Feb. 28, 1939. S. SCHEU 2,148,967

WING FLAP

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Fig. 1

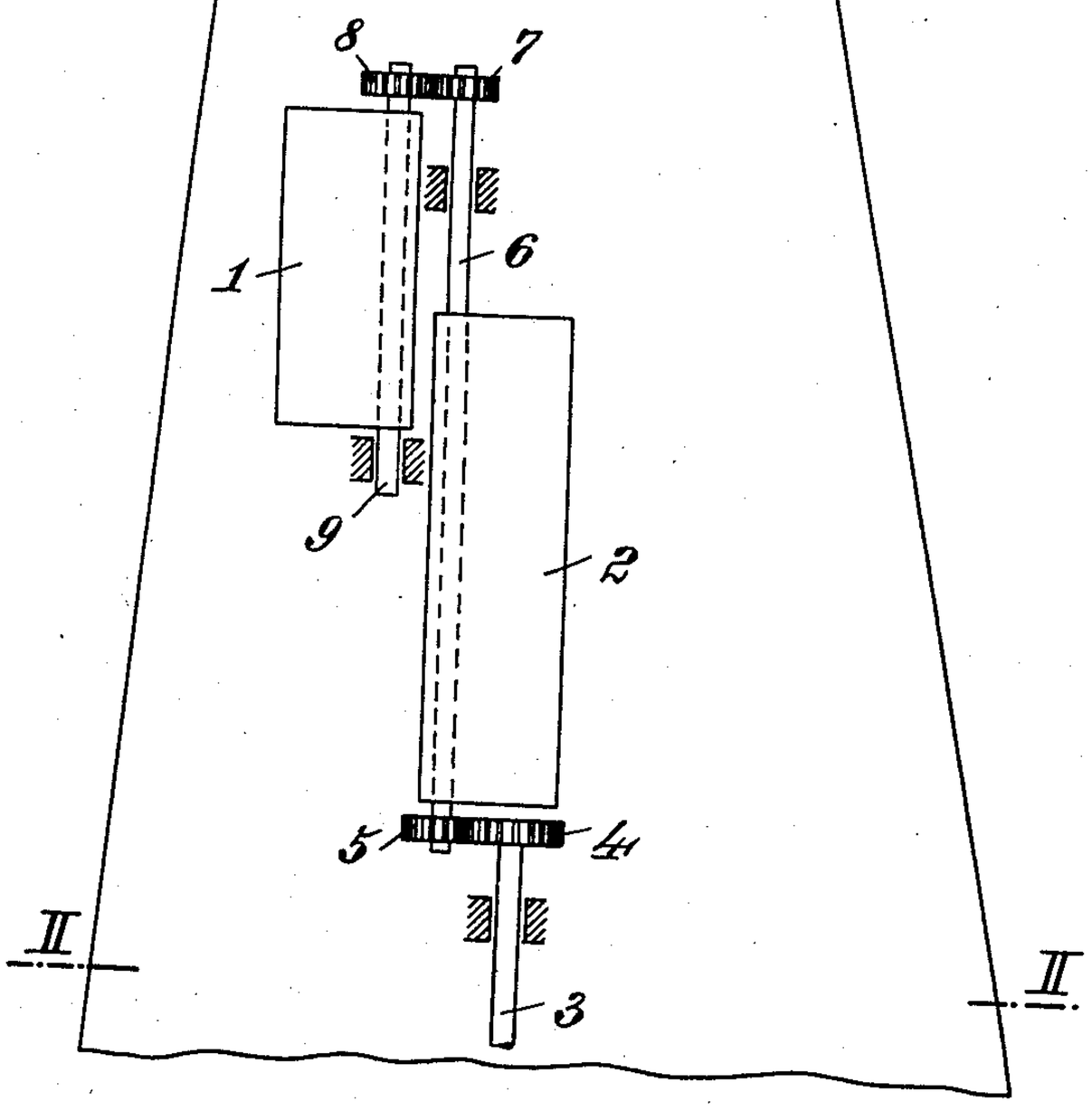
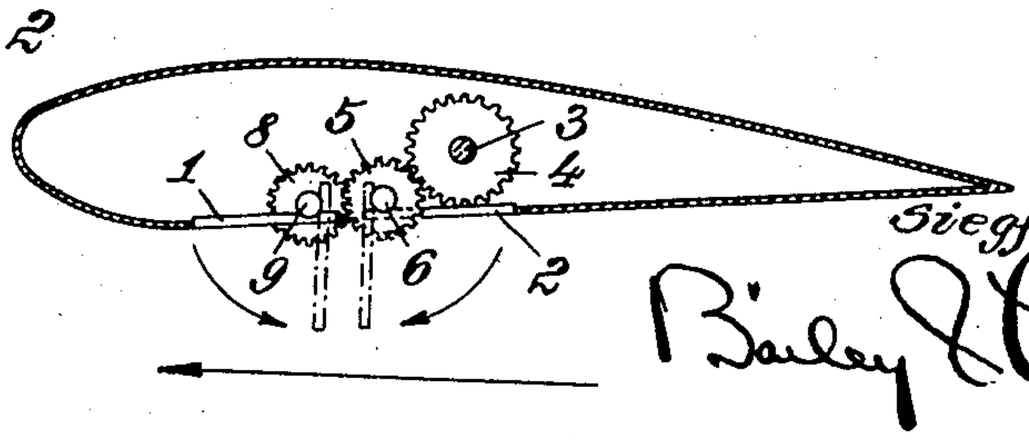


Fig. 2



Inventor:

Siegfried Scheu,

Bailey & Carson

Attorneys

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WING FLAP

Siegfried Scheu, Brandenburg, Germany, assignor to Arado Flugzeugwerke Gesellschaft mit beschränkter Haftung, Nowawes, Potsdam, Germany

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4 Claims. (Cl. 244—42)

The present invention relates to a device provided on aircrafts for altering the gliding angle. Under the expression "gliding angle" the inclination of the longitudinal axis of the body or fuselage of an aircraft about to land with regard to the ground is to be understood.

The devices known hitherto for altering the gliding angle consist of a plurality of flaps adapted to be swung out of the supporting wing or wings. These flaps are so arranged, that a number of same may be opened in the direction of flight, whereas another number of same may be opened in a direction opposite to the direction of flight. The flaps opening in the different directions have hitherto been made of equal size and have been arranged at the lower side as well as at the upper side of the supporting wing or wings. Their adjustment has been effected independently on each other.

The known arrangements have proved to be of disadvantage. If the flaps are to be drawn inwardly, the pilot need not to expend special power for closing the flaps which have been opened in the direction of flight as the wind aids in performing the closing movements of such flaps. For the closing of those flaps, however, which have been opened in a direction opposite to the direction of flight and which with a small angle of opening already have a particular high effect, the pilot must overcome the pressure exerted upon this flap by the wind. The adjustment of these flaps, therefore, causes an undesired strain on the pilot, besides the fact, that the operation of individual and separate control members for the various flaps requires special attention. Similar conditions prevail on opening of those flaps which are swung out into the direction of flight. In this case also on performing the opening movement the pilot must overcome the resistance due to the wind acting upon the flap on opening.

The problem to be solved by the invention consists in improving the devices serving to alter the gliding angle and in allowing the pilot, after starting for a landing to effect the landing at low velocity and to repeatedly alter during gliding the angle of inclination of the path of flight with regard to the ground, i. e. the gliding angle, without exerting therefor appreciable forces.

The invention consists in this, that the flap opening in a direction opposite to the direction of flight is coupled with the flap arranged behind it and opening in the direction of flight, the flap opening in the direction of flight having a larger effective area than the flap opening in the direction opposite to the direction of flight. Besides an essential simplification of operation, the further advantage is obtained by the invention that the pilot has to expend power for opening the flaps only, whereas the closing movement is effected automatically.

In the preferred modification of the arrangement according to the invention the flap having the smaller effective area is arranged in front of the flap having the larger effective area in such a manner, that in the swung out position the smaller flap partially covers the larger flap.

According to a further feature of the invention both flaps may be arranged at the lower face of the supporting wing and the dimensions may be so chosen, that the area of the flap opening in the direction opposite to the direction of flight amounts to about two thirds of the area of the second flap coupled to the first flap and opening in the direction of flight. Furthermore, the arrangement may be such, that the smaller flap in the swung out position covers about a quarter of the larger flap.

In the accompanying drawing one construction according to the invention is shown by way of example.

In this drawing:

Fig. 1 shows in plan view a part of a supporting wing of an aircraft with flaps arranged in accordance with the invention, and

Fig. 2 is a section on the line II—II of Fig. 1.

As may be seen from Fig. 2, two flaps 1 and 2 are arranged at the lower surface of the supporting wing F. In the position of rest shown in full lines in Fig. 2 the two flaps 1 and 2 occupy correspondingly dimensioned hollow spaces or recesses provided at the lower side of the supporting wing. In the swung in position the lower edge of the flaps lies flush with the lower edge of the supporting wing of the aircraft.

The flap 1 may be swung outwardly in the direction of the arrow shown in Fig. 2. This swinging movement of the flap 1 takes place in a direction opposite to the flying direction indicated by a larger arrow in Fig. 2.

The flap 2 may be swung out of the supporting wing in the opposite sense, i. e. it may be opened in the direction of flight.

For the purpose of performing the opening and closing movements the flap 1 is fixed upon a shaft 9 rotatably mounted in suitable bearings provided in the supporting wings. In a similar manner, the flap 2 is fixed upon a shaft 6 which also is rotatably mounted in corresponding bearings arranged in the supporting wing. The shafts

6 and 9 carrying the two flaps 1 and 2 simultaneously serve to transmit to the two flaps the movements required for altering the gliding angle.

For this purpose, a further shaft 3 is provided which also is mounted in corresponding bearings in the supporting wing and which is connected to a device not shown in the drawing arranged in the pilot's space and adapted to be operated by the pilot, i. e. to a corresponding hand lever or the like.

Mounted upon the shaft 3 is a pinion 4 engaging with a pinion 5 mounted upon the shaft 6 carrying the flap 2. Fixed upon the shaft 6 is another pinion 7 engaging with a pinion 8 fixed upon the shaft 9 upon which the flap 1 also is fixed.

The transmission of the pinions 4, 5, 7 and 8 is so chosen, that on turning the shaft 3, by means of any desired device adapted to be operated by the pilot, the flaps 1 and 2 perform equal swinging movements. By a corresponding turning of the shaft 3, therefore, both flaps, occupying the position of rest in the supporting wing, are uniformly swung outwardly into the position shown in dash and dotted lines in Fig. 2.

As may be seen from Fig. 1, the flaps 1 and 2 are arranged one behind the other and, moreover, the effective areas of both flaps are of different size. With the construction, shown by way of example, the flap 1, opening in the direction opposite to the direction of flight, has an effective area of a size of about two thirds of the flap 2 coupled to it and opening in the direction of flight. Furthermore, the arrangement is such, that in the swung out position the smaller flap 1 covers about a quarter of the effective area of the larger flap 2.

With the subject matter of the invention the advantage is obtained, that both flaps when opened tend to automatically close, because the force applied to the flap 2 by the wind and tending to close the flap 2 is greater than the forces which are applied by the wind to the flap 1 in a direction opposite to the direction of the closing movement. Consequently, the flap 2 will easily overcome the resistances counteracting the closing movement of flap 1. The pilot, therefore, has to apply a force upon the adjusting member for the flaps 1 and 2 only, if the flaps are to be opened as soon as the aircraft is about to land. The control operations, therefore, are similar to those which have to be effected by the driver of a motor car for effecting a braking action. As soon as in this case force is not longer applied to the brake, the braking action itself is stopped. The already known devices provided on aircrafts for altering the gliding angle in which the individual flaps has to be separately adjusted, had the disadvantage removed by the invention, that the pilot had to expend force not only when swinging out the flaps for the purpose of obtaining a braking action, but also that he was compelled to do the same on swinging in the flaps, i. e. in reducing or releasing the braking action.

As a rule, the flaps according to the invention are arranged at the lower side of the supporting wing. The arrangement, shown for the sake of simplicity in Figs. 1 and 2 for one side of the wing only, is provided on the right hand wing as well as on the left hand wing. In connection with double deck aeroplanes the flaps may be provided at the upper supporting planes as well as at the lower supporting planes. The flaps may, however, be provided at the upper supporting planes only, or at the lower supporting planes only.

What I claim is:

1. A flap construction for an aircraft wing comprising at least one group of flaps swingably mounted on said wing, a first flap in each group being mounted to open in a direction opposite the direction of flight of said aircraft, a second flap of said group being coupled to said first flap and mounted to open in the direction of flight of said aircraft, said first flap and said second flap being partially overlapped in open position, and said second flap having a larger effective area than said first flap whereby wind forces acting on said second flap substantially balance wind forces acting on said first flap, but tend to hold said flaps in closed position.

2. A flap construction as in claim 1, said first flap being lapped upon said second flap in open position approximately one-fourth the length of said second flap.

3. A flap construction as in claim 1, said first flap having an effective area approximately two-thirds that of said second flap.

4. A flap construction as in claim 1, said first flap having an effective area approximately two-thirds that of said second flap, and said first flap being lapped, in open position, upon said second flap approximately one-fourth the length of said second flap.

SIEGFRIED SCHEU.