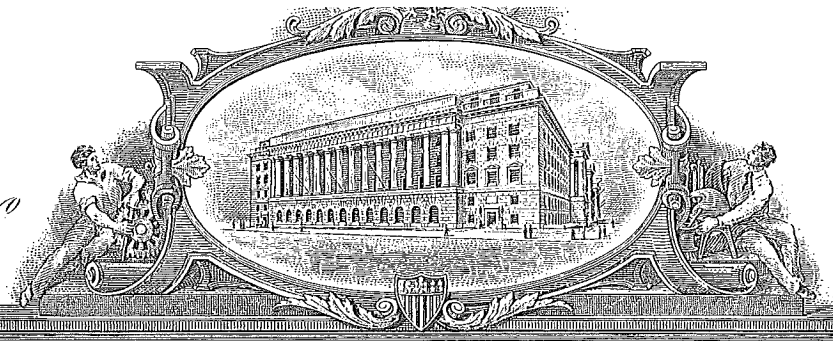


No. 2273022

# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas CARL J. CRANE and GEORGE R. LARKIN,

of

Dayton, Ohio,

PRESENTED TO THE Commissioner of Patents A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL IMPROVEMENT IN

AUTOMATIC THROTTLE CONTROLS,

A DESCRIPTION OF WHICH INVENTION IS CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANTS are ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

NOW THEREFORE THESE Letters Patent ARE TO GRANT UNTO THE SAID

Carl J. Crane and George R. Larkin, their heirs OR ASSIGNS

FOR THE TERM OF SEVENTEEN YEARS FROM THE DATE OF THIS GRANT

THE EXCLUSIVE RIGHT TO MAKE, USE AND VEND THE SAID INVENTION THROUGHOUT THE UNITED STATES AND THE TERRITORIES THEREOF. Provided, however, that the said invention may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

In testimony whereof I have hereunto set my hand, and caused the seal of the Patent Office to be affixed at the City of Washington this seventeenth day of February, in the year of our Lord one thousand nine hundred and forty-two, and of the Independence of the United States of America the one hundred and sixty-sixth.

Attest:

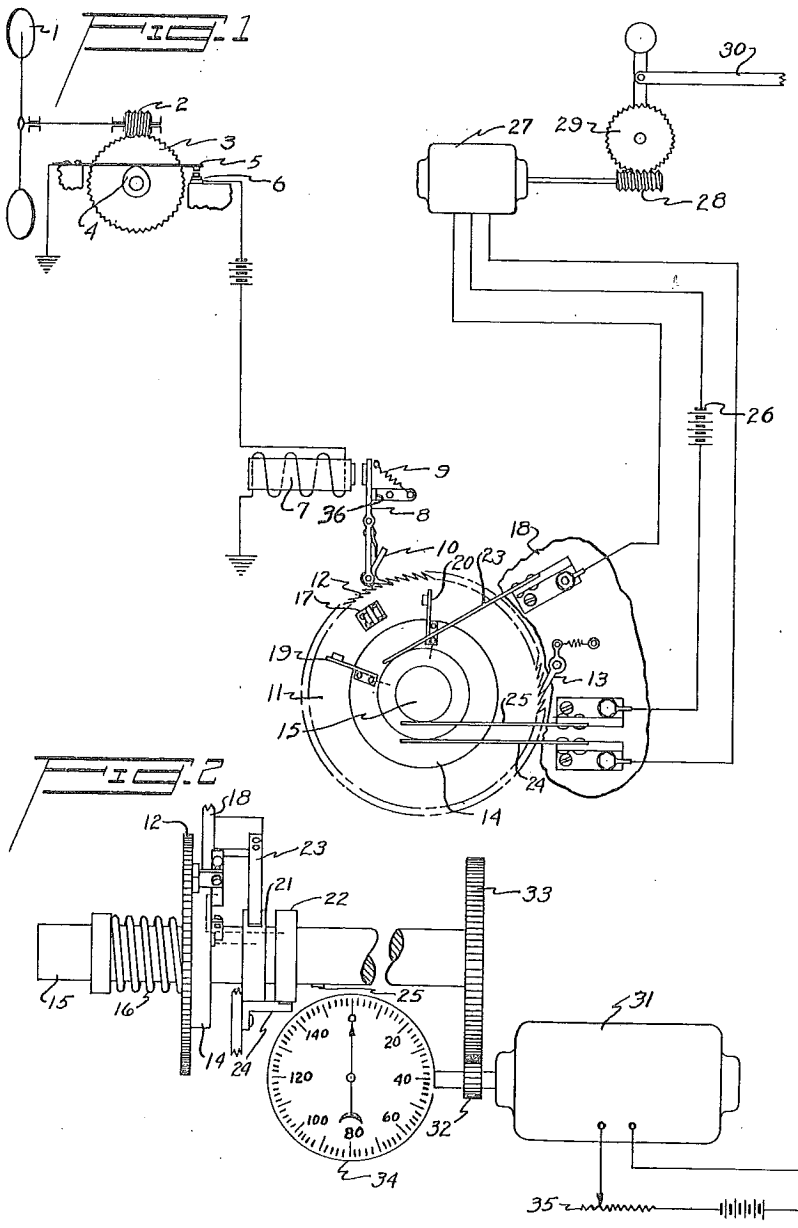
E. L. Reynolds
Law Examiner.

Conway P. Coe
Commissioner of Patents.

Feb. 17, 1942. C. J. CRANE ET AL 2,273,022

AUTOMATIC THROTTLE CONTROL

Filed July 18, 1939




INVENTORS
CARL J. CRANE
GEORGE R. LARKIN
Edgar H. Andrews
BY Charles A. Smith
ATTORNEYS

Patented Feb. 17, 1942

2,273,022

# UNITED STATES PATENT OFFICE

2,273,022

## AUTOMATIC THROTTLE CONTROL

Carl J. Crane and George R. Larkin,
Dayton, Ohio

Application July 18, 1939, Serial No. 285,206
6 Claims. (Cl. 264—9)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to an improved throttle control for the engines of aircraft.

It is an object of our invention to so correlate an anemometer means, a speed reference means and a throttle control mechanism that an out of phase relationship of the anemometer means and speed reference means causes an actuation of the throttle control mechanism to increase or decrease the fuel input to the engines resulting in maintaining the aircraft at a predetermined true air speed.

It is also an object of this invention to so associate a velocity actuated speed controlled means, a constant speed means and a throttle control mechanism that an out of phase relationship of said two means results in the actuation of the throttle control mechanism for controlling the driving engines to maintain the constant speed means and the speed controlled means in phase.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawing, it being clearly understood that the same are by way of illustration and example only and are not to be taken as in any way limiting the spirit or scope of this invention. The spirit and scope of this invention is to be limited only by the prior art and by the terms of the appended claims.

In the drawing:

Fig. 1 is a diagrammatic layout of the device, showing the speed reference means, the throttle valve control mechanism and the anemometer means which includes a speed controlled means; and

Fig. 2 is an elevational view of the constant speed reference means and the speed controlled means.

Referring to the drawing, 1 is the blade of the anemometer which, as is well known, constitutes a means for indicating a true air speed irrespective of temperature or pressure conditions. Rotation of blade 1 causes a rotation of gears 2 and 3 and cam 4 to make and break contacts 5 and 6. Each time the contacts are closed, solenoid 7 is energized, drawing the upper end of lever 8 in a counterclockwise direction about its pivot against the action of spring 9 to actuate spring pressed pawl 10, pivotally mounted on the lower end of lever 8. Ratchet wheel 11 is advanced or rotated one notch by engagement of pawl 10 with one of the teeth 12 on the ratchet wheel. When contact between 5 and 6 is broken, solenoid 7 is no longer energized and spring 9 causes lever 8 to rotate in a clockwise direction to its position of rest against stop 36. Holding pawl 13 prevents counterclockwise movement of the ratchet wheel 11 when the lever 8 and pawl 10 are returning to their position of rest. Ratchet wheel 11, constituting a speed controlled means, is mounted on shaft 15 with freedom for rotative movement and is frictionally held against collar 14 by spring 16. Collar 14 is rigidly attached to shaft 15 to rotate therewith. Contact 17, integral with ratchet wheel 11, extends between electrical contacts 19 and 20, fastened to and insulated from collar 14. Contacts 19 and 20 are electrically connected to contact rings 21 and 22 respectively, which, in turn, are rigidly mounted on and insulated from shaft 15. A brush 23 engages contact ring 21, while brush 24 engages contact ring 22. Brush 25 engages shaft 15 to establish an electrical circuit between a source of electrical energy 26 and a reversing motor 27, which, through gears 28 and 29, operates a carburetor throttle control member 30. Shaft 15, and consequently collar 14, are caused to rotate at a constant rate of speed by motor 31 and gears 32 and 33. A tachometer 34 registers the speed of motor 31 and a rheostat 35 is used to preset the speed of the motor to any desired amount. Brushes 23, 24 and 25 are mounted on and insulated from plate 18.

The operation of the device is as follows: The rheostat 35 is set so that motor 31, shaft 15 and collar 14 operate at the speed desired. Each rotation of cam 4 in response to rotation of anemometer blade 1 causes lever arm 8 to advance ratchet wheel 11 one notch. As long as the true air speed remains constant, wheel 11 and collar 14 move at the same speed and contact 17 is maintained between and out of engagement with contacts 19 and 20. Consequently, motor 27 is inoperative and throttle control member 30 remains in the same position. However, should the air speed of the plane become less than that set by the motor 31, ratchet wheel 11 will lag, contacts 17 and 19 will engage and motor 27 will become energized to operate throttle valve control member 30 to provide more fuel to the engines. This will, of course, increase the air speed of the plane until the ratchet wheel 11 is actuated at a speed to separate contact 17 from contact 19. Should the plane operate at a speed in excess of the desired amount,

wheel 11 will overrun plate 14 until contacts 17 and 20 are in engagement establishing a circuit to motor 27 resulting in the operation of throttle valve control member 30 to close the carburetor valve and reduce the operation rate of the engine.

We claim:

1. Apparatus for maintaining an aircraft at a true air speed comprising, anemometer means for registering the true air speed of the aircraft, a ratchet wheel actuated by said anemometer means, constant speed reference means comprising a motor driven shaft having a collar integral therewith, said ratchet wheel being rotatably mounted on said shaft and spring pressed against said collar, spaced electrical contacts on said collar, a single electrical contact on said ratchet wheel, a reversible motor electrically connected to said contacts, a throttle control mechanism operated by said motor, whereby upon a difference of movement between the ratchet wheel and collar the single contact engages one of the spaced contacts to establish an electric current to said motor thereby actuating said throttle control mechanism to maintain the aircraft at substantially the constant speed of the reference means.

2. Apparatus for controlling the fuel input to an aircraft engine to maintain said aircraft at a constant air speed comprising, a throttle control mechanism, a reversible motor operatively connected to said mechanism, a shaft, means for rotating said shaft at a predetermined speed to establish a constant speed reference means, a ratchet wheel frictionally held in engagement with said shaft with freedom for rotative movement, anemometer means for registering the true air speed of the aircraft, means operated by said anemometer means for rotating said ratchet wheel, an electrical contact on said ratchet wheel electrically connected to said motor, spaced apart contacts mounted on said shaft and electrically connected to said motor, said ratchet wheel contact being floatingly received between said spaced contacts so that when said ratchet wheel and shaft are rotating at the same speed the motor circuit is open, and when said ratchet wheel and shaft are not rotated at the same speed, the motor circuit is closed by engagement of said ratchet wheel contact with one of said spaced contacts to cause operation of said throttle mechanism for controlling the fuel input to the engines.

3. In an aircraft having an internal combustion engine and a throttle valve therefor, a presettable rotatable constant speed reference means, rotatable means controlled by the true air speed of the aircraft, a reversible motor for operating said throttle valve, electrical contacts on said controlled means and said speed reference means electrically connected to said motor, said contacts being spaced apart when said air speed controlled means and said constant speed reference means are in phase and certain of said contacts being in engagement when said controlled means and reference means are out of phase to operate said motor to establish an in phase relationship.

4. Apparatus for maintaining an aircraft at a true air speed comprising, a throttle valve controlling member, a reversible motor for actuating said member for controlling fuel input to the internal combustion engines driving said aircraft, an anemometer controlled speed means operating as a function of the true air speed of said aircraft, a constant speed reference means associated with said speed controlled means, electrical contacts on said speed controlled means and said speed reference means for controlling the flow of current to said motor, said contacts being separated when the true air speed and the speed reference means substantially coincide and certain of said contacts being in engagement to establish a circuit to said motor for actuating said throttle control mechanism to maintain the aircraft at substantially the constant speed of the reference means.

5. Apparatus for maintaining an aircraft at a predetermined true air speed comprising, a driving engine, a throttle valve control mechanism for said driving engine, an air velocity responsive device including an anemometer, a constant speed means, said constant speed means and air velocity responsive device being correlated with said throttle valve control mechanism to operate upon a difference between the constant speed means and the velocity responsive device to actuate said throttle valve control mechanism to maintain a substantial coincidence of said constant speed means and said velocity responsive device.

6. Apparatus for maintaining an aircraft at a true air speed comprising, a throttle valve means for controlling the fuel input to a driving engine, revoluble constant speed reference means, a revoluble air speed controlled means responsive to the true air speed of the aircraft, said constant speed reference means, air speed controlled means, and throttle valve means being so constructed and arranged that lack of identity of the speed reference means and the air speed controlled means results in the operation of said throttle valve to control the input of fuel to said engines to establish identity of said reference means and said controlled means.

CARL J. CRANE.
GEORGE R. LARKIN.