Aug. 21, 1928. 1,681,562

W. H. WENSTROM

SAFETY APPARATUS FOR AIRPLANES

Filed March 17, 1925

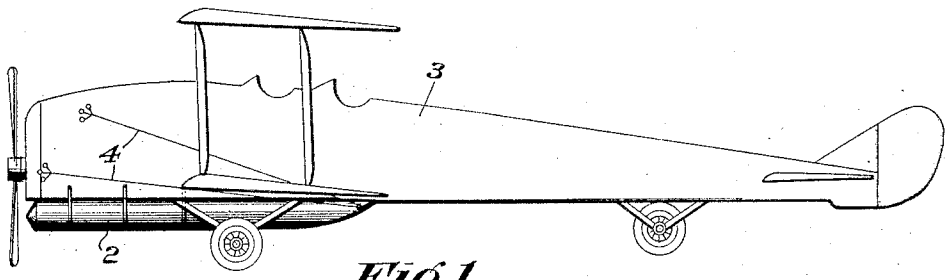



Fig. 1

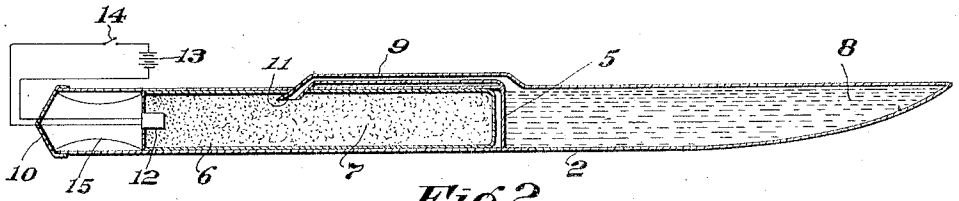



Fig. 2

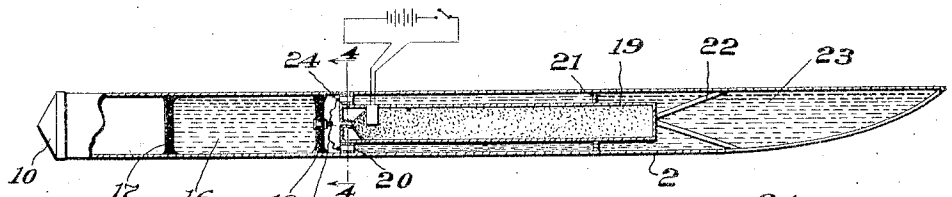



Fig. 3

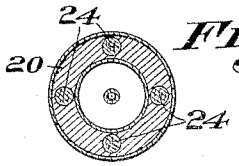



Fig. 4

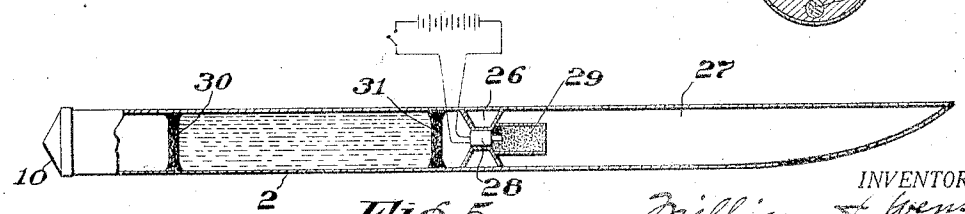



Fig. 5

INVENTOR.
William H. Wenstrom
BY J. R. McCrady
ATTORNEY.

Patented Aug. 21, 1928. 1,681,562

# UNITED STATES PATENT OFFICE.

WILLIAM HOLMES WENSTROM, OF FORT BLISS, TEXAS.

## SAFETY APPARATUS FOR AIRPLANES.

Application filed March 17, 1925. Serial No. 16,159.

This invention relates to airplanes, and is especially concerned with the problem of stopping an airplane under emergency conditions. When an airplane makes a forced landing on terrain other than a smooth field its high speed causes it to crash into anything that may be in its path, often wrecking the airplane and injuring its occupants. The present invention aims to improve both the means and methods of checking the motion of an airplane when its speed for any reason becomes a menace to its safety.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

Referring now to the drawings,

Figure 1 is a side elevation of an airplane equipped with an apparatus involving this invention;

Fig. 2 is a cross sectional view of the apparatus with which the airplane shown in Fig. 1 is equipped;

Fig. 3 is a view similar to Fig. 2 showing a modified embodiment of the invention;

Fig. 4 is a transverse cross sectional view on the line 4—4, Fig. 3; and

Fig. 5 is a view similar to Figs. 2 and 4 showing still another modification.

Referring first to Figs. 1 and 2, it will be observed that a long metal tube 2 is located immediately below the body 3 of the airplane and extends longitudinally of the axis of the plane. The tube is supported partly by being strapped or bolted to the motor supports, and partly by guy wires or stays 4 which connect the rearward end of the tube with the frame of the machine. A partition 5, Fig. 2, divides the tube 2 into forward and rear compartments, and the forward compartment 6 contains a charge of smokeless powder 7, while the rear compartment 8 contains water. A small tube 9 leads from the water compartment 8 into the powder compartment 6, the end 11 of this tube, however, being normally closed by some readily fusible metal, such as lead, or by a cover sealed in place by soft solder. The forward end of the tube 2 is normally closed by a cap 10. For the purpose of igniting the powder 7 when desired an electrical ignition unit 12 of a common form is located in contact with the powder, and wires connect this unit with a battery 13 and a control switch 14 which is placed within convenient reach of the pilot.

When the pilot wishes to check the speed of the airplane suddenly as, for example, in order to avoid striking an obstacle in landing, he closes the switch 14, thus igniting the powder 7. The gases generated in the resulting explosion blow off the cap 10 and are directed forward, thus producing a backward kick on the tube 2 and, consequently, on the airplane which carries it.

This effect may be somewhat increased by fitting a nozzle 15 into the forward end of the tube where it will restrict to some extent the discharge of the highly compressed gases. By using a suitable charge of powder, the intensity of this backward kick may be so proportioned with reference to the weight of the airplane that its speed will be very substantially reduced. The tube 2 confines and directs the gases and protects the adjacent parts of the plane from injury that otherwise might be caused by the explosion.

The body of water in the tube has been provided in this instance for the purpose of quenching the flame which accompanies the explosion. The heat produced by the burning of the powder unseals the end 11 of the tube 9, thus allowing the water in the rear compartment to flow through the tube 9 into the forward compartment. In fact, the water will be drawn through the tube by the rush of gases past the end 11 of the tube.

In order to obtain a greater backward impulse from the explosion of a given quantity of powder, I may direct this explosion against a body of water located in the tube. Such an arrangement is shown in Fig. 3 in which a body of water 16 is confined in the tube 2 between two wads 17 and 18. The charge of powder in this case is held in a tube 19 which preferably is located entirely within the tube 2 but is spaced from the walls of the latter tube by means of a partition 20 and braces 21 and 22. The same apparatus above described is also used in this instance to ignite the charge of powder. The explosion resulting from such ignition discharges the water 16 from the tube 2, and the force required to overcome the inertia of the water and to eject it from the tube produces a rearward impulse or kick which is considerably greater for a given charge of powder than would be produced if the water were not present.

The body of water 23 provided for flame quenching purposes is confined by the partition 20 to the rearward part of the tube. Sev-

eral holes formed through this partition are normally closed by stoppers or plugs 24. These stoppers are connected by flexible wires 25 to the wad 18 so that when this wad is shot out of the tube 2 the stoppers 24 will be pulled out, thus allowing the water to flow forward into the tube and quench the flame.

It will be observed that in this case, as also in the arrangement shown in Fig. 1, the explosion is utilized to release the flame quenching medium. It is contemplated that instead of using water for this purpose an inert gas of some kind might be used, or a liquid such as carbon tetrachloride might be substituted for the water.

Instead of burning powder to create a supply of gas under pressure, I may use a gas which has been mechanically compressed. An arrangement of this character is shown in Fig. 5 which in other respects is like that shown in Fig. 3. That is, the tube 2 in this construction is divided by a partition 26, into front and rear compartments, and the rear compartment 27 is filled with compressed air or gas, preferably an inert gas. This air is normally confined by a plug or stopper 28 which closes an aperture formed in the partition 26. For the purpose of driving out this plug and releasing the gas when desired, a small charge of powder 29 is placed in a container located immediately behind the plug 28, the same apparatus shown in Fig. 2 being utilized to ignite the powder 29. The explosion produced in this manner is sufficient to blow out the plug or stopper 28 and release the gas which is discharged either directly into the air, as in the arrangement shown in Fig. 2, or more preferably, against a body of water normally confined in the tube between wads 30 and 31, with the same result as described in connection with Fig. 3. This arrangement has the advantage that no flame is produced but is open to the objection that a larger container or tube 2 is required to hold a sufficient body of compressed air to produce the same checking or retarding action that would be produced by the explosion of a quantity of powder. It will be understood that in referring to "powder" I mean smokeless powder or any equivalent explosive agent.

While I have herein shown and described the best embodiments of my invention that I have so far devised, it will be understood that the invention may be embodied in many forms without departing from the spirit or scope thereof. For example, it is contemplated that a plurality of containers, such as the tube 2, may be used for holding separate charges of compressed gas or explosives so that a series of backward impulses may be imparted to the airplane to check its speed.

It will be understood, of course, that the rate at which the powder charge burns can be controlled to some extent by properly selecting the size of the powder grains.

Having thus described my invention, what I desire to claim as new is:

1. That improvement in the method of reducing the speed of an airplane which consists in releasing from the airplane a body of highly compressed gas against a body of water carried by the airplane, causing the gas to force said water forward in the direction of motion of the airplane, and using sufficient quantities of gas and water to create therewith a rearwardly directed force serving to substantially reduce the speed of the airplane.

2. That improvement in the method of reducing the speed of an airplane which consists in creating an explosion in a part secured to the airplane, so proportioning and directing the force of the explosion as to cause it to substantially check the speed of the airplane, and causing said explosion to release a medium serving to quench the flame resulting from the explosion.

3. The combination with an airplane, of a metal container carried thereby, said container being adapted to hold a body of water and arranged to discharge the water in a forward direction with reference to the airplane, and means under control of the operator for creating a quick and powerful discharge of gas in said container serving to expel said water from said container in said direction and thereby create a backward kick acting to check the forward movement of the airplane.

4. The combination in an airplane, of a metal tube extending longitudinally of the axis of the airplane, a supply of powder in said tube, electrical means under the control of the operator for igniting said powder, and means arranged to be brought into operation by the burning of said powder to release a medium adapted to quench the flame caused by the burning of the powder.

5. The combination in an airplane, of a metal tube extending longitudinally of the axis of the airplane, a supply of powder in said tube, a body of water in said tube arranged to be expelled by the burning of said powder, and means under the control of the operator for igniting said powder.

6. The combination in an airplane, of a metallic container, a quantity of powder in said container, a water container closely associated with said powder container, means under the control of the operator for igniting said powder, and means arranged to be brought into operation automatically by the explosion of said powder for discharging said water into said powder container.

7. That improvement in the method of reducing the speed of an airplane which consists in creating an explosion in a container secured to the airplane, quenching the flame produced by said explosion, directing the gases produced by said explosion forward in

the direction of motion of the airplane, and so proportioning the intensity of the explosion that the backward reaction produced by it will substantially check the speed of the airplane.

8. The combination of an airplane, of a metal container extending longitudinally of the axis of the airplane, a supply of powder confined in said container, electrical means under the control of the operator for igniting said powder and thereby creating a powerful discharge of gases, said container being adapted to direct said gases forwardly of the airplane and thereby to create a backward kick serving to check the forward movement of the airplane, and means for quenching the flame produced by the burning of the powder.

WILLIAM HOLMES WENSTROM.