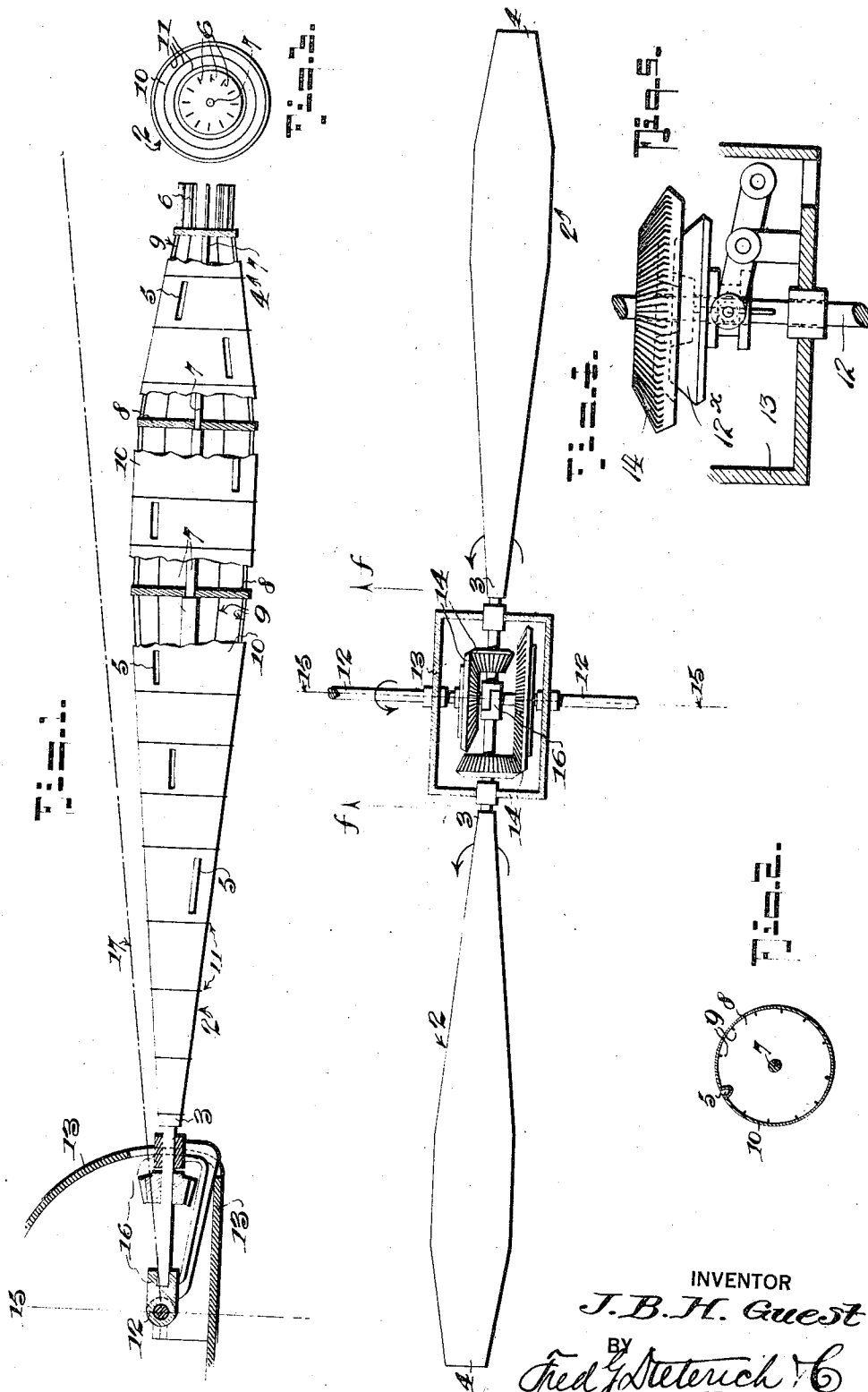


J. B. H. GUEST.
 MEANS FOR STABILIZING AND CONTROLLING THE FLIGHT OF AERIAL MACHINES.
 APPLICATION FILED JULY 18, 1918.

1,311,389.

Patented July 29, 1919.



INVENTOR
 J. B. H. Guest
 BY
 Fred J. Stetrich
 ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN B. H. GUEST, OF OAKLAND, CALIFORNIA, ASSIGNOR OF ONE-HALF TO ROBERT S. STARK AND ONE-FOURTH TO GRACE M. GUEST, BOTH OF SAN FRANCISCO, CALIFORNIA.

MEANS FOR STABILIZING AND CONTROLLING THE FLIGHT OF AERIAL MACHINES.

1,311,389.

Specification of Letters Patent.

Patented July 29, 1919.

Application filed July 18, 1918. Serial No. 245,520.

To all whom it may concern:

Be it known that I, JOHN B. H. GUEST, a subject of the King of Great Britain, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Means for Stabilizing and Controlling the Flight of Aerial Machines, of which the following is a specification.

This invention relates to a means for stabilizing and controlling the flight of a flying machine of any kind. Although primarily intended for this purpose the device has also sustaining qualities which are independent of forward movement of the machine and may therefore be applied to sustain a machine stationary in the air.

The device is based on the physical principle that a tapered spindle, circular in cross section, if rapidly rotated in air, will not only, by its gyroscopic action, resist deviation of it from the direction of its movement, but has a lifting or sustaining property. Owing to its tapered form such a spindle will tend to swing in a wide circle about a center toward which the thinner end of the spindle is directed, so that if two of such spindles project from opposite sides of the middle line of the flying machine, the machine will be steadied in its flight, its sustaining qualities will be increased and the direction of its flight may be controlled if the speed of rotation of one spindle be varied in relation to the other, as the machine will turn toward the side on which is the spindle having the less speed of rotation.

I am unable to explain why a spindle so shaped and so rotated has these properties but have demonstrated by practical experiment that such is the case.

The application of this principle to attain the desired objects is explained as fully as I am at present able to do in the following specification, reference being made to the drawings by which it is accompanied, in which:

Figure 1 is an elevation with parts of the covering removed showing the structure of a spindle.

Fig. 2 is a cross section of the same.

Fig. 3, an end view of the spindle, and

Fig. 4 is a plan showing a means for independently rotating the spindle stabilizer and control on each side of a flying machine.

Fig. 5 is an enlarged detail view showing

a shiftable friction clutch 12* for independently controlling the rotation of the master gears 14.

In these drawings 2 represents the preferred form of spindle which is circular in cross section and tapered gradually larger from the end 3 which is connected to the machine and its rotating mechanism, toward the outer or free end 4 where it is again slightly reduced in diameter. The exact profile does not appear to be material so long as it has the outwardly enlarging taper. This spindle 2 may be of any suitable material and be solid or hollow so long as it complies with the requirements of strength and avoids excessive weight. The surface should be free from flutes or flats and be relatively rough, or at least not polished. Its sustaining properties are increased if a series of lengthwise elongated pockets 5 are projected radially into the body of the spindle, the bottom of which pockets may be rounded or angular, as shown in Fig. 2. These pockets 5 are staggered in relation to one another.

The buoyant action of the rotating spindle is also increased slightly by the addition of a flexible tip 6 at the extreme outer end. This tip may be made by a ring of thin, flat, flexible metal members, inserted radially as shown in Fig. 3, in the larger end of the spindle and parallel to its axis.

In the preferred construction the spindle 2 is built upon the steel shaft 7 by which it is connected to the machine and rotated. This shaft 7 may for lightness be tubular and may be successively reduced in diameter from the end 3 which is connected to the machine and to the rotating agency, toward the outer or larger end 4 of the spindle.

At intervals on this shaft are secured disks 8 of wood or other suitable material and from a collar at the smaller end 3, a series of wires 9 are carried lengthwise over the edges of the disks 8 which are notched to receive them and are made fast to the larger end 4. Over the framework thus formed a covering 10 of wood veneer or other suitable material having a relatively rough surface is applied, care being taken to maintain the circular cross section. Over this covering 10 wires 11 may be wrapped to resist the action of centrifugal force on it during rotation.

If a spindle so constructed is rotated

rapidly, it will not only have a property of inertia resisting any external disturbing influence but if carried forward it will tend to move the body it is connected to in a wide circle about the smaller end of the spindle.

In applying it as a stabilizer to a flying machine two or more of them are projected to opposite sides from the middle line 15 of the machine with the larger end outward, as shown in Fig. 4, and means is provided for independently rotating them at a high velocity with their undersides moving in the direction of flight. Their shafts are preferably connected to the machine that their outer ends may move upward a limited amount from the horizontal before they can exert a lifting tendency on the body of the machine to which they are applied. This enables them to attain their speed of rotation before their lifting tendency is exerted, so that while at rest their axes are horizontal, but they will in use assume an angle somewhat as indicated by the dot and dash lines in Fig. 1.

Fig. 4 of the drawing shows the shaft 7 of the spindles 2 as mounted in connected bearings 16 which are concentrically movable about the shaft 12, which may be the propeller shaft of the machine or a countershaft driven therefrom. These bearings 16 are concentrically movable within a frame 13 to allow each side a limited angular movement upward, as indicated by the dot and dash lines 17 in Fig. 1, and they are independently driven from the shaft 12 by bevel gears 14 having the same speed ratio, but the bevel wheels being turned on the shaft 12 to engage opposite sides of the bevel pinions secured on the shaft 7 of the spindles 2 will independently rotate those spindles in the same direction with their undersides moving in the direction *f* of flight.

The bevel wheels are free on the shaft 12 and are secured to rotate therewith by a friction clutch adjacent each, so that either one or both spindles may be rotated as desired.

I do not desire to be confined to the exact construction of the spindle as here described and illustrated, nor to any particular means for rotating the same, as such may be varied within wide limits to meet the requirements of the aerial machine to which it is applied.

Although designed as a means for stabilizing and controlling the direction of flight of an aerial machine, the device, having sustaining qualities as described, may be susceptible of application to a flying machine to supple-

ment the vanes in sustaining the machine and I desire protection in such application.

Having now particularly described my invention, I hereby declare that what I claim as new and desire to be protected in by Letters Patent, is:

1. A means for stabilizing and controlling the flight of an aerial machine, said means comprising elongated spindles oppositely projecting from each side of the middle line of the machine in a substantially horizontal plane, and means for rapidly independently rotating the spindles to move their undersides in the direction of flight.

2. A means for stabilizing and controlling the flight of an aerial machine, said means comprising elongated spindles oppositely projecting from each side of the middle line of the machine in a substantially horizontal plane, said spindles having lengthwise elongated pockets projected within them, and means for rapidly rotating the spindles to move their undersides in the direction of flight.

3. A means for stabilizing and controlling the flight of an aerial machine, said means comprising elongated spindles oppositely projecting from each side of the middle line of the machine in a substantially horizontal plane, said spindles having flexible tips composed of independently flexible and resilient strips of thin, flat metal secured around the free end of each spindle parallel to its axis, and means for rapidly rotating the spindles to move their undersides in the direction of flight.

4. A means for stabilizing and controlling the flight of an aerial machine, said means comprising elongated conical spindles oppositely projecting from each side of the middle line of the machine in a substantially horizontal plane, and means for independently rotating the spindles to move the undersides of them in the direction of flight.

5. A means for stabilizing and controlling the flight of an aerial machine, said means comprising elongated conical spindles oppositely projecting from each side of the middle line of the machine in a substantially horizontal plane, the smaller end of each spindle being connected to the machine, and means for independently rotating the spindles in the same direction with their undersides moving in the direction of flight.

In testimony whereof I affix my signature.

JOHN B. H. GUEST.