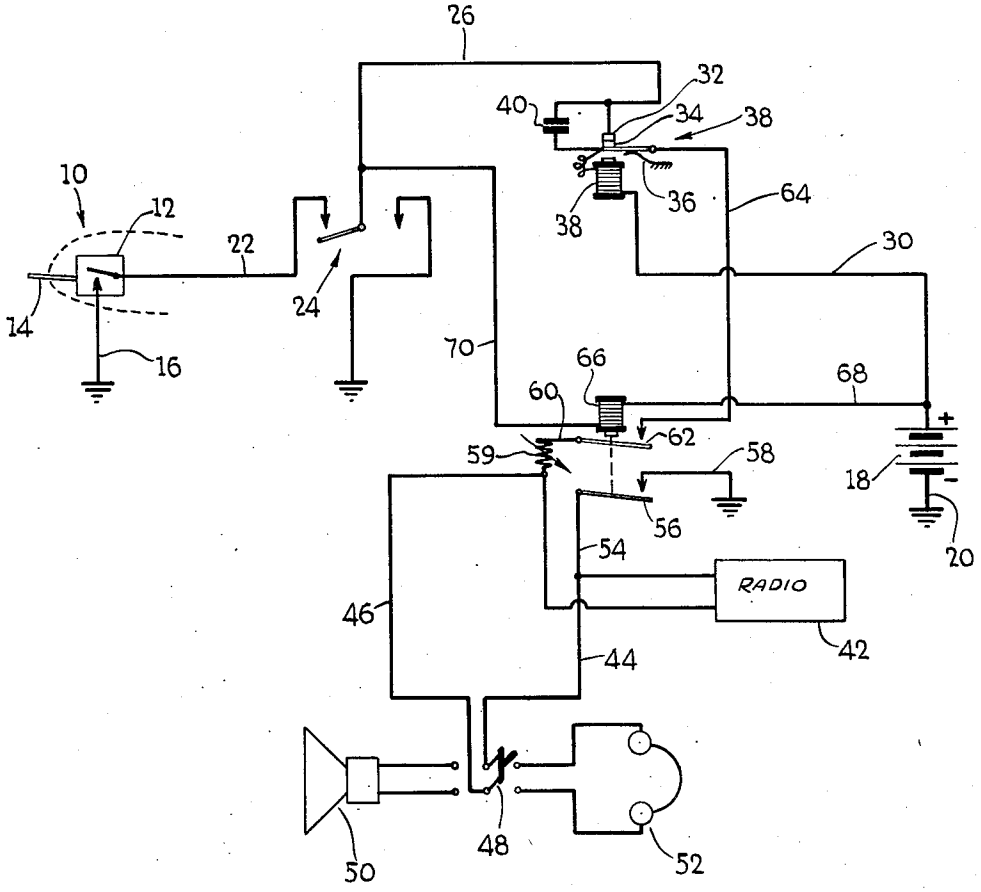
Sept. 23, 1952 L. M. GREENE 2,611,810

AIRPLANE WARNING SYSTEM

Filed Feb. 18, 1950



INVENTOR.
LEONARD M. GREENE
BY
ATTORNEY

Patented Sept. 23, 1952 2,611,810

UNITED STATES PATENT OFFICE

2,611,810

AIRPLANE WARNING SYSTEM

Leonard M. Greene, Scarsdale, N. Y.

Application February 18, 1950, Serial No. 144,986

1 Claim. (Cl. 177—311)

1

This invention relates to airplane warning systems. More particularly, my invention pertains to aural warning systems for airplanes.

At the present time it is customary to advise an airplane pilot of certain dangerous conditions. Typical of these conditions are failure to lower the wheels before landing and assumption by an airplane of a stall-approaching attitude with respect to a local air mass.

Heretofore the pilot usually was warned of such condition of imminent danger visibly, as by lighting or blinking of a lamp, tactually, as by shaking the control stick, or aurally as by sounding of a horn or buzzer. It is preferred to give the signal aurally since, under proper conditions the pilot cannot fail to perceive it as he might a visible signal and since present-day tactual signalling mechanisms are expensive, heavy, awkward and complicated, require considerable power, and often cannot fit into the space available. However, conditions are not always proper for hearing aural signals. For example, a pilot often wears earphones during flight and these, or the cups in which they are mounted, shut the pilot off from the noise of his surroundings so that, unless the aural signal is very loud, he cannot hear it. On the other hand, if the signal is loud enough to be heard by a pilot wearing earphones, it is much too loud for the pilot when the earphones are removed. Moreover, on occasion, due to the relative volumes at the pilot's ear of the aural warning signal and a radio loudspeaker, the loudspeaker may drown the aural warning signal.

It is an object of my invention to provide an airplane aural warning system which is not subject to the foregoing defects.

More specifically it is an object of my invention to provide an airplane warning system of the character described which imparts an aural warning by way of the electro-sound translating output device or devices of the airplane's radio.

It is an ancillary object of my invention to provide an airplane warning system of the character described which sounds at least two warnings simultaneously, one in the earphones, this optionally being of a low magnitude of sound sufficient only to give notice to the wearer of the earphones, and the other a horn or buzzer cockpit warning which is loud enough normally to be heard by anyone in the cockpit not wearing earphones.

It is another ancillary object of my invention to provide an airplane warning system of the

2

character described which imparts an aural warning in the earphones and loudspeaker so that, regardless of any possible condition, the warning will be heard.

It is another object of my invention to provide an airplane warning system of the character described which comprises relatively few and simple parts, is easy to manufacture and inexpensive to install, and is highly effective in operation.

It is another object of my invention to provide an airplane warning signal of the character described which is of such construction that it is normally isolated from the radio except during warning conditions.

Other objects of my invention will in part be obvious and in part will be pointed out hereinafter.

My invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the device hereinafter described and of which the scope of application will be indicated in the appended claim.

The single figure illustrates one of the various possible embodiments of a warning system constructed in accordance with my invention.

In said system the reference numeral 10 denotes a device which is responsive to the imminence of danger. Said device includes an electric switch 12 which preferably is of the normally open type and, desirably, is snap-acting. By way of example the device may be one such as is illustrated in my United States Letters Patent for Stall Warning Device for Airplanes, No. 2,478,967, dated August 16, 1949. Said device constitutes a vane 14 whose forward edge is free and juts a slight distance from the wing into the air stream. The vane is pivoted adjacent its rear edge and is arranged to operate the switch 12. Said vane is located on the leading edge of the wing within the range of influence of the shifting separation point, being so disposed that it will move suddenly from the position it occupies during normal flight to another position upon the approach of the separation point to a predetermined angle ahead of stall. Thus, when the airplane approaches a stalling attitude, the vane will flip from one to another position and in so doing will cause the normally open contacts of switch 12 to close.

It will be understood that the switch 12 may form a part of some other condition responsive device, as for example it may form part of a landing gear warning. In such cases the switch

is closed when the landing gear is up, is adjacent an operating part for the landing gear, and is in series with a throttle switch which is open as long as the throttle control is above a certain position. When the throttle control moves below this position its associated switch closes and, if the landing gear is not fully down, the circuit through both switches is completed.

One contact of the switch 12 is connected to ground by a lead wire 16. The conductive fuselage of the airplane may serve as a ground and constitute the return or neutral lead to one side, for instance the negative side, of a battery 18 or other suitable source of power which is grounded by means of a lead wire 20. The other contact of the switch 12 is connected to the opposite pole of the battery through a lead wire 22, switch 24, a lead wire 26, a vibrating type sounder 28 and a lead wire 30.

The switch 24 is of the single pole double throw type and is used for testing and turning off the signal systems. When the blade of the switch is in its left-hand position as shown in the figure, the switch 12 is connected in series with the sounder 28.

Said sounder is of any conventional type which includes a pair of contacts 32, 34 that open and close at an audible frequency when the sounder is actuated. As illustrated herein, the sounder is of the ordinary buzzer type including, in addition to its two contacts, a spring 36 which urges contacts into normally closed position. The winding of an iron-core solenoid 38 is connected in series with the contacts. When the solenoid is energized it pulls the contacts apart thus interrupting its energizing circuit. By proper adjustment of the contact spacing and tension of the spring, the frequency of vibration can be varied. Optionally a condenser 40 may be shunted across the contacts 32, 34 to prolong the life of the contacts by minimizing sparking.

It will be appreciated that the sounder 28 desirably is of such physical construction as to emit an audible warning which can be heard clearly and easily by the pilot over the normal cockpit noises when the pilot is not wearing earphones. It will be appreciated further that any of the various types of sounders can be used, the one shown here being illustrated merely by way of example. Thus the sounder can be of the type wherein a cam rotates in contact with a plate and also includes a pair of contacts which are rapidly opened and closed during rotation of the cam.

From the foregoing it will be understood that when the switch 24 is closed in its left-hand position and when the airplane approaches the condition to which the device 10 is responsive, the sounder will emanate an aural warning.

The airplane has a radio 42 whose output is delivered to a pair of wires 44, 46 running to a double-pole, double-throw switch 48 or any other equivalent type of switch which enables the radio selectively to energize either a loudspeaker 50 or a pair of earphones 52 or both by use of a suitable type of switch, i. e. a double jack.

In order to impress a signal from the sounder 28 across the output of the radio, I connect one of the output wires, e. g. the wire 44, to ground (the fuselage) through a lead wire 54, a normally open pair of relay contacts 56 and a lead wire 58. The other wire 46 of the radio output is connected to the sounder solenoid 38 through a volume control resistor 59, a lead wire 60, a normally open pair of relay contacts 62, a lead wire 64, and sounder contact 34.

The normally open pairs of contacts 56, 62 are ganged and are arranged to be operated by a relay coil 66. One terminal of the relay operating coil is connected by a lead wire 68 to the positive side of the battery and its other terminal is connected by a lead wire 70 to the blade of the switch 24.

The system operates as follows. Normally the switch 24 is closed in its left-hand position. upon approach to a specified dangerous condition, e. g. stall, the device 10 is actuated by operation of the vane 14 to close the normally open contacts of switch 12. This causes the sounder 28 to be energized and will apprise the pilot of the imminence of danger. If, however, the radio should be on, its output emanating either through the loudspeaker or through the earphones may drown the warning of the sounder were the present novel system not employed. Nevertheless, the warning will be heard over that sound output device of the radio which happens to be in operation, or both if such be the case. Moreover it will be heard in such device even if the radio is not operating. This occurs because, as soon as switch 12 is closed, a circuit is completed from said switch through the relay operating coil 66 to the battery. Energization of the relay coil closes the pair of contacts 56, 62, thus completing the circuit from the sounder solenoid 38 to the output of the radio.

When the sounder opens and closes its contacts 32, 34, the condenser 40 and sounder solenoid 38 will impress in the radio output a potential which is modulated at the audio frequency of the sounder. Said potential will be translated into sound at the loudspeaker and/or earphones. Since the superimposed signal is of the same frequency as the sounder signal, it will be recognized by the pilot as the warning of the sounder to which he has been trained to take appropriate corrective action.

Attention is directed to the fact that, until the switch 12 has been closed, no extraneous electric impulses will be imposed upon the radio output. This is due to the fact that the means for impressing the signal in the radio output is not connected to said output until such time as the switch 12 is closed. That is to say unless the switch 12 is closed the normally open pair of contacts 56, 62 will isolate the radio output.

If it is desired to check the sounder and coil 66, the switch 24 is swung to its right-hand position. This should energize said coil and the sounder 28, causing a warning signal to be heard in the loudspeaker and/or earphones.

It thus will be seen that I have provided a device which achieves all the objects of my invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein described, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

For use in an airplane having a radio and a source of electric power, and wherein an actuator is provided which upon the imminence of danger closes a switch that completes a circuit to the source of power: an electrically actuable sounder,

means to connect said sounder in series in the circuit between the switch and the source of power, said sounder including a pair of contacts in the circuit of the sounder and means to rapidly open and close said contacts at an audio frequency when the sounder is actuated, a relay having an operating coil and a normally open switch which is arranged to be closed upon energization of said coil, means to connect said coil in the circuit between the switch and the source of power, and circuit means to impress the potential of said contacts upon the output of the radio,

said last-named means being connected to the radio output through said relay switch.

LEONARD M. GREENE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,051,827	De Florez	Aug. 25, 1936
2,386,992	Trott	Oct. 16, 1945
2,552,331	Lamb	May 8, 1951