Jan. 22, 1924. 1,481,759

R. SUGIURA ET AL

FILM DEVELOPING TUBE

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Fig. 1.

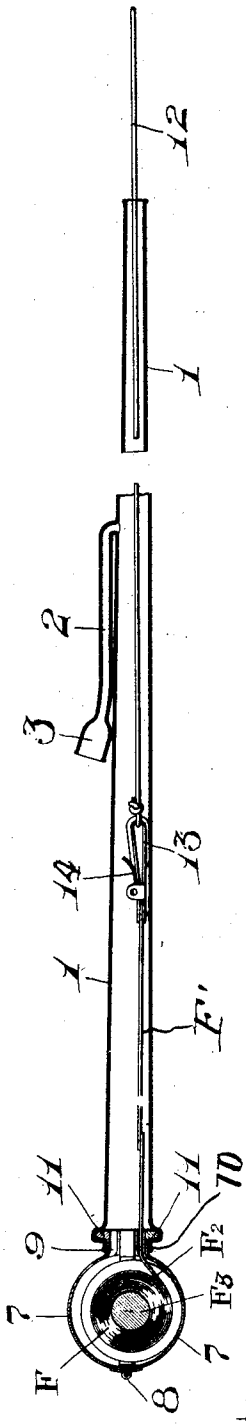
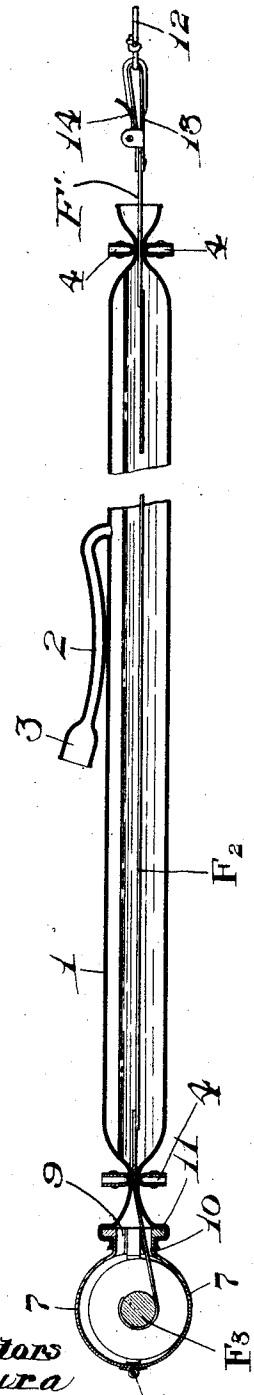


Fig. 2.



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Fig. 7.

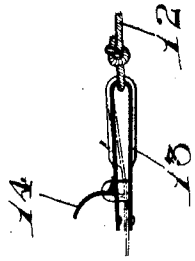


Fig. 8.

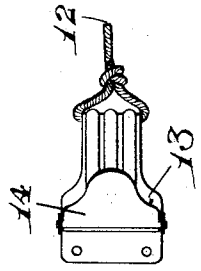


Fig. 5.

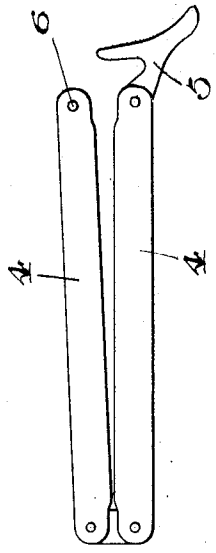


Fig. 6.

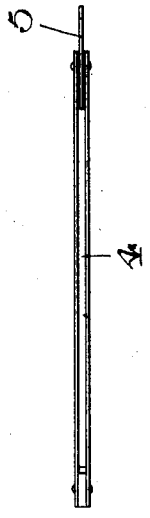


Fig. 3.

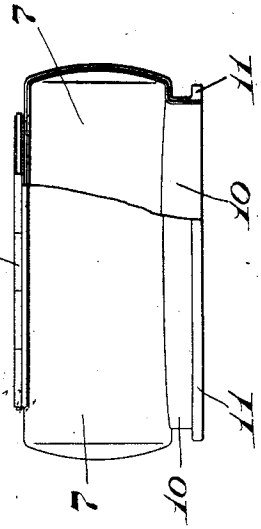
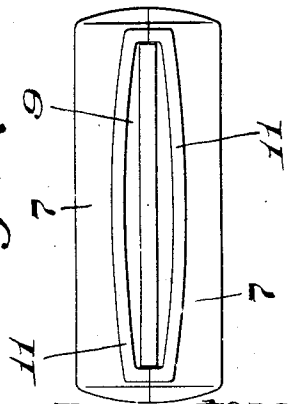


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROKUEMON SUGIURA, OF TOKYO, AND KISO OKIMOTO, OF TOKYO-FU, JAPAN.

FILM-DEVELOPING TUBE.

Application filed October 15, 1921. Serial No. 507,919.

To all whom it may concern:

Be it known that we, ROKUEMON SUGIURA and KISO OKIMOTO, subjects of the Empire of Japan, residing, respectively, at No. 3 Honcho 2-Chome, Nihonbashi-Ku, Tokyo, and at No. 166 Aza Yoyogi, Yoyohatamachi, Toyotama-Gu, Tokyo-Fu, have invented certain new and useful Film-Developing Tubes, of which the following is a specification.

Our invention relates to a film developing tube comprising a flexible, water-proof and photographically dark-coloured tube, made of thin rubber, and means for clamping both ends of said tube. The films being adapted to be drawn into and developed within said tube.

The object of the invention is to develop sensitized films without need of a dark room. Another object of the invention is to render the operation of developing films easy and safe. Another object of the invention is to provide a new developing apparatus which is compact, light and handy to carry. Another object of the invention is to economize in the quantity of developing solution needed and to permit of the repeated use of the same. Further objects will appear in the course of the specification.

The accompanying drawing shows an example of the apparatus embodying the present invention.

Fig. 1 is a longitudinal section with a film partly drawn into the tube.

Fig. 2 is a longitudinal section with the film drawn entirely within the tube and the developer introduced therein.

Fig. 3 and Fig. 4 are detail views of roll film case.

Fig. 5 and Fig. 6 are detail views of a clamp for fastening ends of the tube.

Fig. 7 and Fig. 8 are detail views of a cord or string with a snap at one end for drawing a film through the tube.

The apparatus of the invention comprises a tube made of a flexible, water-proof photographically dark-coloured material (such as rubber). Both ends of said tube are open and are adapted to be tightly clamped and closed by a suitable means. After a film has been drawn into said tube, both ends are clamped and developing solution is poured into the tube, and the developing operation proceeded with.

The tube (1) is preferably made of thin rubber open at both ends and having a proper size and length to accommodate a film. Said tube may be made of a dark or deep-brown rubber, but a part or whole thereof is preferably rendered transparent so that the progress of developing may be readily observed, said transparent portion being colored red to prevent the passage of actinic light. An opening is formed in the tube at a point intermediate its ends and is connected with a slender pipe (2) made of rubber and provided with a funnel-shaped opening to facilitate introduction or removal of the developing solution.

A clamp for fastening the ends of the tube is shown in Fig. 5 and Fig. 6 and comprises two straight bars (4) (4) respectively hinged at one end so that they can open and shut, and at the other end of one bar (4) is provided a hook (5) to engage with a pin (6) fixed at the other end of the other bar (4), and the rubber tube (1) as well as a part of film (F_1) are tightly clamped between said bars (4) (4) as shown in Fig. 2.

A film-roll holding case consisting of two trough-like pieces (7) (7) jointed at one side by hinge (8), is provided with a slot (9), and an extension (10) having a flange 11. One end of the rubber tube (1) is adapted to be closely fitted over the flanged extension 10, as shown in Fig. 1 and Fig. 2. For storage, the rubber tube (1) may be compactly rolled up and placed in the film roll case.

To draw a film through the tube (1) a cord or string (12) with a snap (13) at one end is provided. Said snap is opened or closed by properly manipulating knob (14).

In developing a film according to the apparatus of the present invention the metal case (7) (7) is opened and a film roll (F) is placed therein. After closing the case the paper part (F_1) at one end of the film is drawn out through the slit (9) and the snap (13) is attached thereto. The cord (12) is previously drawn through the rubber tube one end of which latter is closely fitted over the flange (11) of the metal case, and by pulling the other end of the cord (11) the sensitized part (F_2) of the film is unwound from the spool (F_3) and drawn into the rubber tube (1) as shown in Fig. 1, leaving the spool (F_3) in the case. After the sensitized surface (F_2) is completely

enveloped by the tube both ends of the latter are closed by the clamps (4) each holding the paper part (F_1) between the tube as shown in Fig. 2, and then a suitable quantity of developing solution is poured into the tube through the pipe (2). The tube is placed horizontally, and preferably is slightly inflated with air, and by successively pressing various portions of the tube, the developing solution is agitated and contacts the film surface (F_2) throughout its entire length and thus develops the film uniformly. When a proper density of development is obtained the funnel (3) is turned downwards to pour out the solution, and after the clamps at both ends of the tube have been removed the film is drawn out from the tube in a clear water, thus the surface of the film is never injured.

According to the present invention the quantity of developing solution necessary for proper development of the film is minimized owing to the fact that the tube has a narrow sectional area in comparison with ordinary developing apparatus and very little quantity of solution will act uniformly on the whole length of a film, besides the solution can be repeatedly used.

We claim:—

1. In a device of the character described, a flexible tube having open ends, means for introducing developing solution into said tube, and removable means adapted to embrace and close the open ends of the tube to close the latter and also adapted to embrace and clamp the extremities of a film disposed in said tube whereby to prevent displacement of either end of said film with respect to the tube.

2. In a device of the character described, a flexible tube having open ends, means for introducing developing solution into said tube, removable means adapted to embrace and close the open ends of the tube to close the latter and also adapted to embrace and clamp the extremities of a film disposed in said tube whereby to prevent displacement of either end of said film with respect to the tube, and means for introducing a developing solution into the tube at a point intermediate the ends thereof.

3. A developing tube comprising a body formed of flexible material and having a portion thereof rendered transparent to facilitate inspection of a film contained in the tube and having said transparent portion colored to prevent the passage of actinic light rays therethrough.

4. In a device of the character described, a flexible film receiving tube adapted to contain a developing solution and having open ends, a film spool holding casing adapted for connection with one terminal of the tube, means for drawing the film from the casing into the tube, and clamping devices engageable with the opposite extremities of the tube for closing the latter and for embracing the extremities of the film whereby to prevent displacement of either end of the latter with respect to the tube.

5. In a device of the character described, a casing consisting of hingedly connected sections adapted to receive a film spool and having a flanged slot therein, a flexible film receiving tube having one end engageable with the flanged slot and clamping means engageable with the opposite extremities of the tube to the exclusion of the light and fluid and adapted to embrace the opposite extremities of the film to prevent displacement of the latter with respect to said tube.

In testimony whereof we have affixed our signatures in presence of two witnesses.

ROKUEMON SUGIURA.
KISO OKIMOTO.

Witnesses:
KUKUI ICHIKAWA.
EDWARD C. WYNNE.