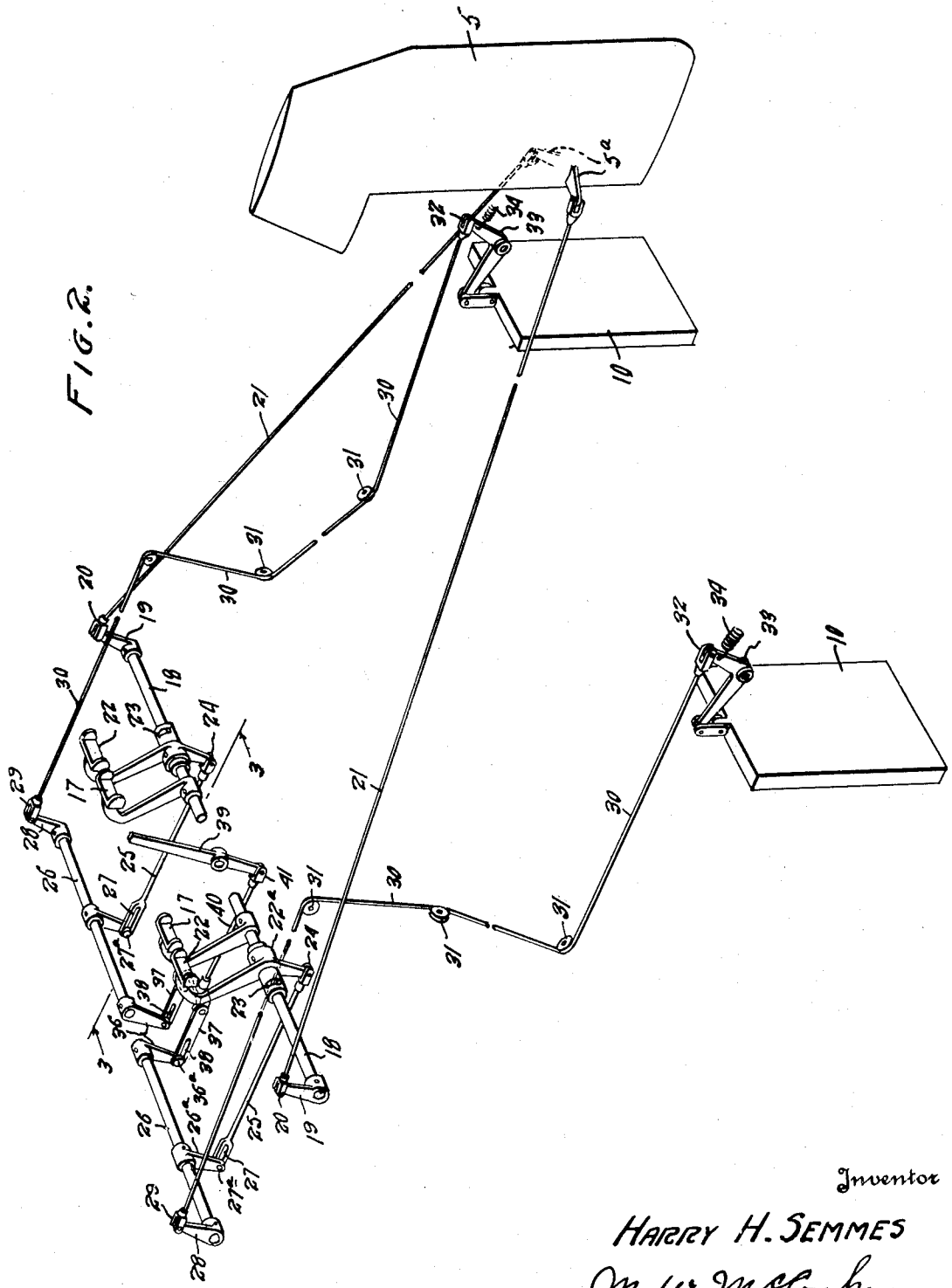
FIG. 2.



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AERIAL VEHICLE CONTROL

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7 Claims. (244—2)

This invention relates to aerial vehicles and more particularly to steering and arresting means therefor. The invention is shown as applied to a seaplane and is particularly advantageous when applied thereto although it is not limited thereto. The seaplanes and flying boats now in common use have the inherent disadvantage that they are difficult to maneuver while on the surface of the water. Heretofore, no mechanism has been provided which will allow ready steering and at the same time retardation of the plane.

An object of the present invention is to generally improve the steering of aerial vehicles.

Another object is to provide brakes cooperating with the rudder for steering and retardation.

A further object is to provide novel means for actuating the steering means in unison.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combination to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement without departing from the spirit and scope of the appended claims.

In accordance with the present invention there is provided means adapted to coact directly in unison with the rudder of an airship having a water sustaining member for greatly facilitating the steering of a seaplane on the surface of the water together with retarding the speed of the plane with respect to the water. It is to be understood, of course, that this invention is applicable to both the seaplane and flying boat types of airships.

In order to make my invention more clearly understood, I have shown in the accompanying drawings, means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

Figure 1 is a side elevation of a seaplane in which the improvement is embodied,

Figure 2 is a perspective view of the cooperating mechanism,

Figure 3 is an enlarged view taken along line 3—3 of Figure 2,

Figure 4 is a view taken along line 4—4 of Figure 3,

Figure 5 is a cross section view along line 5—5 of Figure 4,

Figure 6 is a view showing the yoke connection for the water brakes, and

Figure 7 is a view taken along line 7—7 of Figure 6.

Referring to Figure 1 there is shown a conventional seaplane having the usual elements of structure including the fuselage 1, sustenation surfaces 2, empennage 3, propelling mechanism 4, and an air rudder 5. Associated with the plane are the twin floats or pontoons 6, of any suitable structure, preferably of a light weight alloy of low corrodability and high tensile strength, such for example, as alloy dural. The pontoons 6, are preferably of the hollow V-bow type to present good freeboard and a good cruising bow. As shown the pontoons are equipped with one step 6a, but, of course, it is to be understood that any number of steps may be employed.

The pontoons may be attached to the fuselage of the seaplane directly or, when the invention is applied to a biplane, through the intermediacy of sustaining or lifting surfaces. As shown the attaching mechanism may comprise the conventional pontoon struts 7, 8 and 9, although it is to be understood that any type of attachment may be employed to suitably insure against hogging and sagging effects. Interfloat struts may also be used to minimize racking effects. As will hereinafter appear, in steering a seaplane by the present invention on the water torsional stresses are set up when the water brake is applied on one side only of the longitudinal axis of the plane and it is therefore preferable to provide additional bracing between the fuselage and the pontoons.

When practicing the invention each pontoon, when twin pontoons are employed, is provided with a water brake 10. The water brake is slidably mounted in a suitable housing formed by the longitudinal members 11 and 12 suitably attached to lateral framing members or ribs 13, 14, 15, and 16, within the pontoon 6. The members 11 and 12, as shown in Figure 1, are so constructed within the float so as to take up or distribute the thrusts incident to the retarding operation. The member 11 does not, however, extend the entire longitudinal distance of the float but is so constructed, as shown in Figure 1, as to receive the bell crank lever attached to the water brake, the purpose of which will more fully hereinafter appear.

The water brake 10 is capable of vertical movement in the housing or well formed by the longitudinal members 11 and 12. The element is so adapted as to be in an inoperative position and out of contact with the water, or to be lowered into the water to present a relatively large con-

tact area and to thereby increase the resistance to movement of the pontoon through the water.

Associated with the water brake 10 is a suitable mechanism for operating the air rudder 5 in unison, if desired with the water brakes 10, or operating the water brakes independently of the air rudder. As shown, a pedal 17 is suitably attached to a rudder rock shaft 18. Positioned on the rudder rock shaft 18 is a crank 19 supporting a clevis 20. Suitable linkage or a cable 21 connects the rudder 5, as at 5a, with the foot pedal 17 for operating the rudder while the plane is in flight.

Loosely mounted on the rudder rock shaft 18 and adjacent the rudder control is another pedal 22 for actuating both the water brakes and the rudder in unison. The loosely mounted sleeve 22a of this pedal is provided with an aperture 23 adapted to engage a suitable pin on the rock shaft 18. This arrangement permits of free control of the rudder mechanism while the plane is in flight, and also by suitably constructing the aperture 23, allows the cooperative operation of both the air rudder and the water brake for steering and retarding the plane while on the water.

Connected to the lower part of the pedal 22 is a clevis 24 suitably attached to a water brake shaft 26 by suitable linkage such as a cable 25. The cable 25 is provided with a slip connection 27 adapted to engage a suitable bolt or pin 27a on the crank 26a which is attached to the water brake shaft 26. The slip connection provided in the cable 25 will permit counter-clockwise rotation of the shaft 26 without affecting the mechanism controlling the air rudder, the purpose of which will hereinafter appear.

The crank 28 is suitably positioned on the water brake shaft 26 and supports a clevis 29. Suitable linkage, such as a cable 30 and pulleys 31, connects the water brake shaft 26 with the water brake 10 by means of another clevis 32 positioned on a bell crank lever 33, suitably attached to the water brake 10. A spring 34 for exerting the necessary tension to return the water brake after it is applied, is attached to the bell crank 33 and rigidly fastened, as at 11a, in the housing formed by the member 11. The connections described between the foot pedals, water brakes and air rudder are, of course, only typical of any suitable type of mechanism whereby the air rudder may be actuated alone in the air or cooperatively with the water brakes while the ship is on the surface of the water.

As shown in Figure 2, a suitable mechanism is provided for applying the two brakes simultaneously without cooperating with the air rudder 5. A rigid yoke 35 is attached to the water brake shaft 26 through suitable cranks 36. The two legs 37 of the yoke 35 are provided each with a suitable slip connection 38 to allow bolts, or any projection 36a on the cranks 36, to be freely moved when the foot pedal 22 rotates the water brake shaft 26 in a counter clockwise direction. The yoke is connected to a lever 39 by a suitable linkage, such as a cable 40, and a clevis 41, which arrangement permits the water brakes to be actuated independently of the air rudder 5.

Figure 1, shows the water brake 10 positioned substantially to the rear of the center of gravity of the plane which is, of course, preferable to obviate the dangers of nosing over when the brakes are applied. Positioning the water brakes so, adds the further advantage of causing the ship to settle at the stern when the brakes are applied.

The device described is adapted to subserve a number of useful functions especially when applied to seaplanes. As is known, twin float types of planes are more difficult to maneuver than the single hull type and also single screw flying boats or seaplanes generally turn easier in one direction than in the other due to the slip stream effects. The present invention provides a supplementary method of steering the plane on the water which is used in a cooperative relationship with the rudder. It will be appreciated that if one only of the water brakes 10 is operated to engage the water and the rudder is rotated in unison therewith, the plane will turn on that pontoon as an axis.

Such usage of one of the brakes and the rudder can also be utilized to compensate for the sluggish turning in one direction of a single screw ship. Using one of the brakes and the rudder in this manner for steering sets up torsional stresses due to the different relative speeds of the pontoons and, to compensate for this, it is preferable to provide suitable additional bracing between the pontoons and the fuselage.

The present invention also provides for the use of the brakes simultaneously to effectively retard the speed of the plane through the water by merely actuating the lever 39. Actuation of the lever 39 in this instance does not affect the steering mechanism comprising the cooperating water brakes and the rudder in view of the slip connection 27, which allows the bolts or suitable projections 27a on the cranks 26a to slide into the grooving 27 provided in the slip connection.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In an aerial vehicle, a rudder, laterally spaced brakes operable independently of each other, control means operable about an axis remote from the rudder axis and for controlling the rudder, other means operable about a different axis for controlling the brakes, and means for operating said rudder control means independently of the brake control means, separate means for operating the said brake control means independently of said rudder control means, and separate means for operating both of said control means conjointly, said control means, operable means, operating means and both separate means being adjacent one another and remote from said rudder and brakes.

2. In an aerial vehicle, a fuselage, a rudder, a pair of supporting members, a pair of brakes one associated with each supporting member, a pair of pedals, connections from both of said pedals to the rudder, a second pair of pedals pivoted independently of said first named pedals, connections from each of said last named pedals to one of the brakes, and means operated by actuation of each of said last named pedals about its pivot for operating said rudder connections.

3. The combination set forth in claim 2 in which the first named pedals are ineffective to operate the brakes.

4. The combination set forth in claim 2 in which the aerial vehicle is provided with means

for operating both of said brakes conjointly comprising a hand lever connected thereto.

5. In an aerial vehicle, a rudder, laterally spaced brakes operable independently of each other, control means operable about an axis remote from the rudder axis for controlling the rudder, other control means operable about a different axis for controlling the brakes, means for operating said rudder control means, separate means for operating said brake control means independently, and separate means for operating said rudder control means and said brake control means conjointly, both of said control means, operating means and both of said separate means being adjacent one another and remote from said rudder and brakes.

6. In an aerial vehicle, a rudder, laterally spaced brakes operable independently of each other, control means operable about an axis remote from the rudder axis for controlling the rudder, other control means operable about a different axis for controlling the brakes, foot pedal means for operating said rudder control means, separate means for operating said brake control means independently, and separate foot pedal means for operating said rudder control means and said brake control means conjointly both of said control means, said operable means, both foot pedal means and separate means being adjacent one another and remote from said rudder and brakes.

7. In an aerial vehicle, a rudder, laterally spaced brakes operable independently of each other, cross shafts for controlling the rudder, additional cross shafts for controlling the brakes, foot pedal means for operating said rudder cross shafts, a lever for operating said brake cross shafts independently of said rudder cross shafts, and foot pedals for operating said rudder cross shafts and said brake cross shafts conjointly.

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