June 16, 1942. W. H. RICHARDS 2,286,229

PORTABLE FILM DEVELOPING APPARATUS

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FIG. 1.

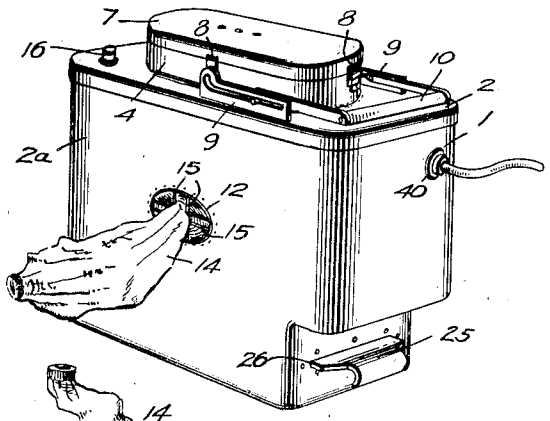


FIG. 2.

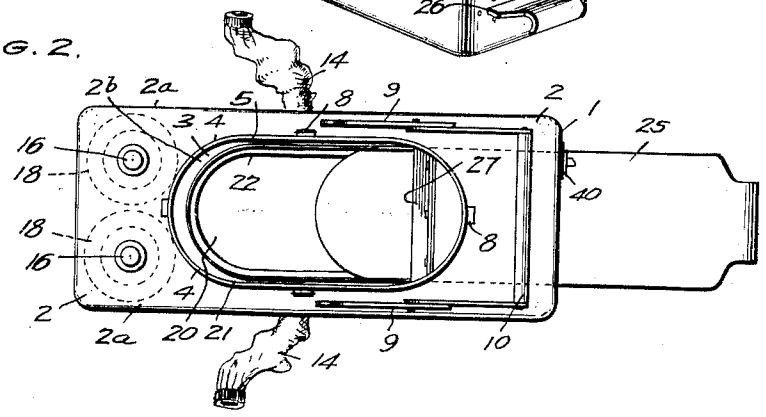
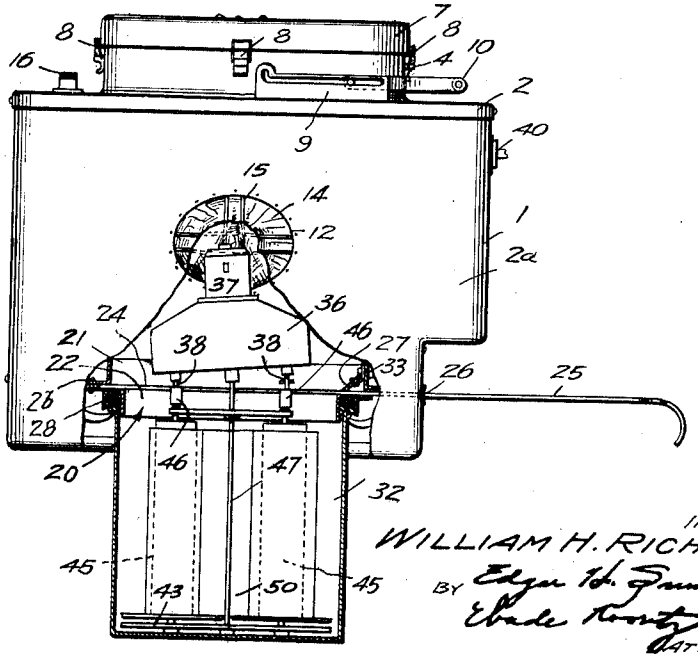


FIG. 4.



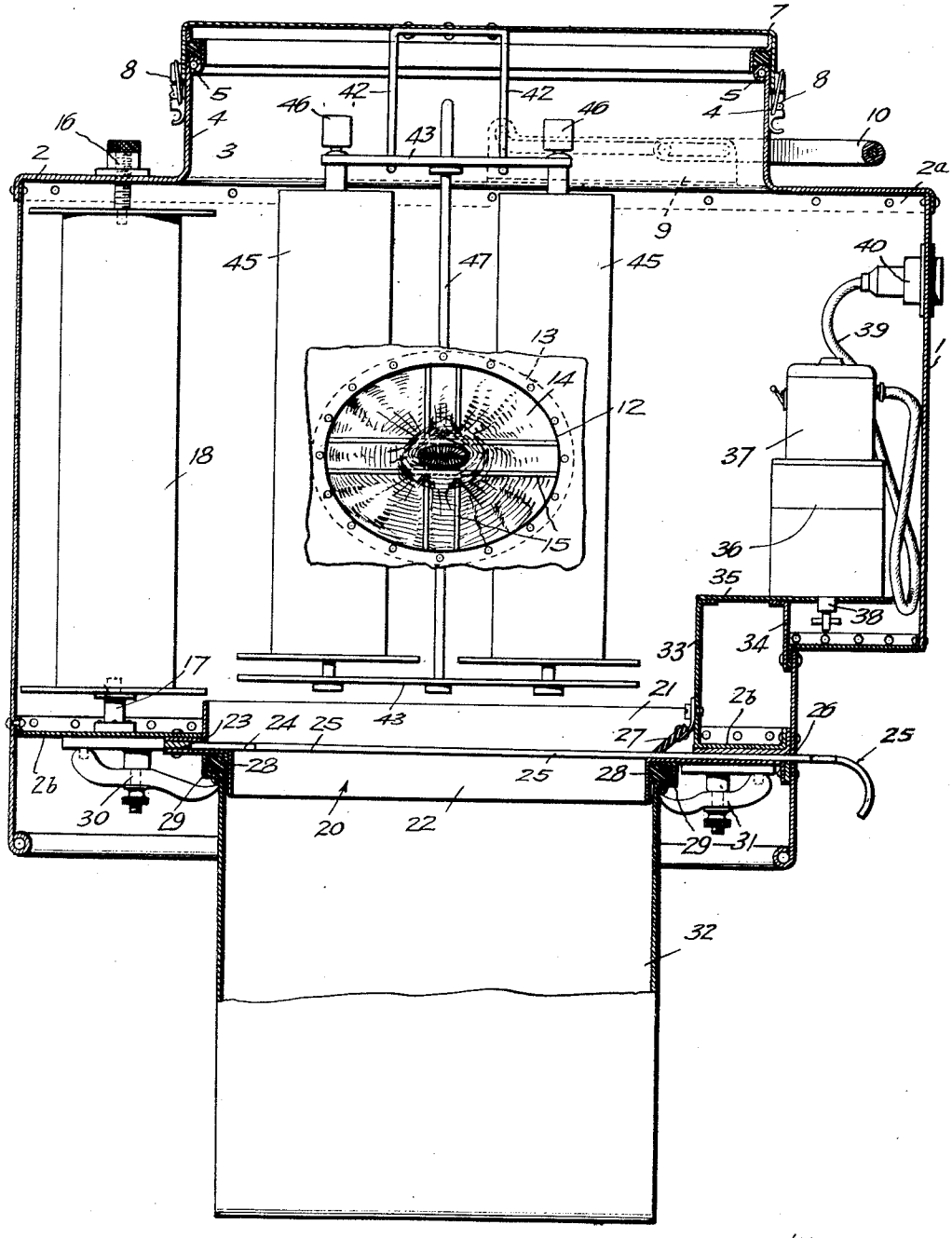
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FIG. 3.



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PORTABLE FILM DEVELOPING APPARATUS

William H. Richards, Dayton, Ohio

Application June 10, 1941, Serial No. 397,431

5 Claims. (Cl. 95—91)

(Granted under the act of March 3, 1333, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to portable film developing apparatus which is light in weight and very compact so that in effect it supplies a portable darkroom which may be employed on aircraft for developing aerial photographs and may be used in the field for developing cut or roll film.

Portable developing apparatus of various types are as old as the art of photography itself, but in such previous constructions of which I am aware, the developing solutions have been placed in containers placed within a portable housing into which the operator's hands are inserted through lightproof sleeves or the like. Such previous constructions were messy due to splashing of the developing solutions and are not adapted for use with automatic motor-driven film developer rolls such as now widely used in developing roll-type films such as employed in aerial photography.

The apparatus in accordance with the invention comprises a generally rectangular box or casing having a removable lid through which trailer spools, developing reels, film rolls and the like may be inserted, the box being provided with at least two sets of spool bearings, one for rotatably supporting an empty trailer spool onto which is wound the protective covering or trailer of the developed film roll, the spool on which the latter is wound adapted to be rotatably mounted on the other set of bearings. The box or compartment is provided on opposite sides thereof with elliptical handholes into which are secured rubber sleeves so that the operator's hands may be inserted into the compartment without permitting the entrance of light. The box or compartment is provided with a large opening or aperture in its bottom which may be covered or uncovered by a dark slide. A sealing gasket is provided on the external part of the bottom of the compartment around the marginal edges of the aperture which is adapted to seat on the top of a separate developing tank and which may be removably clamped to the casing. The removable lid or cover for the compartment is provided with hooks for supporting a frame carrying developing reels such as illustrated and described in U. S. Patent No. 1,969,823 granted to John Wesley Smith, and the construction of which per se forms no part of the present invention. By opening the aperture in the casing by removal of the dark slide, the developing reels after being loaded with exposed film, may be manually lowered into the developing tank, the reels then being driven by an electric motor-driven transmission to cause the film to be passed back and forth in the developing solution as explained in the aforementioned U. S. Patent No. 1,969,823. After the film has been in the developing solution for the requisite amount of time, the motor is removed and placed on a shelf provided in the box or compartment, the developing reels are elevated and again mounted on the supporting hooks, the dark slide is pushed in to cover the aperture in the compartment bottom and the box or compartment is unclamped from the developing tank and connected to a second tank in a similar manner to perform the next stage in the developing process.

The principal object of the invention is the provision of apparatus for use in the development of photographic film comprising in combination, a container adapted to contain a solution for developing or otherwise treating the exposed film, and a casing having an aperture therein adapted to be clamped to said container with the aperture in register with the top of the container, the said casing including a dark slide adapted to be moved to cover or uncover said aperture, and the casing being provided with handholes having sealing means whereby the operator may insert his hands within the casing and lower the film to be developed through the aperture in said casing into the developing container.

Another object of the invention is the provision in portable film developing apparatus of the character described, of a casing having a removable cover, a support means on said cover for removably supporting developing reels, an aperture in the bottom of said casing adapted to be placed in register with a developing solution container, and a dark slide adapted to be moved to cover or uncover said aperture.

A further object of the invention is the provision in portable film developing apparatus of the type comprising a casing having handholes for the insertion therein of the operator's hands without admitting light, of a removable cover for said casing, means on said cover for removably supporting film developing reels, bearing means in said casing for rotatably supporting a pair of spools adapted respectively to have exposed film and a film protective cover wound thereon, an aperture in the bottom of said casing for lowering the developing reels into a developing solution container and a slide operable to be moved to cover or uncover said aperture.

Other objects of the invention not specifically enumerated above will become apparent to those skilled in the art by reference to the detailed description hereinafter given and to the appended drawings in which:

Figure 1 is a perspective view of a portable case forming a part of the invention; and

Figure 2 is a top plan view of the casing illus-

trated in Figure 1 with the developing reels and cover removed; and

Figure 3 is a longitudinal sectional view through the casing of Figure 1 when assembled with a developing solution container to form a portable darkroom; and

Figure 4 is a view with parts broken away illustrating the assembled apparatus such as illustrated in Figure 3 showing the developing reels lowered into the developing container.

Referring now to Figures 1 and 2, the reference numeral 1 generally indicates a rectangular casing or housing forming a part of the complete developing apparatus as hereinafter explained, and having a top 2, side walls 2*a* and bottom 2*b* (see Figure 2). The casing is preferably constructed of a light gage metal such as aluminum and the parts thereof being secured together as by welding or riveting. The casing top 2, as seen in Figure 2, is provided with an aperture or opening 3 having a rectangular shape with rounded ends, the marginal edge of the opening being surrounded by a flange portion 4 formed integral with the top 2 and having the upper edge thereof beaded over as indicated at 5 to serve as a seat for a removable cover 7 (Figure 1) which may be secured to the cover flange 4 by means of snap locks 8. The casing 1 is provided with a pair of brackets 9 which are adapted to support a slidable handle 10 which may be moved along the supports 9 so as to permit the easy removal of the cover 7 and the handle serving as a means for carrying the complete apparatus hereinafter described.

As seen in Figure 1, the side walls 2*a* are provided with elliptical cutouts 12 into which are fitted a similar shaped ring 13 to which is secured a flexible sleeve 14 and normally maintained closed by means of rubber cords 15 and serving as armholes through which the operator's hands and arms may be inserted to the interior casing 1 to perform the necessary operations incident to the developing process.

As seen in Figure 2, the casing 1 is provided with an aperture generally indicated by the reference numeral 20 through the bottom 2*b* thereof, the aperture being surrounded by an inwardly projecting flange 21 and also being surrounded by an outwardly directed elliptical flange 22 which defines the edge of the aperture 20. The aperture 20 is adapted to be covered or uncovered by means of a removable slide 25 which may be inserted or removed through a transverse slit 26 in the end wall of the casing 1, as seen in Figure 1. A flexible rubber squeegee 27 is arranged within the housing 1 so as to contact the slide 25 to wipe off any liquids adhering to the upper side thereof and preventing the ingress of light into the interior of the casing 1 through the slit 26 after the slide is moved to a position to uncover the aperture 20.

Referring now to Figure 3, it is seen that the casing 1 is provided with upper and lower aligned bearings 16 and 17 adapted to rotatably support a reel 18, these bearings being provided in duplicate spaced pairs for supporting two separate reels such as indicated at 18 and the upper bearings 16 being removable to allow the reels to be inserted or removed from the casing 1 through the opening 3 in the top 2 thereof. The baffle 21 formed of a flanged plate is secured directly to the bottom 2*b* of the casing 1 and the flange member 22 similarly formed, is secured to the bottom 2*b* with a spacer member 23 inserted between the flange members 21 and 22 to form a space 24 in which the dark slide 25 is movable through the slit 26 provided in the end of the casing 1, as previously noted. The downwardly depending flange 22 is surrounded by a wide gasket member 28 preferably made of rubber or other resilient material and secured between the flange 22, and a flange ring 29 secured to the flange member 22 by spot welding or the like, the gasket being securely cemented in the space between these members and serving as a seat for the beaded open top of a container 32 adapted to contain a liquid used in the developing process such as a developing solution, a fixing solution, or rinsing water. The container or tank 32 is adapted to be removably secured to the casing 1 in sealing engagement with the gasket 28 by means of a pair of clamps 30 and 31 respectively secured to the bottom of the casing and adapted to engage the under side of the beaded top of the container 32 to clamp the same into tight engagement with the gasket 28. As seen in Figure 3, the bottom 2*b* of the casing 1 is formed with a bent-up flange 33 which together with a transverse bracket 34 serves as a means for supporting a shelf 35 which projects into an offset portion of the casing to support a motor-driven power-transmission device 36 adapted to be driven by an electric motor 37 and having two driving members 38. The motor is supplied with current by means of a flexible cable 39 adapted to be secured to a plug connection 40 through which current may be conducted from any suitable external source, not shown. The transmission 36 and electric motor 37 form a part of the automatic film developing apparatus disclosed and claimed in the aforementioned U. S. Patent 1,969,823, the construction of which per se forms no part of the present invention. The shelf 35, in addition to serving as a support for the motor-driven transmission 36, may also serve as a support for suitable containers for the necessary developing and fixing chemicals. The removable cover 7 of the casing 1 is provided with a pair of downwardly depending hooks 42 which are adapted to removably support a developing reel framework 43 which serves as a means to rotatably support a pair of developing reels 45 of the same character as illustrated and described in the aforementioned U. S. Patent 1,969,823, the specific construction of which also forms no part of the present invention. The shafts of the reels 45 are provided with driving coupling members 46 which are adapted to be respectively driven by one of the driving elements of the motor-driven transmission 36, the transmission being tiltably supported on the rounded upper ends of a pair of spaced supporting rods 47 so as to engage either of the driving members 38 with the corresponding coupling member 46 to alternately drive the reels 45 as more fully explained in the aforementioned U. S. Patent 1,969,823.

Operation

The operation of the portable film developing apparatus, above described, is as follows:

A loaded spool of exposed film suitably covered by a protecting trailer made of paper, or other opaque material, is inserted into the housing 1 after removing the cover 7, and is supported upon one of the sets of bearings 16 and 17 and the paper or other trailer initially wrapped around an empty reel such as at 18, located adjacent the loaded film roll, and the empty reel is rotated sufficient to start the trailer winding up thereon. The developing reels and support-

ing structures 43 and 45 are hung upon the hooks 42 and the cover 7 replaced on the housing 1. The operator then clamps a container 32, containing for example, a developing solution, onto the housing 1, the container serving as a means to support the housing assembly. The operator then passes his hands through the flexible sleeves 14 into the interior of the housing 1, and completes the unwinding of the trailer from the loaded film roll and cuts the trailer from the exposed film upon reaching the end of the trailer. The end of the exposed film is then transferred to one of the reels 45 which is rapidly rotated by hand until all the exposed film is wound thereon, the other end of the film being wound around the remaining developing reel 45. The operator then removes his hands from the sleeves which are then closed by the rubber cords 15 to prevent light from entering the casing. The dark slide 25 is moved axially to the right, as seen in Figure 3, so that the interior of the casing 1 is in free communication by means of the aperture 20 with the interior of the container 32. The operator then again inserts his hands into the interior of the casing 1 and removes the developing reel assembly with the exposed film thereon from the hooks 42 and lowers the entire assembly through the aperture 20 into the container 32 to a position, such as indicated at Figure 4. The operator then removes the motor-driven transmission 36 from the shelf 35 and places the same on the pivotal support rods 47 in the position as indicated in Figure 4, whereby one of the driving members 38 is coupled to a coupling member 46 of one of the reels 45 to drive the same. The electric motor 37 is then energized and is operative to rotate the respective reels 45 until substantially all of the film is wound upon one of the reels and then to tilt automatically in response to the torque required to wind the film to drivingly engage the other of said reels 45 to cause a reverse motion of the exposed film 50 in the container 32. By means of the transmission 36, the film is caused to continuously be passed back and forth through the solution contained within the container 32 to cause a development or fixing thereof, as the case might be, in a manner more than fully explained in the aforementioned U. S. Patent 1,969,823, and the automatic process of moving the film relative to the solution being old and well known in the art and fully disclosed in the aforementioned patent. After the film 50 has been immersed in and moved relative to the solution in the tank 32 for a sufficient length of time, the operator removes the transmission 36 and replaces the same on the shelf 35, and raises the developing reel assembly from the position, as shown in Figure 4, back onto the hooks 42 as seen in Figure 3, the film being allowed to drain any surplus liquid back into the container 32 through the aperture 20 and the baffle 21 preventing any liquid from splashing into the interior of the housing 1. The operator then replaces the dark slide 25 so as to cover the aperture 20 and unclamps the housing 1 from the container 32 and transfers the same to a second container of similar character and repeats the procedure as outlined above in carrying out the next stage of developing process, such as rinsing or fixing, a suitable number of containers 32 being provided with the proper liquid such as water, fixing, or developing solution in close proximity so that the casing 1 may rapidly be transferred from one container to the other. The dark slide 25 prevents any light from entering the casing during the process of transferring the casing containing the exposed film from one container to the other. After the fixing process is complete, the final rinsing of the film in water may be conducted without the use of the housing 1, since it is then not necessary to prevent the film from being exposed to light. Whenever the dark slide 25 is removed from the casing, the squeegee 27 wipes off any chemicals or solution adhering to the upper side thereof and prevents the ingress of liquid into the interior of the housing 1.

In practice, the liquid containers 32 are made so as to telescope or nest one within the other, so that the containers may be placed within the interior of the housing 1 when the dark slide is moved to cover the aperture 20. The developing reels 45 may then be lowered within the inner container and all necessary chemicals housed within the casing 1, so that all of the equipment except water may be carried in the casing 1.

While the above equipment has been described relative to its use in carrying out the developing process of roll film, it is obvious that cut film may be developed in a similar manner with the exception that the developing reels may be dispensed with.

While I have illustrated and described a single embodiment of my invention, it will be apparent to those skilled in the art that many changes and modifications may be made therein falling within the scope of the invention as defined in the appended claims.

I claim:

1. In a portable apparatus for use in the development of photographic film including a casing having light protected armholes in opposite sides thereof; a removable cover for said casing, a support on said cover for removably supporting film developing reels, an aperture in the bottom of said casing, a gasket on the exterior of said casing surrounding the marginal edges of said aperture, a container adapted to contain a liquid employed in the developing process, means for removably clamping said container against said gasket in register with said aperture, and a slide in said casing movable to cover or uncover said aperture, and said slide when in the latter position permitting the developing reels to be lowered into the said container.

2. In photographic apparatus of the character described, a casing having light protected armholes on opposite sides thereof, a removable cover for said casing, an enlarged opening in the bottom of said casing, a dark slide adapted to be moved to cover or uncover said opening, first bearing means in said casing for removably and rotatably mounting a reel containing exposed photographic film, second bearing means in said casing for removably and rotatably mounting a reel upon which the protective covering of the film may be wound, a pair of power driven developing rolls in said casing, a frame for rotatably supporting said developing rolls, and means for removably suspending said frame within said casing from the removable cover thereof.

3. In portable photographic apparatus of the character described including a casing forming a darkroom compartment and adapted to be removably secured to a developing liquid container; said casing having an opening in the bottom thereof adapted to connect the interior of said casing with said container, a dark slide in said casing adapted to be moved to cover or uncover said opening, a slit in said casing through

which said slide may be inserted, and a resilient wiper member in said casing adjacent said opening and adapted to wipe the upper surface of said slide to remove liquid therefrom for drainage through said opening and to prevent the entrance of light into said casing when the slide is removed.

4. The structure as claimed in claim 3, in which said casing is provided with an inwardly directed flange adjacent the marginal edges of said opening to prevent splashed liquid from the container from entering the interior of the casing.

5. In a portable dark room including the casing having light protected arm holes, an aperture in the bottom of said casing, an open-topped container adapted to contain a liquid employed in the developing process, means for removably clamping said casing to said container with the said aperture in register with the top of said container, a slide in said casing for opening said aperture for communication of the interior of said casing with said container or for closing said aperture to prevent the ingress of light to said casing, and said casing being provided with two pairs of vertically disposed bearings, each pair of bearings being adapted to removably and rotatably support a reel adapted to contain exposed film and a protective film cover respectively, a pair of developing reels upon which the exposed film may be wound, a frame for rotatably supporting the developing reels, and means within the casing for removably supporting the developing reel frame whereby the developing reel assembly may be lowered through the aperture in the bottom of said casing into the developing liquid container or be suspended within said casing when the said aperture is covered by said slide.

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