

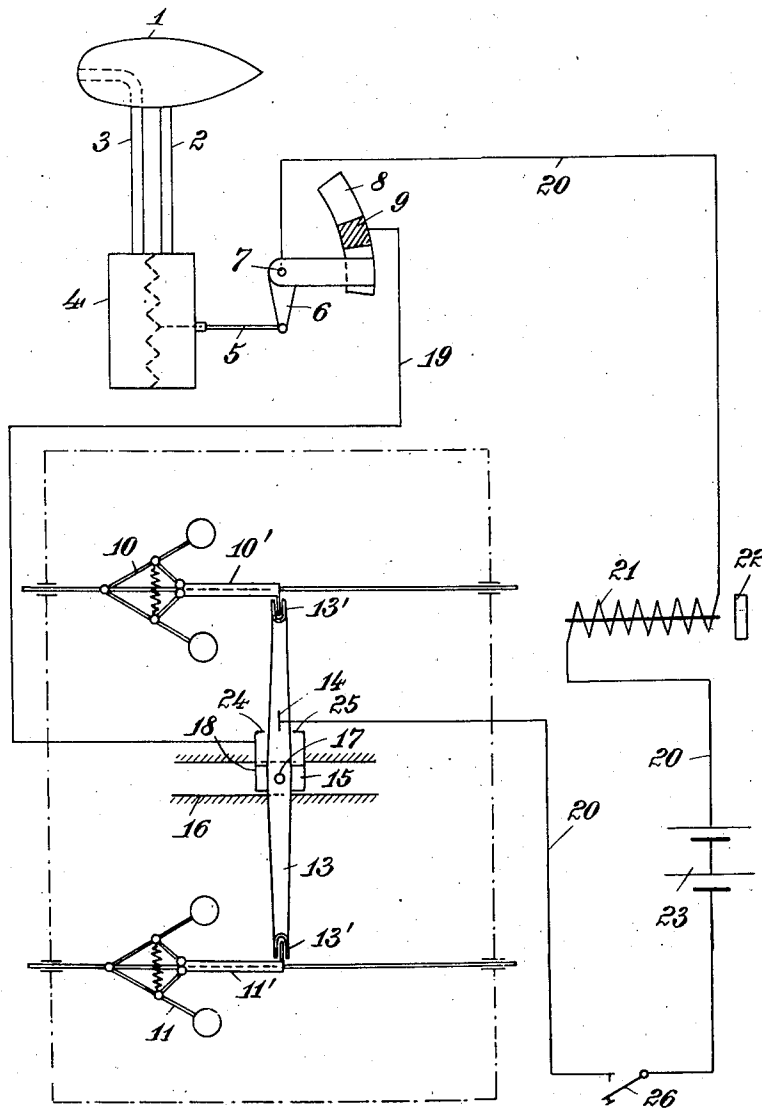
Dec. 3, 1940.

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2,223,708

MEANS FOR THE CONTROL OF THE ENGINES OF MULTIENGINE AIRCRAFT

Filed Jan. 4, 1939



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UNITED STATES PATENT OFFICE

2,223,708

MEANS FOR THE CONTROL OF THE ENGINES
OF MULTIENGINE AIRCRAFT

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Application January 4, 1939, Serial No. 249,351
In Germany February 17, 1938

4 Claims. (Cl. 244—53)

This invention relates to improvements in means for the control of the engines of aeroplanes equipped with a plurality of associated engines arranged symmetrically with respect to the longitudinal axis of the aeroplane.

So-called high-speed aeroplanes have very small dimensions relatively to the engine power, because the increase of the flying capabilities compels the use of powerful engines and increase of the surface loading. If, now, with such high-speed multiengine aeroplanes, one of the side engines stalls on starting or shortly after starting, there is a danger that the opposing force exercised by the lateral directing gear may be insufficient to balance the unilateral thrust occasioned by the stalling of one engine. In such a case the aeroplane crashes.

The invention provides means enabling the aeroplane to effect an emergency landing with normal gliding descent if such troubles should arise.

The object of the invention is realised by the invention by reason that the engines in question are automatically shut off by closure of a circuit containing an auxiliary device, for example, a relay, acting on the control means for the engines, and two switches. Of these switches one is closed only within the limits of a predetermined dynamic pressure by a contact lever influenced by a Pitot tube device, and the other by a member influenced by the difference in the number of revolutions of the two associated engines.

An embodiment of the invention is illustrated by way of example in the accompanying drawing.

1 denotes a Pitot tube which is connected by way of a static pressure conduit 2 and a dynamic pressure conduit 3 with a casing 4. A diaphragm within the casing 4 is connected by a rod 5 with a bell-crank switch lever 6 mounted on a shaft 7. 8 is a segment the hatched portion of which designates a switch contact. 10 and 11 are two centrifugal governors actuated by the respective engines, not shown. These governors comprise the usual flyweights. The outward movement of these flyweights is transmitted by links to adjusting members 10' 11' each mounted for sliding movement in the direction of its longitudinal axis. Each of these adjusting members 10', 11' is provided with an arm engaging loosely a bifurcation 13' in a switch member 13. The two governors are thus interconnected by way of the switch member 13.

The switch member 13 is pivoted on a ful-

crum pin 17 carried by a slide 15 shiftably mounted in a parallel slideway 16. The switch member 13 carries a contact 14; a double contact 18 is connected with the slide 15. At the two sides of the slide 15 the double-contact 18 has limbs each presenting a contact 24 or 25 within the range of the contact 14. The contact portion 9 of the segment 8 is connected by a conductor 19 with the contact 18. From the shaft 7 a second conductor indicated at 20 is led to the switch contact 14. Interposed in the circuit containing this conductor 20 is a relay 21 with an armature 22. In the same circuit is also included a source of current 23 for example, in the form of a battery (dry cell, or accumulator). 26 denotes a manually operable switch adapted to be closed by the pilot to bring the device into a condition ready for use.

The operation is as follows:

Let it be assumed that the switch 26 is in closed position and that the aeroplane is just starting or has just started. There is then exercised a dynamic pressure which flexes the diaphragm in the casing 4, so that through the action of the rod 5 the switch lever 6 is rocked to effect closure of the contact 9.

If at this moment, for example, the side engine, not shown, which drives the centrifugal governor 10 should stall, then by the alteration of the distance of the flyweights of the said governor 10 from the axis of rotation, the upper end of the switch member 13 is moved to the right while the lower end remains in its position. At this time the contact 14 engages the contact 25 and closes the battery circuit while the slide 15 is shifted to the right.

By the closure of the circuit the relay 21 is energised and attracts the armature 22. The movement of the armature effects the shutting off of both engines with the utilisation of any known auxiliary means, not shown. For example, the armature 22 may be connected by suitable transmission mechanism with a linkage acting on the throttle valves of the engines.

If the engine actuating the centrifugal governor 11 should stall, the lower end of the switch member 13 is shifted to the right while the upper end retains its position. The contact 14 then engages the contact 24 and closes the battery circuit, the slide 15 travelling to the right. By closure of the circuit the relay 21 is energised and by attracting the armature 22 effects the shutting off of both engines.

When the two engines and thus also the two centrifugal governors run at approximately the

same rate, the switch member 13, the slide 15 and the contact 18 remain in the mean position shown in the drawing, and the contact 18 is kept open.

- 5 If, on the other hand, there is exercised on the aircraft a higher or lower dynamic pressure than that experienced at starting, then the diaphragm in the casing 4 is so influenced that the lever 6 connected therewith is adjusted in
10 manner to open the contact 9. If, in rolling or in normal high-speed flight, one of the engines stalls, the device does not operate. Operation of the device at this time is unnecessary as any irregularity in the operation of the en-
15 gines that may occur in these flying conditions does not entail a danger of crashing.

The double switch contact 18 may be so constructed that its two limbs and thus the distance apart of the contacts 24 and 25 are adjustable.
20 Provision may be made for adjusting the difference in the number of revolutions of the engines which is to be counted as permissible.

I claim:

1. Emergency control gear for an aeroplane
25 having port and starboard engines, comprising speed responsive devices driven one by each engine, a normally open electric switch, means associated with said speed responsive devices for controlling said switch to close the same when
30 a given difference in the rotational speeds of said engines occurs, a second electric switch, an air pressure responsive device actuating said second mentioned electric switch in dependence on the conditions of flight of the aeroplane, a
35 source of electric current, and means in circuit with said switches and said source of current and operative on closure of both of said switches to cut out both engines.

2. Emergency control gear for an aeroplane

having port and starboard engines, comprising speed responsive devices driven one by each engine, a normally open electric switch, means associated with said speed responsive devices for controlling said switch to close the same when a given difference in the rotational speeds of said engines occurs, a second electric switch, an air pressure responsive device actuating said second mentioned electric switch in dependence on the conditions of flight of the aeroplane, a source of electric current, and an electro-magnetic cut-out device in circuit with said switches and said source of current and operative on closure of both of said switches to cut out both engines.

3. Emergency control gear for an aeroplane having port and starboard engines comprising centrifugal governors driven one by each engine, a normally open electric switch, means associated with said governors for controlling said switch to close the same when a given difference
20 of rotational speeds of said engines occurs, an air pressure responsive device including a Pitot tube mounted on the aeroplane, an electric switch actuated by said air pressure responsive device within a predetermined dynamic pressure
25 range, a source of electric current and an electromagnetic cut-out device in circuit with said switches and said source of current and operative on closure of both of said switches to cut out both engines.

4. Emergency control gear as claimed in claim 1, said electric switch controlled by the speed responsive devices comprising a switch lever operatively connected to the speed responsive devices, a member having contacts, a contact
35 carried by said switch lever for engaging either of said contacts on said member, said lever having a floating fulcrum on said member.

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