July 25, 1944. H. F. STIFFLER 2,354,225

DEVELOPING TANK

Filed Sept. 13, 1943 2 Sheets-Sheet 1

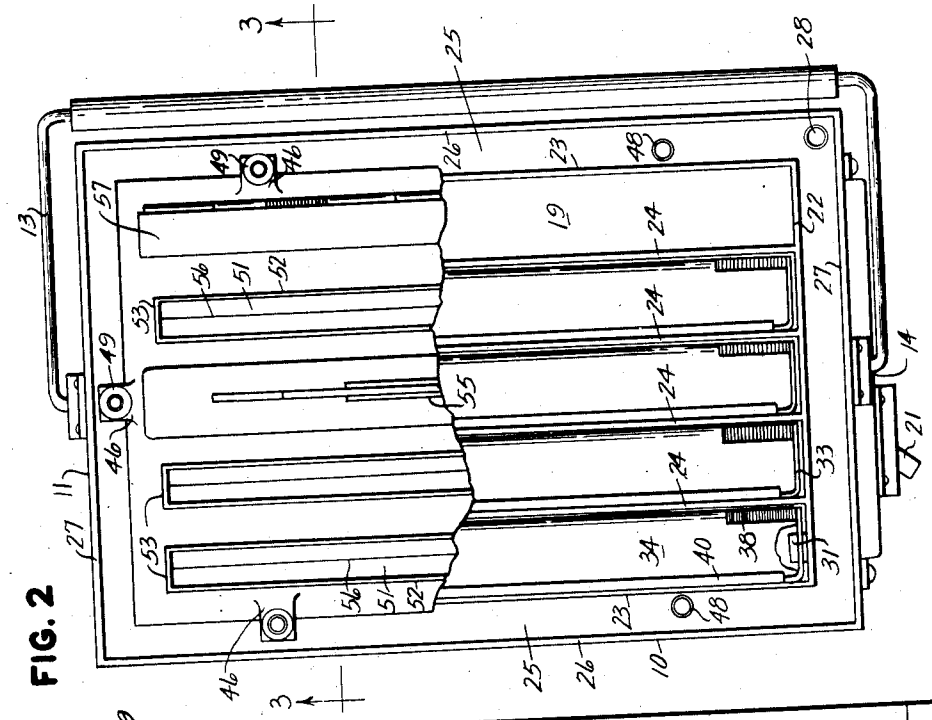


FIG. 2

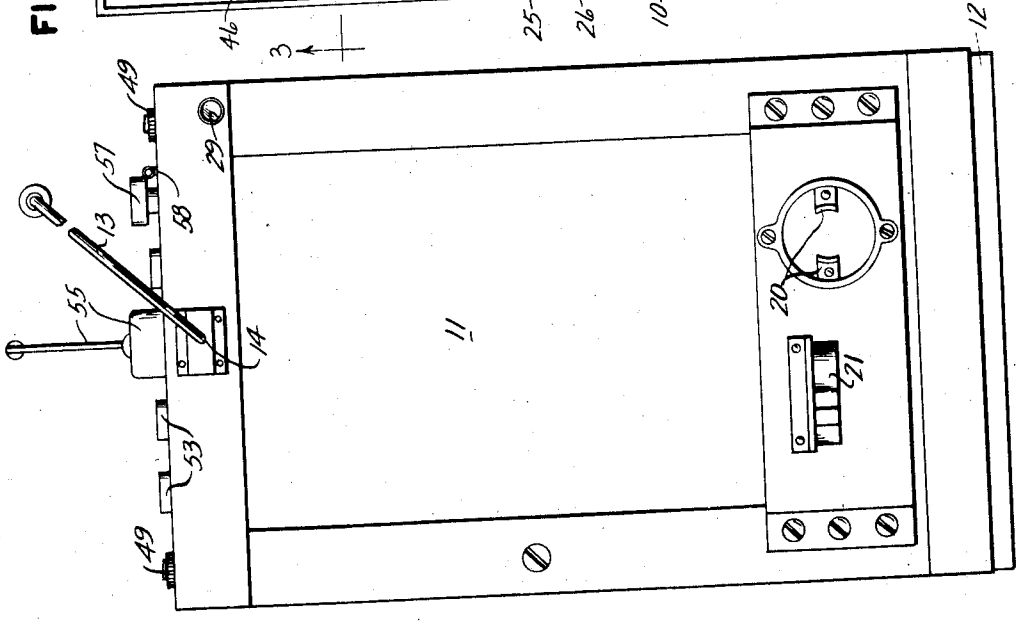


FIG. 1

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FIG. 3

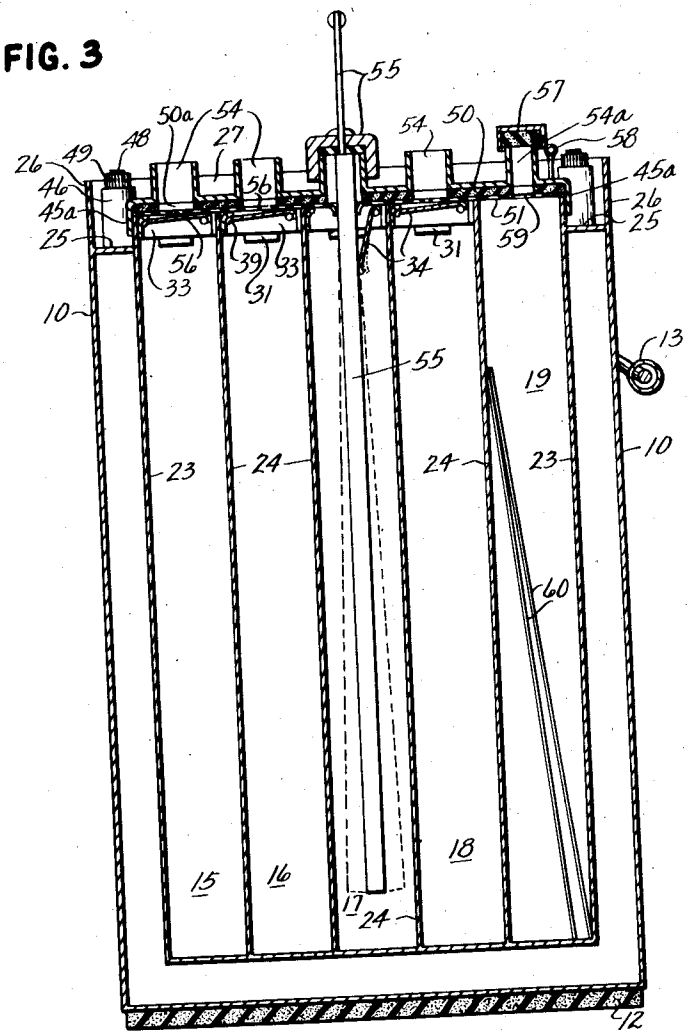
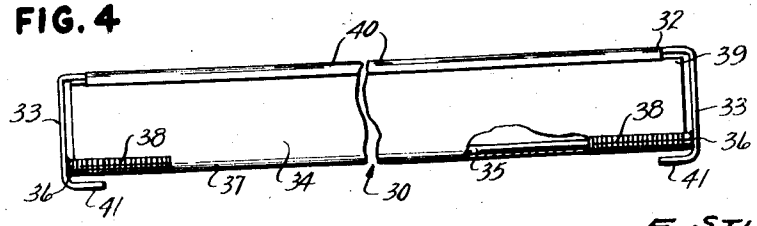


FIG. 4



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UNITED STATES PATENT OFFICE

2,354,225

DEVELOPING TANK

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Application September 13, 1943, Serial No. 502,184

6 Claims. (Cl. 95—90)

(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 me of any royalty thereon.

This invention relates to photographic tanks, especially quick development tanks, which are portable tanks that may be carried into an airplane and may be electrically heated when at high altitudes (where intense cold usually prevails), thus making possible the development of negatives very quickly after exposure. In reconnaisance of bombed targets often immediate information of the extent of damage inflicted on the enemy is required, so that oncoming waves of bombers may be advised if a change in their original instructions is desirable. Hence a quick development tank is used in many observation airplanes. It has been found, however, that chemicals from these tanks are sometimes spilled and then may cause considerable trouble, for instance, by destroying the control cables relied upon to operate certain apparatus, resulting in serious accidents. There is a definite need for a quick development tank which however handled will not spill the chemicals and which will process the negatives in daylight without danger of exposure to light, yet will permit ready insertion and removal of film holders and storage of developed films. This need the present invention meets. Another object is to provide a tank top construction which will permit the operator to agitate the chemicals in the tank by oscillating the film holder when inserted in the tank, but without danger of exposing the films to light. Other objects and advantages of the invention will be pointed out or else readily understood from the following description of the preferred embodiment of the invention shown in the accompanying drawings, wherein—

Fig. 1 is an end elevation of the tank;

Fig. 2 is a top plan view of the same, with part of the lid broken away;

Fig. 3 is a vertical cross section on line 3—3 of Fig. 2, looking in the direction indicated; and

Fig. 4 is a top plan view of one of the door assemblies, with a part broken away.

According to the Unger Patent No. 650,622 dated May 29, 1900, it has been proposed to employ a portable casing in which photographic plates may be developed, with rubber strips and other precautions to protect the plates as much as possible from light. Drosser in Patent No. 1,075,905 dated October 14, 1913 and Magnus in Patent No. 1,884,781 dated October 23, 1932, disclosed portable daylight developing tanks having several narrow vertical compartments open at the top for films or plates. The Gindele Patent No. 1,256,893 discloses the employment of light-excluding strips in a developing carrier which is constructed to permit the insertion of a plate or film holder from the upper end. None of these constructions, however, has the advantageous features of my invention.

Referring particularly to the drawings, the tank is preferably in the form of a parallelopiped with metallic side walls 10 and end walls 11, and has a sponge rubber or similar cushion 12 cemented to the bottom to protect the surface of anything on which the tank may rest, and a bail 13 pivoted as at 14 to the end walls 11 near their upper edges, so that the tank may be easily carried. One or more electrical resistance heating elements (not shown), which may be similar to heating elements for flat-irons, are placed inside the tank and suitable insulation (not shown) is located between the heating element and the outside tank walls, so that the major portion of the heat generated within the tank is directed inwardly toward the five narrow compartments 15, 16, 17, 18, 19 in which the films are developed or stored. A plug connector 20 is built into the end wall of the tank and provides means for electrically connecting the heater circuits of the tank with a source of electric current supplied by the airplane, and a switch 21 mounted adjacent the plug connector may permit the operator to select the circuit (12 v. or 24 v.) which is to energize the heater. Ordinarily 200 watts will be ample power for heating the tank.

The compartments 15, 16, 17, 18, 19 are preferably adjacent each other, being formed out of a rectangular metal can open at the top and having end walls 22 and side walls 23, with four vertical partitions 24 to form the five compartments. Each compartment may be about 10 in. long by $1\frac{1}{16}$ in. wide and $12\frac{1}{2}$ in. deep. The end walls 22, and the side walls 23, project above the top wall 25 of the tank, but this top wall is bordered by marginal flanges 26, 27, which may be continuous with the side walls 10 and end walls 11 respectively of the tank and may project about one-half inch above the top edges of the compartment walls 22, 23, 24. As the top wall 25 seals off the top of the tank, and is bordered by higher walls on the inside and outside, a basin is thereby formed for catching chemicals as they drip from the surfaces of films or film holders withdrawn from the baths in the compartments. Any chemicals caught in this manner may be drawn off, without tilting the

tank, by screwing a drain tube 28 (Fig. 2) into an opening 29 (Fig. 1) which is the discharge end of a conduit concealed in the walls of the tank. The drain tube may serve as a plug to close the conduit when screwed into the top end of the conduit.

Substantially to close the open upper ends of each compartment, a door assembly 30 is removably supported at opposite ends on two lugs 31 fixed to the end walls 22 of a compartment somewhat below the top end thereof. Each door assembly comprises an elongated sheet metal frame 32 (Fig. 4) bent to provide end portions 33 which extend at right angles, and a door 34 carried on a hinge pintle 35 whose ends are brazed or welded as at 36 to the end portions 33 on the inside. Rolled flanges 37 integral with the door embrace the hinge pintle 35 to hinge the door thereon. Coil springs 38 are carried on the hinge pintle between the rolled flanges 37 and the end flanges 33, and each coil spring is a torsion spring, with one end engaging the door on the underside and the other end fixed by the welding 36. Thus the springs tend to move the door upwardly toward a vertical position. But the door has its free longitudinal edge bent downwardly as at 39 to engage beneath the inwardly bent portion 40 of the frame 32, this inwardly bent portion thereby acting as a door stop and holding the door in a horizontal position, the coil springs permitting the door to yield under pressure and move downwardly to open the compartment. Spacing flanges 41 bent at right angles from the extremities of end portions 33 engage the partition 24 to insure a proper fit when a door assembly is inserted in the upper end of a compartment. End portions 33 then rest on lugs 31, as shown in Fig. 3. Each door assembly is inserted or removed by hand and when in position has its upper surface lying in the plane of the top edges of walls 22, 23, 24. As the door assemblies are directly exposed to acid and other chemicals, they will be made of some metal or material which can resist chemical action.

To close and seal the several compartments, a lid 45 with a marginal flange 45a is provided for the top of the tank. As indicated, each lid has six laterally projecting ears 46 each with a central bore (not shown) for receiving a stud 48 fixed to and projecting vertically above the top wall 25 of the tank. Knurled thumb nuts 49 are threaded on the studs and engage the ears when it is desired to secure the lid firmly. On the inside the lid carries a heavy cushion rubber gasket 50, and a thin, highly flexible rubber sheet 51 is cemented to the bottom of gasket 50. Projecting above the upper surface of the lid are a series of vertical flanges 52, 53 bordering openings 54, each opening 54 being adapted to receive a film holder 55 which may be entirely conventional and hence is not described. Each opening 54 is directly above a compartment in the tank; hence if there are five compartments as described, there will be five such openings. Beneath each opening 54 the gasket 50 has a registering opening or slot 50a. The thin rubber sheet 51 is cut by a sharp knife directly below the central axis of four of these openings, as indicated at 56. The slits 56 are only as long as the width of the film holder or may be a little shorter, and are normally closed by the elasticity and tension of the rubber, but open when a film holder is thrust down into the compartment, at which time the sides of the film holder are elastically hugged by the edges of the slit through which it is thrust. This assists in maintaining a tight seal for the chemicals and also aids in excluding light.

The fifth opening 54a is narrower than the others and is normally sealed by a spring-actuated rubber-lined cover 57 pivotally supported by vertical legs 58 fixed to the top of the lid. Directly beneath opening 54a the rubber sheet 51 has a relatively wide slit 59. Cover 57 may be lifted at any time for the insertion of developed films or plates 60 through opening 54a and slit 59 into the compartment 19 below. Thus safe storage of the developed films is facilitated. If preferred, however, all five of the compartments may be used for developing.

The described developing tank, if properly constructed, may be tilted through any angle without loss of the chemicals, and thus is almost ideal for use in airplanes. As previously stated, when the lid is in position, light is effectually excluded from the tank even during insertion or removal of the film holders. Also agitation of the chemicals may be effected by oscillating the upper ends of the film holders, which are easily grasped above the lid. The oscillation of a film holder is indicated by the dotted lines in the central compartment 17, Fig. 3. The openings or slots 50a in the gasket are sufficiently wide to permit this oscillation, which takes place without entry of light rays because the slitted rubber sheet 51 continuously adheres to the sides of the film holder, as will be understood from Fig. 3.

Obviously many changes in the details of construction may be resorted to without departing from the invention, which is defined in the appended claims.

What I claim is:

1. In combination, a development tank having at least one compartment into which a film holder may be inserted from the top; an anti-splash door supported at the upper end of the compartment and having a horizontal spring hinge so that the door will yield to a downward thrust from a film holder during insertion and will automatically rise to a horizontal position wherein the compartment is substantially closed but not sealed; a lid having a compartment-sealing gasket on its underside and having an opening so located that a film holder may be inserted through the opening and through the gasket and past the door into the compartment, when the lid is in clamped position; and means removably clamping the lid on the tank in sealing relation to the compartment.

2. The invention according to claim 1, wherein the gasket is of heavy sponge rubber or the like, and a thin, flexible, elastic sheet is secured under tension to the underside of the gasket and is slitted to permit the aforesaid insertion of the film holder, the slit being so narrow as to hug the sides of the film holder and normally being closed by the elasticity and tension of the sheet.

3. The invention according to claim 1, wherein the lid has vertical flanges projecting above the body of the lid and defining the opening provided for insertion of a film holder; the film holder resting on the upper edges of the flanges when inserted and then being laterally swingable within the compartment to agitate the chemicals therein; and means maintaining a light seal between the sides of the film holder and the compartment when the film holder is being swung.

4. The invention according to claim 1, wherein the anti-splash door is manually insertible in and removable from the top end of the compart-

ment and lies directly in contact with the gasket when the lid is clamped in position.

5. In combination, a film holder; a developing tank having a compartment therein which is permanently closed except at the top; a lid for the top of the tank; readily removable fastening means for securing the lid upon the tank so that the tank compartment is closed; said lid having an opening for a film holder, said opening permitting insertion of the film holder into the compartment without removing the lid; means fixed to the underside of the lid for sealing said opening against light but permitting the insertion of the film holder as aforesaid; other means fixed to the lid for sealing the joints between the lid and the tank compartment; and anti-splash means supported at the top of the tank compartment but on the inside of said light-sealing means and said joint-sealing means, and adapted to minimize the amount of developing fluid which will reach said sealing means.

6. A development tank suitable for use in airplanes comprising a body having a compartment therein adapted to hold a developing solution; a lid secured to the tank body; sealing means on the lid adapted to seal all joints between the lid and the tank, including the compartment; said lid having an opening which is located so as to be directly over the upper end of the compartment when the lid is secured upon the tank body; a flexible sheet supported on the lid and substantially closing the opening in the lid but having a slit permitting insertion of a film holder through the opening into the compartment; a door supported at the top of the compartment by a spring hinge, so that it yields to the thrust of the film holder while being inserted in the compartment, but normally is held in a substantially horizontal position directly beneath the slitted sheet; the flexible sheet being of some elastic material impervious to liquids and unaffected by developing solutions, and being under tension so that the slit is normally closed except when the film holder is thrust therethrough.

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