April 30, 1946. W. SINTON ET AL 2,399,265

SMOKE SCREEN EQUIPMENT

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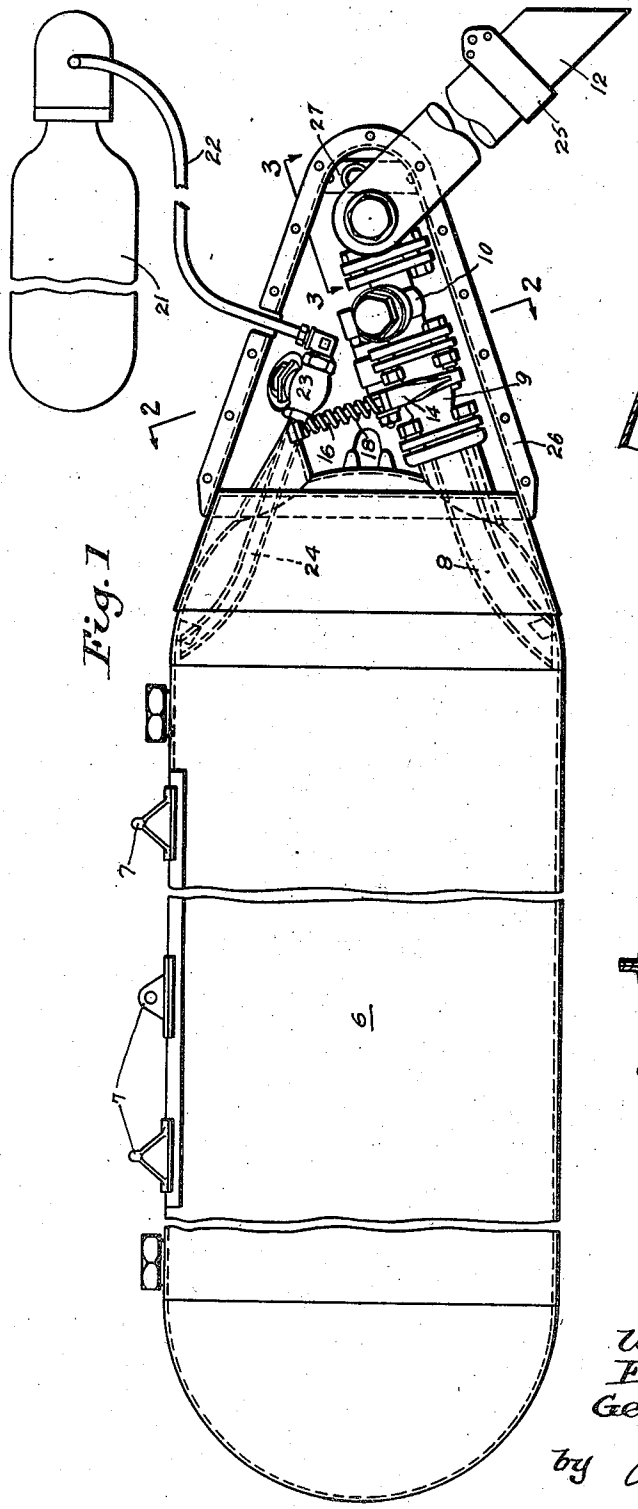


Fig. 1

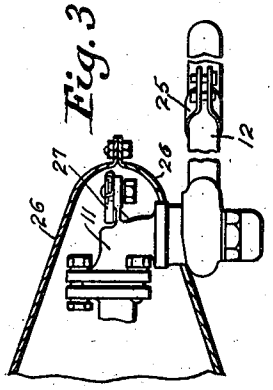


Fig. 3

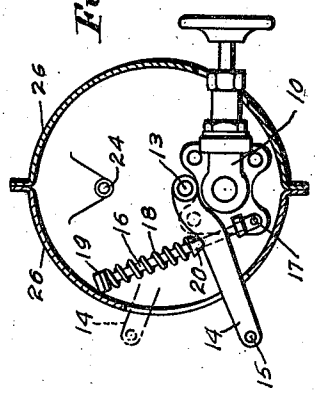


Fig. 2

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Fig. 4

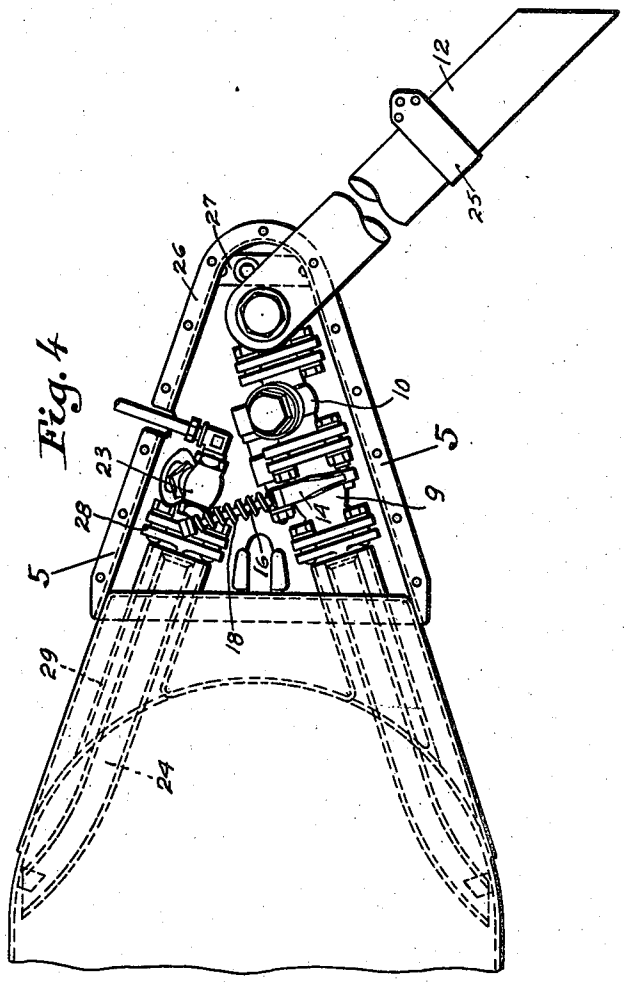
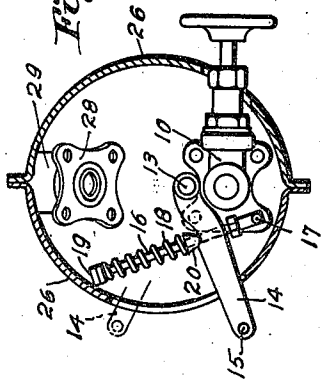



Fig. 5




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# UNITED STATES PATENT OFFICE

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## SMOKE SCREEN EQUIPMENT

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Application January 18, 1938, Serial No. 185,522

4 Claims. (Cl. 244—136)

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

This invention relates to means and methods for forming smoke screens and has among its objects:

To eliminate the formation of thin zones in smoke screens;

To provide means to insure a uniform rate of discharge of the smoke forming material;

To provide smoke screen equipment that may be attached to the bomb racks of military air craft;

To provide smoke screen equipment that will offer a minimum of air resistance;

To provide such equipment whereby smoke forming material is expelled by a fluid under uniform pressure;

To provide smoke screen apparatus readily operable from a station remote therefrom.

In the drawings:

Fig. 1 is a side elevation of an embodiment of our invention with a portion of the enclosure removed;

Fig. 2 is a section substanitally on the line 2—2, Fig. 1;

Fig. 3 is a detailed view taken on the line 3—3, Fig. 1;

Fig. 4 is a detail of a form of our invention embodying certain changes from Fig. 1;

Fig. 5 is a section substantailly along the line 5—5, Fig. 4.

It is well-known to those conversant with this art that smoke screens formed by prior apparatus have not been uniformly of maximum effectiveness due to the presence of thin zones caused by variations in the rate of expulsion of the smoke forming material. The present invention overcomes this defect and insures optimum concealment.

As depicted in Fig. 1, the tank 6 that contains the smoke forming material has in general the external contour of a bomb and is provided with attaching elements 7 for securing the tank 6 to the usual bomb racks of military aircraft, though it may be attached thereto in any other suitable manner. The smoke forming material passes from the tank 6 through a pipe 8 that has an open end adjacent the lowermost portion of the tank 6 and is connected, in the order named, to a gate valve 9, an operating valve 10, a fitting 11, and a discharge pipe 12 that is pivotally connected to the fitting 11 and is preferably streamlined in fore and aft cross section. The gate valve 9 is normally closed but is opened just prior to taking off when the equipment is to be used. The valve 10 is operated by means of a shaft 13 to which is fixed one end of lever 14 having at its other end an opening 15 to be engaged by a cord or cable that extends to the cockpit of the craft to permit remote operation of the valve 9. The lever 14 is slotted longitudinally and through this slot extends a spring retainer rod 16 that is pivoted at 17 to the valve 10 and carries a spring 18 under compression between a head 19 at the outer end of the rod and a rocking spring abutment 20 that is slidable on the rod 16.

The smoke forming material is expelled from tank 6 by a suitable expansible medium under pressure in the flask 21, such medium being preferably carbon dioxide due to the fact that this gas is chemically inert. The fluid medium is transmitted through a pipe 22 that has preferably connected in it pressure regulating valves disposed adjacent the operator, but since such means are common and well-known and constitute no part of the present invention they are not shown. The pipe 22 is connected through valve 23 to pipe 24 that extends into tank 6 and discharges adjacent to the upper surface thereof. The valve 23 is likewise normally closed but is opened immediately prior to the beginning of the flight. Stirrup 25 is provided to form a connection with some fixed part of the craft, through a rigid linkage, to fix the angular position of the discharge tube 12. A substantially conical housing for the valves is formed of two mating sections 26 that are secured to the tail end of the tank 6 and thereby complete the streamlining of the assembly and reduces parasitic drag during flight. Bracket 27 is fixed to the section 26 and is connected to the fitting 11, as shown in Fig. 3, to constitute a steadying support for the valves 9 and 10 and the discharge tube 12.

The use of the constant fluid pressure to expel the smoke forming material results in a uniform flow thereof from the tank 6 and therefore produces a smoke screen that is of substantially unvarying thickness and density, whereas in prior apparatus, such as those employing suction to remove the smoke forming material from the tank, discharge varying quantities of the smoke forming material and hence do not produce a smoke screen of uniform effectiveness.

It appears that the mode of operation is obvious since, with valves 10 and 23 opened before beginning the flight, movement of lever 14 to the dotted line position shown in Fig. 2 leaves an unobstructed conduit for the smoke forming material from the tank 6 out through discharge tube 12 and this operation of lever 14 is effected by pulling a cord or cable attached to the lever, as above set forth. The pressure control device

used in pipe 22 assures the action of a constant expelling force upon the smoke forming material in the tank 6.

The embodiment of our invention shown in Figs. 4 and 5 is in general similar to that disclosed in Fig. 1 and insofar as the elements in the two are common they have been given the same reference characters. However, it will be noted that a flanged coupling 28 is used for connecting the valve 23 to the pipe 24 instead of a plane screw-threaded connection as in Fig. 1. Likewise, a tubular and closing member 29 for the pipe 24 is provided and bears against the coupling 28 whereby a more rigid construction and a more certain support for valve 23 are effected.

According to the provisions of the patent statutes we have set forth the principle and mode of operation of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically illustrated and described.

Piping, regulator valve, cut-off valves 9 and 23 and operating valve 10 are so proportioned that freezing due to over-rapid expansion of the gas is prevented and no parts are subjected to excessive pressure. The cut-off valve 9 keeps the operating valve 10 free from contact with the chemicals until take-off and permits removal and disassembly of the operating valve for cleaning and adjustment.

The invention herein described and claimed may be used and/or manufactured by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

We claim:

1. In combination, a tank adapted to contain smoke-forming materials and provided with means for attachment to the bomb rack of an aircraft, a hollow conical tail-piece cooperating with said tank to give an external bomb-like contour, means to introduce into said tank, under regulated pressure, a gas chemically inert with respect to the said materials, the parts of said means being proportioned to prevent freezing due to expansion of said gas, and means forming an outlet conduit for discharging said materials including a quick-opening gate valve, a second valve, a pivotally mounted lever to actuate said second valve, resilient means acting to maintain said second valve normally closed and an outlet tube having one end pivotally associated with said valves, said tube being streamlined in cross section, said valves, said resilient means and the pivotally mounted end of said tube being enclosed in said tail-piece.

2. In combination, a tank adapted to contain smoke-forming materials, a hollow conical tail-piece cooperating with said tank to give an external bomb-like contour, means to introduce into said tank, under regulated pressure, a gas chemically inert with respect to the said materials, the parts of said means being proportioned to prevent freezing due to expansion of said gas, and means forming an outlet conduit for discharging said materials including a quick-opening gate valve, a second valve, a pivotally mounted lever to actuate said second valve, resilient means acting to maintain said second valve normally closed and an outlet tube having one end pivotally associated with said valves, said tube being streamlined in cross section, said valves, said resilient means and the pivotally mounted end of said tube being enclosed in said tail-piece.

3. In combination, a tank adapted to contain smoke-forming materials, a hollow conical tail-piece cooperating with said tank to give an external bomb-like contour, means to introduce into said tank, under regulated pressure, a gas chemically inert with respect to the said materials, the parts of said means being proportioned to prevent freezing due to expansion of said gas, and means forming an outlet conduit for discharging said materials including a quick-opening gate valve, a second valve, a pivotally mounted lever to actuate said second valve, means acting to maintain said second valve normally closed and an outlet tube having one end pivotally associated with said valves, said tube being streamlined in cross section, said valves, said resilient means and the pivotally mounted end of said tube being enclosed in said tail-piece.

4. In combination, a tank adapted to contain smoke-forming materials, a hollow conical tail-piece cooperating with said tank to give an external bomb-like contour, means to introduce into said tank, under regulated pressure, a gas chemically inert with respect to the said materials, the parts of said means being proportioned to prevent freezing due to expansion of said gas, and means forming an outlet conduit for discharging said materials including a quick-opening gate valve, a second valve, a pivotally mounted lever to actuate said second valve, means acting to maintain said second valve normally closed and an outlet tube having one end pivotally associated with said valves, said valves, said resilient means and the pivotally mounted end of said tube being enclosed in said tail-piece.

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