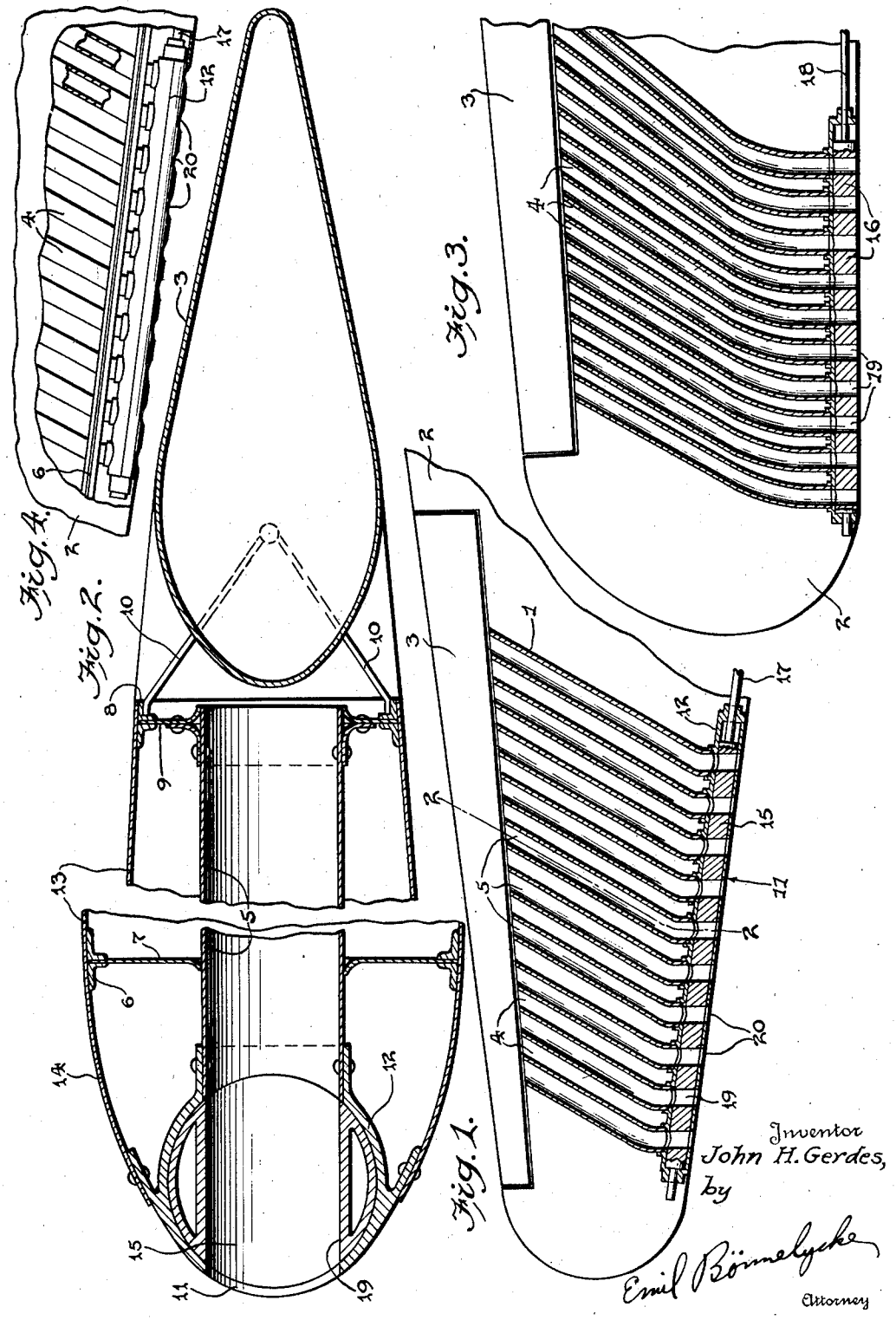
June 12, 1934. J. H. GERDES 1,962,390

LATERAL CONTROL FOR AIRCRAFT

Filed Oct. 8, 1932



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Patented June 12, 1934

1,962,390

UNITED STATES PATENT OFFICE

1,962,390

LATERAL CONTROL FOR AIRCRAFT

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Application October 8, 1932, Serial No. 636,919

12 Claims. (Cl. 244—29)

The present inventon relates to improvements in aeroplanes or in any type of aeronautical ship, such as gliders and the various types of heavier than air craft which depend principally on their wing structure for lifting purposes. However, it should be fully understood that the present invention may also be applied to the fin or wing like structure as used with lighter than air ships, such as dirigibles, and the like.

The particular improvement has to do with applying means in combination with the wing structure of aeroplanes and the like for controlling the planes in lateral directions, and may be more specifically described as internal lateral control means. It is an object of the invention to provide a novel lateral control means on the aeroplane wings and preferably within the wing structure of the plane replacing the wing tip rudder.

Heretofore, it has been found that aeroplanes with short tail structures could better be controlled laterally by placing lateral control rudders at each wing tip, due to the longer leverage obtained in this type of design, and thereby bring about a quicker response of the air craft to its lateral control levers.

On tailless ships it is found to be compulsory to control the ship laterally by means of rudders at the wing tip. However, in actual practice the wing-tip-rudder is an awkward, cumbersome and impractical construction and design, difficult to install, causing too much drag, consuming too much power, and, if installed below the wing, it is too near the ground, and then again if applied or installed above the wing structure, it is too high for practical purposes and function.

It is the purpose of the present invention to apply means to the wing structure of an aeroplane that will enable the same to be controlled in a lateral direction without having any of the foregoing structural weaknesses, but having a number of improvements over and above the same.

An important object of the invention is to provide internal lateral control means within the aeroplane structure that will function in such a manner and will be of such design and construction as not to impede or reduce the plane speed when the lateral control means is not functioning, or in operation.

Still another object of the present invention is to provide internal lateral control means within the wing structure of an aeroplane which will not offer any air resistance when in closed position, thus allowing for the saving in power at a given ratio of speed, over the conventional types of lateral controls.

Another important object of the present invention is to provide means whereby the same may be used as a braking means, to various degrees, in braking and thus reducing to a substantial amount the landing speed of the ship or aeroplane, to which the same may be applied.

Still another object of the invention is to provide the wing structure of an aeronautical craft with internal means that will function either as a lateral control, or speed reducing and braking means for the said craft, the same being without air resistance to impede the speed of the craft when the said control and braking means is in closed or neutral position.

A further object of the invention is to provide the lateral control means in an aeroplane wing tip as a plurality of passages or bent tubes in parallel or non-parallel relation to one another.

Another purpose of the invention is to provide means whereby the conventional wing aileron will function in combination with the lateral control and braking means, enabling the aileron to maintain a controllable position for the plane when the same is landing at a comparatively slow speed, and particularly should the plane be hit by a sudden air bump on one side.

In present day types of aeroplanes during a tailspin the rudder is sheltered or blanketed against the air flow rendering such rudder practically useless, which is likewise true of the ailerons. In the present invention, under similar circumstances, the lateral control is effective at the point of highest air pressure which is at the leading edges of the wings, resulting in immediate functioning of the lateral control means, and likewise permitting the ailerons to function, whereby it is possible to bring an aeroplane, having the lateral control means according to this invention, always and immediately under responsive control even when the plane is making a nose dive or is in a tailspin.

In the accompanying drawing, I have illustrated an aeroplane internal lateral control and braking means for the same, embodying the various features of my invention, and in which:

Figure 1 is a diagrammatic top view, partly in section, of the end portion of an aeroplane wing,

the upper wing cover being removed and showing the lateral control means therein,

Figure 2 is a sectional view through the wing and control taken on line 2—2 of Figure 1,

Figure 3 is a diagrammatic top view, partly in section, of a modified form, and

Figure 4 is a top view showing constructional details of the control means.

The lateral control means 1 is mounted in each end of the wing tip, the right hand portion 2 being shown on the drawing, of the aeroplane and preferably in front of the aileron 3. The lateral control and braking means 1 is constructed or fitted into the wing and consists of a plurality of passages 4 of any shape and cross section but preferably in the form of bent or leading tubes 5 which are mounted or secured to the front wing spars 6 by means of flange members 7 and to the rear wing spars 8 by short connecting members 9. The aileron 3 is movably mounted by any suitable means such as a bracket 10.

In the leading edge 11 of the wing a casing 12 is secured to which the cover 13 of the wing may be fastened. That part of the cover 14 between the front spar 6 and the casing 12 is preferably made of metal. All of the tubes 4 open into the casing 12 and the latter is provided with a control shutter or valve 15 of which the one shown in Figure 1 is slidable and the one 16 shown in Figure 3 may be slidable or rotatable. The shutter or valve 15 is actuated by a slidable rod 17 and the valve 16 by a rotatable or slidable rod 18. These rods 17 and 18 are entirely within the wing so that they offer no resistance to the air, which is likewise true of the valves and tubes. The rods may be operated from the cockpit or control section of an aeroplane in any desired manner.

As clearly shown the valve 15 or 16 is constructed with a plurality of channels 19, one for each passage or tube 4. The valve 16 of Figure 3 may form the leading edge of the wing, or, as shown in Figures 1, 2 and 4, the casing 12 extends around the valve 15 and has a plurality of openings 20 therein, one for each tube 4 to be interconnected by the valve channels 19.

The passages or tubes 4 may have any shape or configuration such as U-shaped channels riveted to the wing skin or they may comprise thin wings secured to the wing surfaces so that the inner wing surfaces form a part of the walls of the passages. Furthermore, the tubes may not only be provided parallel to each other but they may be non-parallel as shown in Figure 3. Also, the diameters of the tubes or the passages may vary so that tubes of different cross sections may be provided in the same control means.

It is likewise possible to change the construction and configuration of the shutter or valve as well as its casing to any desired design.

The operation of the lateral control is as follows:

Assuming that the plane is flying, the valve 15 in each wing being closed, it is desired to fly the plane laterally. This is accomplished by actuating the respective rod 17 or 18, which slides or actuates the valve 15 or 16 permitting the air to rush or be forced into the tubes. The tubes being curved or on an angle by being bent, the air builds up a pressure against one side or wall of the tube, thereby holding the respective wing portion back, which results in the lateral turning of the aeroplane. The tubes being open at the rear end adjacent the aileron, the air escapes therefrom. If now both valves are opened at the same time the air setting up a pressure on the walls of the tubes in both portions of the wing will act as a powerful brake which may be very useful in landing the plane. In this way the air flowing from the tubes will strike the leading edges of the ailerons which maintains such ailerons controllable at low speeds. This is extremely useful in landing in case the plane hits a sudden air bump or pocket on one side.

An important advantage of applicant's invention is that an airplane equipped with the lateral control avoids the results of side winds on a standard rudder and fin of present day air craft. It is of course known that an airplane flying with a side wind must fly at an angle to the course, which results in a considerable loss of speed. The side wind naturally strikes the fuselage so that the smaller the fuselage the less surface it presents to the side wind. It is of course impossible to avoid the wind striking the fuselage, but the main disadvantage of a side wind is that it strikes the fin and the rudder and therefore the pilot must constantly hold up on the rudder in order to keep the plane on its course. This is very tiring on the pilot for the reason that the pilot is forced to fly the ship constantly at an angle, resulting in a considerable loss of speed. Since the internal control according to the present invention avoids the use of the standard rudder and fin, it can be readily seen that this is quite an advantage because it permits flying on a straight course in spite of the side wind, or at least the angle can be greatly reduced so that a pilot is flying the plane practically on its course.

The passages or tubes 4 are preferably constructed and secured in the wing as shown on the drawing. Each tube or passage is composed of an air leading section 21 which is arranged parallel to the longitudinal axis of the aeroplane so that the tube or passage will thus take in the greatest possible amount of air. Next to the air leading section is a radius section 22 which is for the purpose of guaranteeing an even air flow, and after this section there is a preferably fixed angle section 23. The air which enters the leading section 21 when the valve is open flows evenly through the radius section and against the surface of the angle section, which will thus build up a pressure against the surface of the angle surface, thereby guiding the aeroplane in lateral directions when operated on one side of the wing to the exclusion of the other side and acting as a powerful brake when operated on both sides of the aeroplane simultaneously.

It is also within the scope of this invention to provide a plurality of tubes 4 or passages parallel to the longitudinal length of the aeroplane for the wing thereof having openings for the air which may or may not be controlled for the entry of air but which tubes or passages are flexible or jointed so that they may be bent or moved out of alignment longitudinally to thereby create the pressure surface for the air for lateral control or brake effect.

I claim as my invention:—

1. A long-leverage lateral control particularly for tailless aeroplanes and planes with short tails as a replacement for wing tip rudders, comprising an element having a passage secured and mounted in and adjacent the wing tips of the aeroplane and extending from the nose to the rear, and means to control the resistance

to air flow therethrough for guiding the aeroplane in lateral directions, said element, due to its internal location in the wing structure, offering no air resistance when in an inoperative position.

2. A lateral control according to claim 1, in which the control means is operable for controlling the amount of air flow or to exclude the air flow therefrom in the inoperative position.

3. A lateral control according to claim 1, in which the passage is composed of an angle section, a radius section, and an air leading section, and in which the means is provided in the air leading section to control the amount of air flow or to exclude the air flow therefrom in the inoperative position.

4. A lateral control according to claim 1, in which the passage is composed of an air leading section which is parallel to the longitudinal axis of the aeroplane so that the passage will always be capable of taking in the maximum air flow, a radius section to provide an even air flow, and an angle section whereby the air flow will enter the leading section and flow evenly through the radius section and against the surface of the angle section so that the air will build up a pressure against the surface of the angle section to guide the aeroplane in lateral directions when operating the passage in one wing and to brake the plane when operating the passage in both wings simultaneously.

5. A long-leverage lateral control particularly for tailless aeroplanes and planes with short tails as a replacement for wing tip rudders, comprising a plurality of passages in the form of tubes secured and mounted in and adjacent the wing tips of the aeroplane and extending from the nose to the rear to control air flows for guiding the aeroplane in lateral directions, said passages, due to their internal location in the wing structure, offering no air resistance when in an inoperative position.

6. A lateral control according to claim 5, in which a control device is provided for the tubes in each wing to control the amount of air entering the tubes or to exclude the air therefrom in the inoperative position.

7. A lateral control according to claim 5, in which each tube is composed of an angle section, a radius section, and an air leading section.

8. A lateral control according to claim 5, in which each tube is composed of an angle section, a radius section, and an air leading section, and in which a control device is provided for the tubes in each wing to control the amount of air entering the tubes or to exclude the air therefrom in the inoperative position.

9. A lateral control according to claim 5, in which each tube is composed of an air leading section which is parallel to the longitudinal axis of the aeroplane so that the tube will always be capable of taking in the maximum air flow, a radius section to provide an even air flow, and an angle section whereby the air flow will enter the leading section and flow evenly through the radius section and against the surface of the angle section so that the air will build up a pressure against the surface of the angle section to guide the aeroplane in lateral directions when operating the tubes in one wing and to brake the plane when operating the tubes in both wings simultaneously.

10. A long-leverage lateral control particularly for tailless aeroplanes and planes with short tails as a replacement for wing tip rudders, comprising a tube having a curved portion therein and a straight portion and secured and mounted in and adjacent the wing tips of the aeroplane, said tube extending from the nose to the rear to control air flow for guiding the aeroplane in lateral directions, and the straight portion of the tube being in the nose and having its longitudinal axis parallel to the longitudinal axis of the aeroplane.

11. A lateral control for aeroplanes, comprising a channel arranged through the wing of the aeroplane from the nose to the rear of the wing, and adjustable means to control the amount of air flowing through the channel for guiding the aeroplane in lateral directions and to exclude the flow of air entirely through the channel when lateral guiding is not desired.

12. A lateral control according to claim 11, in which the channel is curved to set up a resistance for the air flow through the channel.

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