June 30, 1936. G. H. MOREY 2,045,865

SKYWRITING APPARATUS

Filed April 30, 1934

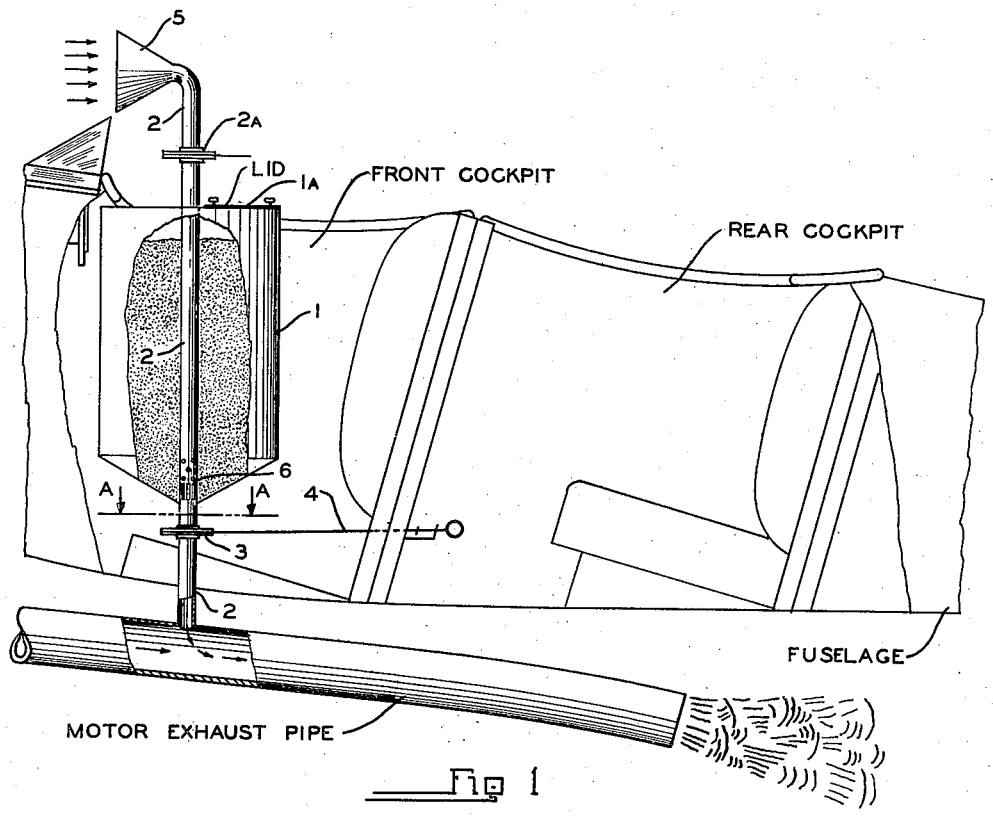

Fig 1

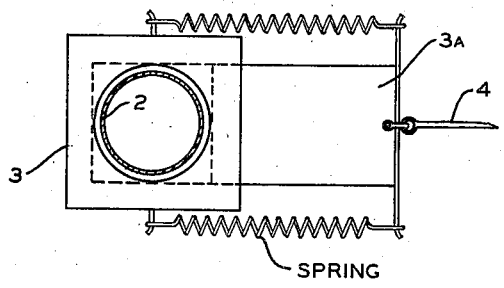

Fig 2

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Patented June 30, 1936 2,045,865

UNITED STATES PATENT OFFICE

2,045,865

SKYWRITING APPARATUS

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Application April 30, 1934, Serial No. 723,283

4 Claims. (Cl. 244—1)

My invention relates to the formation of smoke trails from an aircraft in flight, and to improvements in the method and apparatus used in forming same. It relates more particularly to the discharge of finely divided solid substances into the exhaust channel of an aircraft motor and thence discharged into the atmosphere in the form of a visible smoke trail.

It is well known that aircraft can be utilized, when properly maneuvered in flight, so that a regulated trail of smoke can be made to form signs, letters, characters or words visible to observers on the ground. Skywriting is an old art and many flights have been made for advertising purposes in which the heat of the motor exhaust pipe was used to vaporize a liquid in producing a visible smoke trail. In one proposal, the powdered carbon is mixed with a vaporized liquid by allowing the powdered material to fall by gravity from a receptacle and be added near the outlet end of the exhaust pipe, but only after the liquid has been vaporized. It is also known to use a device to positively withdraw a liquid or powdered material from a container placed in an aircraft so as to produce a uniform cloud of smoke or gas while in flight, but the liquid or powdered material is not vaporized by passing through the exhaust pipe of the motor.

The object of my invention is to provide a device that will insure a rapid and uniform withdrawal of a powdered material from a container placed in an aircraft.

Another object of my invention is to provide a means for discharging the powdered material and controlling the feed thereof into the exhaust pipe of an aircraft motor at such a point that the material will be subjected to heat for vaporization.

It is a further object of my invention to use a paranitraniline dye for producing a colored smoke and a means of regulating the number and length of such smoke trails.

These and other objects will be more clearly understood from the following description and accompanying drawing which forms a part of this application, and in which drawing:

Figure I is side view and part sectional view of the container showing the position of the air pipe in passing through the container and the relative position of these parts to the exhaust pipe of an aircraft.

Figure II is a top view of the valve chamber in the pipe in an open position taken on the line A—A of Figure I.

Referring now more in detail to the figures in the drawing, the closed container 1 is mounted at any convenient place in the aircraft, preferably as shown in this instance, in the front cockpit. 1A represents a lid or cover for the opening in the container. The pipe 2 extends perpendicularly through the center of container 1, the lower end terminating in and in communication with the motor exhaust pipe. 2A represents an ordinary conventional type of shut off valve. A valve chamber 3 intersects the pipe 2 exterior of and below the container 1 and the valve shutter 3A is adapted to open or close pipe 2 by the operation of wire 4 and springs attached to valve chamber 3 and shutter 3A. The pipe 2 extends upwardly through the container 1 and terminates in a funnel shaped mouth 5 located exteriorly of and above container 1. At a point within and near the lower part of container 1, the pipe 2 is provided with suitable port openings 6, which permit the contents of container 1 to enter the exhaust pipe at the will of the operator controlling the valve shutter 3A in valve chamber 3.

In actual operation the powdered material surrounds the pipe which extends through the container and can only be discharged into the motor exhaust pipe through the port openings in the pipe near the lower part of the container, when the valve shutter is withdrawn and the shut off valve in the pipe above the container is in an open position. The operator may withdraw the shutter by any one of a number of means other than the one described in this application, which is by pulling a wire connected to the valve shutter, thereby opening the passageway into the exhaust pipe. A swift current of air, derived from the forward motion of the aircraft, enters the pipe through the funnel and produces a suction effect when the passageway to the exhaust pipe is opened by withdrawing the valve shutter, whereby the powdered material is drawn downwardly through the port openings of the pipe, and is readily released and positively fed into the exhaust chamber.

This suction effect is further augmented by the escaping exhaust gases passing through the exhaust pipe, the result being insurance of a rapid and positive feed of the powdered material into the exhaust pipe.

It is very apparent that the quantity of powdered material fed per unit of time may be varied over a wide range by varying the size and number of port openings in the pipe, and that two or more containers, properly connected to the exhaust pipe, might be employed to provide for the discharge of powdered material, which would

result in as many different colors of smoke trails.

It is also readily understood that compressed gases may be used instead of atmospheric air for the high velocity gas stream necessary to feed the powdered material. It may be advantageous to employ nonoxidizing gases such as nitrogen or carbondioxide instead of air in the feeding system, in the event that the cloud forming material is easily oxidized during its admixture with the hot exhaust gases.

As the powdered material is admitted to the exhaust pipe it is subjected to the action of hot exhaust gases. The effect of the hot gases is to vaporize or sublime the powdered material without decomposing it, thereby producing smoke. I have found that satisfactory results are obtained by the use of a paranitraniline dye, however, I do not restrict myself to the use of paranitraniline dye inasmuch as other colored smoke trails can be produced by selecting a dye for the desired color. It is also understood that other means may be provided for supplying the heat for vaporization, but I have described a practical means, that of employing the heat of exhaust gases. The discharge of the powdered material into the exhaust pipe is controlled by a manually operated valve shutter which regulates the feed of said material, thereby enabling the operator to control the number and length of smoke trails and make visible signals in the sky, and when it is desired to cut off the smoke trail, as would be the case in making short signals or a series of letters, the operator stops pulling on the wire connected to the valve shutter, which permits the valve shutter to return by spring action to a position closing the passageway in the tube.

By repeating this action, of opening and closing the passageway to the exhaust pipe by manipulating the valve shutter, it is apparent that the operator is able to cause any desired number of visible colored smoke trails to be formed, and by proper handling of the aircraft can arrange for the smoke trails to take the form of letters, characters or signs.

I believe that the construction, operation and advantages of my invention may be readily understood from the foregoing description, and while I have shown and described the preferred embodiment, which has been found to give satisfactory results, it is to be understood that I do not restrict myself to the details, as the same are susceptible of modification in various particulars without departing from the spirit or scope of the invention.

What I claim as new and desire to secure by Letters Patent, is:

1. In combination with an aircraft a device of the character described, including a closed container provided with an opening in the upper part thereof and suitable means for closing said opening, a means for passing air currents through said container without contacting the contents thereof, the same comprising a continuous passageway having apertures therein and passing coaxially through the container, one end of which terminates in an enlarged mouth exterior of and above the container, the opposite end being in communication with the motor exhaust pipe, a means for opening and closing the passageway above the container, port openings in said passageway disposed adjacent the lower part of the container, a valve chamber intersecting the passageway below the container and a means for opening and closing the passageway in said valve chamber.

2. In an aircraft a means for producing visible smoke trails, comprising a container for powdered skywriting material, means for passing a current of air through said container to remove therefrom a portion of the skywriting material without contacting the remaining contents of said container, the same comprising a continuous passageway extending through said container and having apertures in the side walls thereof, said passageway being adapted to utilize a current of atmospheric air for drawing the powdered material from the container and into the exhaust pipe whereby heat of the exhaust gases is utilized to effect sublimation of the powdered material and the production of a visible smoke trail, and means for controlling the air current through said passageway, and a means for controlling the discharge of the powdered material into the exhaust pipe.

3. In combination with an aircraft a device of the character described, the same comprising a container for a skywriting material, an inlet for said container, an outlet for said container connected to an exhaust pipe of said aircraft, a continuous conduit extending through said container and connected to said inlet and said outlet, apertures in said conduit disposed within said container for the escape therethrough of portions of said skywriting material into said conduit and said exhaust pipe.

4. In combination with an aircraft a device for producing skywriting effects of the type described, the same comprising a container for a skywriting material, an inlet and an outlet for said container, said outlet being connected to the exhaust pipe of said aircraft, and means for passing air currents produced by the motion of said aircraft through said container and out of contact with the skywriting material contained therein and for withdrawing particles of said material into said exhaust pipe, the same consisting of a continuous conduit passing through said container and having apertures in one portion thereof for the escape of said skywriting material and connected at its ends with the inlet and outlet for said container.

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