PATENT SPECIFICATION

413,184

Convention Date (Germany): Feb. 2, 1933.

Application Date (in United Kingdom): Nov. 24, 1933. No. 32,944/33.

Complete Accepted: July 12, 1934.

COMPLETE SPECIFICATION.

Improvements in or relating to Rotatable Supporting Wing Arrangements for Aircraft.

I, Dr. Ing. Claude Dornier, a German Citizen, of Friedrichshafen on Lake Constance, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to rotatable supporting wing or plane arrangements of so-called helicopters which are driven by the reaction of a driving medium issuing at the ends of the wings.

Devices used in connection with helicopters are known which by the motion of flaps on the wings or by turning of the whole wing or in some other manner produce forces or moments which influence the equilibrium of the complete aircraft. The present invention enables the same idea to be carried into effect in connection with helicopters the wings of which are driven according to the reaction principle. The problem is solved according to the present invention by the provision of reaction nozzles at the tips of the wings from which nozzles a working or driving medium issues, the said nozzles being rotatable around an axis which is approximately parallel to the longitudinal axis of the said wings. It thus becomes possible to vary the direction of force due to the reaction of the outflowing medium by periodical displacement of the nozzles, and it is possible to produce forces during each revolution which influence the equilibrium of the aircraft and/or maintain it. If the nozzles be revolved 180° the rotatable wing arrangement is subjected to a braking action. The displacement of the reaction nozzles may be effected manually. Known devices can be used which serve to move periodically flaps on motor driven helicopters in order to displace the nozzles according to the present invention.

In order that the invention may be clearly understood and readily carried into effect reference is made to the accompanying drawings which show diagrammatically and by way of example rotatable supporting wing arrangements in accordance with the present invention.

Figure 1 is a sectional elevation of a wing supporting arrangement in accordance with the present invention and lying in the plane of rotation.

Figure 2 is a section taken at right angles to Figure 1.

Figure 3 shows a rotatable wing arrangement diagrammatically and in profile.

Figure 4 shows the nozzles of Figures 1 and 2 in their displaced position.

Figure 5 is a section through the rotatable wing arrangement in the plane of rotation.

Figure 6 is a diagram showing the nozzles moved to opposite sides and out of the rotational plane of the rotor.

Figure 7 is a diagrammatic elevation showing means to move the nozzles independently out of the plane of rotation of the rotor either at the same time or at different times and toward the same side or toward different sides.

In the drawings Figures 1 and 2 the supporting wing arrangement 1 is rotatable around the axis A—B Figure 2. The wing arrangement is mounted on the neck of an aircraft by means of an annulus 2 and is supplied with a current of air by means of a pipe 3 The delivered air issues into the atmosphere through the nozzles 4 and 5. These nozzles are rotatably mounted at 6 and 7. The nozzles 4, 5 are connected to rotatable axes or spindles 8 and 9. On the spindle 8 is a bevel gear wheel 10 and on the spindle 9 is a bevel gear wheel 11. The gear wheels 10 and 11 are mounted at the inner ends of the spindles 8 and 9 and near a rotatable shaft 13, the said bevel gear wheels meshing with a bevel gear wheel 12 on the shaft 13. The shaft 13 which carries the bevel gear wheel 12 rotates at the same speed as the supporting wing arrangement. If the shaft 13 be displaced in a leading or lagging sense relatively to the rotating wing arrangement, then the nozzles 4 and 5 are thereby also displaced, both nozzles moving in opposite directions and out of the plane of rotation. As mentioned in the specification the device may be so adapted that each nozzle can be displaced independently of the other and

[Price 1/-]

periodically during each revolution.

In Figure 3 the outlet nozzles 4, 5 for the working fluid are mounted at the tips or ends of the wings and are shown in their middle or median position, that is to say in the position in which the reaction of the issuing working medium acts tangentially in the plane of rotation of the rotor.

In Figure 4 the nozzles 4, 5 are shown displaced according to the arrangement shown in Figures 1 and 2.

The arrangement shown in Figure 5 differs from that shown in Figure 1 in that only one small bevel gear wheel 17 is used in the arrangement of Figure 5 whereas two are used in Figures 1 and 2. The wheel 17 engages with a bevel gear wheel 16, the bevel gear wheel 17 being rigidly mounted on the shaft 18 and adapted to influence the two nozzles 14 and 15 by means of the said gear wheel, in such manner, that when the nozzles are moved out of their middle position, they always move out of the rotational plane of the rotor in the direction of different sides Figure 6.

In Figure 7 is shown an arrangement for moving the nozzles by means of which both nozzles can be moved out of the rotational plane of the rotor quite independently either at the same time or at different moments towards the same side or toward different sides. A nozzle 19 is rigidly connected with a shaft 20 and with a bevel gear wheel 21 which is rigidly mounted on the said shaft 20. The bevel gear wheel 21 meshes with a toothed segment 22 which is mounted on a tubular shaft 23. A nozzle 24 is turned by means of a shaft 25 provided with a bevel gear wheel 26. The latter engages in a toothed segment 27 which is mounted on a shaft 28. This arrangement renders it possible to move the two nozzles quite independently of one another.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A rotatable supporting wing arrangement for aircraft, the said arrangement being driven by the reaction effect of a driving medium issuing at the tips or ends of the wings wherein outlet nozzles for the driving medium are arranged rotatably around an axis approximately parallel to the longitudinal axis of the wings.

2. A rotatable supporting wing arrangement according to claim 1, wherein the outlet nozzles can be rotated by means of a manually operable control device separately for each wing.

3. A supporting wing arrangement according to claim 1, wherein the outlet nozzles can be simultaneously displaced or rotated for several or all of the wings by means of a manually operable control device diametrically opposite nozzles being rotatable in the same or in opposite directions.

4. A supporting wing arrangement according to claim 1 wherein the outlet nozzles are adapted to be positively turned about their axis of rotation during each revolution.

Dated this 24th day of November, 1933.

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Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1934